

2nd International Congress of the Turkish Journal of Agriculture - Food Science and Technology

TURJAF 2021

CONGRESS BOOK

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Nigde Ömer Halisdemir University
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EDITORS

Prof.Dr. Ahmet ŞEKEROĞLU

Niğde Ömer Halisdemir University
Department Of Animal Production And Technologies
Faculty of Agricultural Sciences and Technologies

Prof.Dr. Hasan ELEROĞLU

Department of Plant and Animal Production
Sivas Vocational School,
Sivas Cumhuriyet University,
58140 Sivas, Turkey

Dr. Mustafa DUMAN

Niğde Ömer Halisdemir University
Bor Vocational High School
51700 Bor/Niğde

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FOREWORD

"II. International Journal of Agriculture - Food Science and Technology (TURJAF 2021) "was held in Gazimağusa / Cyprus between 25 and 29, October, 2021 with the participation of scientists working in agriculture and related disciplines to share scientific knowledge, to propose scientific solutions to international problems by international cooperations, and to establish the scientific outcomes that will benefit mankind by using economic international resources.

Congress participants came all the way from 26 different countries including Algeria, Azerbaijan, Benin, Côte d'Ivoire, Egypt, Ethiopia, Ghana, India, Iranian, Iraq, Jordan, Lebanon, Malaysia, Nepal, Nigeria, Pakistan, Rwanda, Saudi Arabia, Spain, Sri Lanka, Sudan, Tunisia, Turkey, Uganda, United Kingdom and Viet Nam. Approximately 268 papers were presented, including 202 oral presentations and 66 poster presentations. Invited speakers shared their scientific knowledge joining from 6 countries including Algeria, Egypt, Ethiopia, Pakistan, Sri Lanka and Turkey

The following topics were discussed by the participants in the Congress: original and advanced technologies related to agriculture and natural life, animal and crop production, aquaculture, food science and technologies, agricultural technologies, soil science, sustainable agriculture systems, agricultural economics, genetics, biology, agricultural ecology, landscape architecture and agricultural environment.

Congress organization secreteariat has undertaken important tasks during the organization of the congress and proper continuation of it. Ast. Prof. Mustafa Duman, Ast. Prof. Emre Aksoy, Ast. Prof. Burak Şen and Mustafa Özcan from the CNS Congress Organizations Ltd. undertook the congress organization.

We are grateful to all our stakeholders who have supported us for the successful realization of our Congress and to all the scientists who supported us by participating with their presentations.

Sincerely,

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CONGRESS PROGRAMME

KONGRE PROGRAMI/ CONGRESS PROGRAMME

	25 Ekim 2021 Pazartesi 25 October 2021 Monday	PROF.DR. MİTHAT ÖZSAN SALONU PROF. DR. MİTHAT ÖZSAN HALL	Açılış OTURUMU OPENING SESSION
	Başkan/ Moderator: Prof.Dr. Ömer CAMCI		
	Kıbrıs Batı Üniversitesi Rektörü, Kongre sahibi	Rector of Cyprus West University, Northern Cyprus, Owner of The Congress	
10:00-11:00	AÇILIŞ PROGRAMI/OPPENİNG PROGRAMME		
	Prof.Dr. Ahmet ŞEKEROĞLU	Kongre Kordinatörü	Coordinator of the Congress
	Prof.Dr. Hasan ELEROĞLU	Kongre Başkanı	Conference Chairman
	Asım BAŞ	Niğde İl Tarım ve Orman Müdürlüğü	Niğde Directorate of Provincial Agriculture and Forestry
	Dr. Nevzat BİRİŞİK	Tarımsal Araştırmalar ve Politikalar Genel Müdürü	Turkey Ministry Of Agriculture And Forestry General Directorate Of Agricultural Research And Policies
	Zekeriyya ERDURMUŞ	Tarım ve Orman Bakanlığı Hayvancılık Genel Müdürü	Republic Of Turkey Ministry of Agriculture And Forestry General Directorate Of Livestock
	Prof.Dr. Ömer CAMCI	Kıbrıs Batı Üniversitesi Rektörü	Owner of The Congress
	Prof.Dr. Hasan USLU	Niğde Ömer Halisdemir Üniversitesi Rektörü	Nigde Omer Halisdemir University Rector
	Dr. Yılmaz ŞİMŞEK	Niğde Valisi	Governor of Nigde
	Açılış Sunumu		Opening Presentations
11:00-12:00	Prof.Dr. Murat TÜRKEŞ Boğaziçi Üniversitesi	İklim Değişikliği ve Tarımın Etkilenebilirliği Vulnerability of Agriculture	Climate Change and
12.00-12.45	Ara		Break

PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Yusuf KIRTOK OTURUMU / PROF. DR. MİTHAT ÖZSAN FALL Prof. Dr. Yusuf KIRTOK SESSION			
<i>Başkan/ Moderator: Dr.Serkan Yeşil</i>			
YAZARLAR/AUTHORS			
12.45-13.00	Abdul Hannan	Comparative efficacy of commercial fungicides and Trichoderma harzianum against Fusarium wilt in strawberry	
13.00-13.15	Muhammad Daniyal Junaid	Assessment of drought stress effects on morpho-physiological and biochemical changes in carrot	
13.15-13.30	Burhan Başaran	Türkiye pazarındaki bebek bisküvilerinin Na, Ca, Mg, K, Fe, Pb, As, Cd ve Hg düzeylerinin belirlenmesi ve risk değerlendirmesi	
13.30-13.45	Ahmed Abdurahman Ahmed, Gökçen İzli	The use of ultrasound pretreatment in food drying	
13.45-14.00	Serkan Yeşil, Özder Gömlekli	Determination of Prevalence and Reservoir Weed Species of Tomato Spotted Wilt Tospovirus-TSWV on Peppers Grown in Greenhouses in Kumluca District in Antalya	
14.00-14.15	Ara	Break	

PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Mustafa KILIÇ OTURUMU PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Mustafa KILIÇ SESSION			
<i>Başkan/ Moderator: Dr. Orhun Soydan</i>			
14.15-14.45	Invited speaker Neelamanie Yapa, Asanka Madhushan, Chaturanga Bamunuarachchige	Assessment of the potential of biofertilizers and natural soil amendments to replace chemical fertilizer in rice (Oryza sativa L.) Farming in the dry zone, SRI LANKA	
14.45-15.00	İnci Cerit, Ayşe Özbağ, Ayşegül Çiydem, Feyza Eleşkirtli, Ömer Faruk Yakut, Zeynep Şirin, Omca Demirkol	Effect of pumpkin powder incorporation on the antioxidant activity of hazelnut cream	
15.00-15.15	Orhun Soydan, Nefise Çetin	Investigation of the sufficiency of antalya parks	
15.15-15.30	Mesut Selamoglu,	Transportation Of Food Products And Cold Chain	
15.30-15.45	Ara	Break	



PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Muhsin YILMAZ OTURUMU PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Muhsin YILMAZ SESSION		
<i>Başkan/ Moderator: Dr. Burak Şen</i>		
15.30-15.45	Kashif Ghafoor	Recovery of Phytochemicals using Innovative Processing Methods
15.45-16.00	Jean Constant Kouablan Karim	Studies of Phenolic Compounds Coupled to Minerals in Cocoa Beans of the "Mercedes" and "Forastero" Varieties from the Divo and Abengourou Regions (Côte d'Ivoire)
16.00-16.15	Odangowei Ogidi	Effect of Mondora myristica and Tetrapleura tetraptera on Oxidative Stability of Coconut Oil and Palm Kernel Oil
16.15-16.30	Olumuyiwa Akin Olaniyi	Determinants of Mobile Phones Usage for Agricultural information and Social Networking among Farmers in Oyo State, Nigeria.
16.30-16.45	Faisal Omer Ahmed, Mohamed Syed Mohamed Nour, Imadeldin Elfaki, Shemalsamedin Mohammed, YassinElamin Ahmed Adam	Impact of Age on Postpartum Reproductive Efficiency of Cross-bred(Friesian X Kenana) Dairy cows
16.45-17.00	Ara	Break

Poster Sunum PROF.DR. MİTHAT ÖZSAN SALONU Prof.Dr. Lütfi ÖZCAN OTURUMU Poster Presentation PROF. DR. MİTHAT ÖZSAN HALL Prof.Dr. Lütfi ÖZCAN SESSION		
<i>Başkan/ Moderator: Dr. Buket Er Demirhan</i>		
17.00-17.05	Amina Badmos	Effect of Christmas melon (<i>Laganaria Breviflorus</i>) extract on toxigenic <i>Mycoflora</i> Isolated from Stored Unpolished Rice Sold in Major Markets in Abeokuta, Nigeria.
17.05-17.10	Godfrey onuwa, Solomon Folorunsho	Determinants of Tomato Farmers Participation in Agricultural Services and Training Centre (ASTC) Activities
17.10-17.15	godfrey onuwa	Empirical Analysis of Productivity among Broiler Farmers
17.15-17.20	Ali Abid Abojassim	Total Annual Effective Dose due to ²²² Rn, ²²⁶ Ra, and ²³⁸ U in Selected Samples of Grain in Kerbala Governorate, Iraq
17.20-17.25	Jerry Ampofo-Asiama, Bright Quaye, Rosemond Dadzie	Improving the Storage Quality of Some Tropical Green Leafy Vegetables
17.25-17.30	Norazura Aila Mohd Hassim	Chocolate bar: effect of stearin addition on mouldability
17.30-17.35	Malak Abou Shahine, Jana Choubassi, Sanaa Khaled, Sami El Khatib	Fortification of a Lebanese Dairy Product (Labneh) with Vitamin D
17.35-17.40	Fikriye Alev Akçay, Ayşe Avcı, Mohammed L. Hamk	The Functionality of Bioactive Peptides Generated from Food Proteins via Enzymatic Hydrolysis
17.40-17.50	Fikriye Alev Akçay, Isabel S. Carvalho, Ayşe Avcı	Functional Properties of Different Parts of <i>Salvia officinalis</i> (Sage) Plant: A Comparative Study
17.50-17.55	Buket Er Demirhan, Burak Demirhan	The investigation of some contaminants in nut butters and chocolates
17.55-18.00	Nur Haqim Ismail	Effects of various palm-based oils on rheological and textural characteristics of cheese spread
18.00-18.15	Ara	Break

PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Ali KASAP OTURUMU PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Ali KASAP SESSION		
<i>Başkan/ Moderator: Dr. Emre Aksoy</i>		
18.15-18.30	Aqsa Parvaiz, Ghulam Mustafa, Faiz Ahmad, Amjad Ali, Muhammad Sarwar Khan	Development of transgenic sugarcane to encounter red rot by overexpressing SUGARWIN genes for fungal resistance
18.30-18.45	Ghulam Mustafa, Aqsa Parvaiz, Faiz Ahmad Joyia, Sultana Anwar, Muhammad Saeed, Muhammad Sarwar Khan	Genetic transformation of sugarcane for improved valuable traits
18.45-19.00	Hafsa Abid, Arfa Tanveer, Sadam Munawar, Aqsa Parvaiz, Ghulam Mustafa, Muhammad Sarwar Khan, Faiz Ahmad Joyia	Development And Characterization Of Hybrid Proteins For Plant Insect-Pest Control Using Computational Tools
19.00-19.15	Ismael Niyokwizigirwa, Sylvestre Habimana, Saidi Rumanzi Mbaraka, Innocent Nyamwasa, Ivan Gasangwa, Florence Uwamahoro, Evergiste Niyonsenga, Erastus Dushimeyesu, Theophile Kanyarwanda, Angelo Ndayiragije, Jean Irene Museminari, Charles Ntigurirwa, Philippe Sibomana	Assesment Of Aboveground Insects Associated Within Farm Fields Of Musanze District: Classification And Abundance
19.15-19.30	Aqsa Nazir, Allah Rakha, Faiza Khalid, Saman Mubashar	Exploring the Anti-Diabetic Potential of Variable Sized Wheat Grains
19.30-19.45	Najib Altawell	China's Energy Needs Resources, Challenges, and Issues
19.45-20.00	Abdelfadeel Khalfallah Abuelgasim	Effect of Bio fertilizer on Growth and Yield of Two Broad bean Cultivars (<i>Vicia faba</i>) Under New Halfa Environment, New Halfa, Kassala State, Sudan





25 Ekim 2021 Pazartesi Monday, October 25, 2021

PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Yüksel BEK OTURUM
PROF.DR: FAHRETTİN TOSUN HALL Prof.Dr. Yüksel BEK SESSION

Başkan/ Moderator: Dr. Abdulrezzak Memon

13.00-13.15	Invited speaker Abdulrezzak Memon	CRISPR/Cas9 mediated genome editing in crop plants
13.15-13.30	<u>Rana Arsalan Javaid</u> , Ghulam Shabbir, Qurat ul Ain sani, Muhammad Ilyas, Munir Ahmad	Induction of line x tester for genetic analysis of iron & zinc micronutrients in parents and their hybrids in bread wheat
13.30-13.45	Abdul Khaliq	Economic assessment of Optimum canola planting technique in sugarcane
13.45-14.00	Moshood Abiola Popoola	Phenotypic characterization and body indices of nigerian heterogenous rabbit population under backyard systems of production
14.00-14.15	<u>Moshood Abiola Popoola</u>	<i>Training needs of dairy cattle farmers in oyo state, Nigeria</i>
14.15-14.30	Ara	Break

PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Kamil DOĞAN OTURUMU
PROF.DR: FAHRETTİN TOSUN HALL Prof.Dr. Kamil DOĞAN SESSION

Başkan/ Moderator: Dr. Emre Aksoy

14:30-15.00	Invited speaker <u>Emre Aksoy</u>	Potential implementation of amino acid conjugates as novel micronutrient fertilizers
15.00-15:15	<u>Sancar Bulut</u> , Mehmet Arslan	Organic Field Crops Production Factors
15.15-15:30	<u>Karl Tamègnon Assogba</u> , Karl Tamègnon Assogba, Céléstin Tchekessi	Production and characterization of breadfruit (<i>Artocarpus altilis</i>) bread flour
15.30-15:45	Alamettin Bayav	Turkey's Situation in the World in the Temperate Zone Fruit Species: A Case of Apple, Pear, Cherry, Apricot, and Peach-Nectarine
15.45-16.00	<u>Harun Bektaş</u> , Yasemin Bektaş	2,4-dichloro-6-[(E)-[(3-methoxyphenyl) imino] methyl] phenol (DPMP) as a seed priming agent in bread wheat (<i>Triticum aestivum</i> L.)
16.00-16.15	Ara	Break

PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Mesut TÜRKOĞLU OTURUM
PROF. DR. FAHRETTİN TOSUN HALL Prof.Dr. Mesut TÜRKOĞLU SESSION

Başkan/ Moderator: Dr. Fazli Wahid

16.15-16.30	Invited speaker Muhammad Amjad Ali	Biochar in combination with antagonistic microbes leads to enhanced nematode resistance in tomato
16.30-16.45	Fazli Wahid	Arbuscular mycorrhizal fungi in the presence of composted rock phosphate fed dung improve the growth and phosphorus uptake of mung bean plants
16.45-17.00	Saeed Ullah Jan	Adsorptive removal of methylene blue aqueous solution using
17.00-17.15	Alamgir Khan Qureshi	Oxidative stress associated with exercise and nutrition
17.15-17.30	Ara	Break

Poster sunum PROF.DR: FAHRETTİN TOSUN SALONU Prof.Dr. Osman TEKİNEL OTURUMU
PROF.DR: FAHRETTİN TOSUN HALL Prof.Dr. Osman TEKİNEL SESSION Poster presentation

Başkan/ Moderator: Harun Bektaş

17.30-17.35	<u>Nazik Meziyet Dilek</u> , Mustafa Karakaya	Some Turkish Traditional Meat Products
17.35-17.40	<u>Riadh Ilahy</u> , Imen Thili, Thouraya R'him, Kamel Arfaoui, Marcello Salvatore Lenucci, Helyes Lajos	Assessment of the phenolic and flavonoid content in certain artichoke (<i>Cynara scolymus</i> L.) cultivars grown in Northern Tunisia
17.40-17.45	<u>Damla Baş</u>	Wheat Bread Enriched with Chickpea Flour
17.45-17.50	Muhammad Nabeel Afzal, Muhammad Nabeel Afzal, Muhammad Amjad Ali, Waqar Akram, Amjad Abbas	Study of pathogens associated with <i>Convolvulus arvensis</i> and <i>Chenopodium album</i> weeds in wheat crop, and biological control of selected weeds
17.50-17.55	<u>Merve Seçil Bardakçı</u> , Erkan Karacabey	Determination of Quality Properties in Mushroom Slices Dried by Different Drying Techniques
17.55-18.00	Dikshya Khatiwada	Technical Efficiency of Ginger Production in Ilam, Nepal: A Stochastic Production Frontier Approach
18.00-18.05	<u>Abid Shehzad</u> , Muhammad Farukh Saleem, Muhammad Abdullah Saleem, Taseer Ahmad, Iqra Akram, Wajeeh Ur Rehman, Waqar Akram	Effect of Soil Applied Zinc and Boron on Growth, Yield and Quality of Spring Planted Maize (<i>Zea mays</i> L.)
18.05-18.10	<u>Muhammad Yousuf Aazaz</u> , Waqar Akram, Wajeeh Ur Rehman, Muhammad Usman Aslam, Muhammad Abdullah Saleem, Abid Shehzad	Response of Soyabean germplasm against soyabean mosaic virus and its impact on biochemical contents of plants
18.10-18.15	<u>Fatma Fulya Dal</u> , Erkan Karacabey	Determination Of The Physical, Physio-Chemical And Chemical Properties Of Gilaburu Fruits (<i>Viburnum Opulus</i>) Dried By Convectonal Drying Technique



18.15-18.20	Fatma Atalay, <u>Sedat Sayar</u>	Utilisation Of Dried Pitaya (Dragon Fruit) Slices In A Breakfast Cereal Formulation
18.20-18.25	Koray Yarim, <u>Sedat Sayar</u>	Effect of Salts Added to Soaking Water on Cooking Properties of Legumes
18.25-18.30	Waseem Liaquat, Faizan Nisar, <u>Waqar Akram</u> , Muhammad Usman Aslam, Muhammad Awais Ghani	Production of F1 hybrid seed of turnip by autopolyploidization
18.30-18.35	Yusra Gulzar, <u>Waqar Akram</u> , Muhammad Usman Aslam, Iram Shafiq, Bisman Ijaz, Aina Israr	Genetic Response Of Chili Cultivars Against Anthracnose Caused By Colletotrichum Capsici And Its Management Through Phytoextracts And Chemicals
18.35-18.40	Aina Israr, <u>Waqar Akram</u> , Muhammad Usman Aslam, Iram Shafiq, Bisman Ijaz, Yusra Gulzar	Assessment Of Phyto-Extract And Chemicals Against Fusarium Wilt Of Cucumber
18.40-18.45		
18.45-18.50	<u>Odangowei Ogidi</u>	Mathematical Modeling Of The Growth Of Specific Spoilage Micro-Organisms In Tilapia (Oreochromis Niloticus) Fish
18.50-18.55	<u>Okwong John Walter</u>	Melissopalynological Study Of Apis Mellifera L. Honeys Sourced From Different Localities In The Middle Belt Of Nigeria
18.55-19.10	Saman Mubashar, Aqsa Nazir, Aqsa Nazir, Tayyaba Gull, Tayyaba Gull, Maira Anam, Maira Anam, Allah Rakha Rehman, Allah Rakha	<u>Physicochemical evaluation of unripe banana and broken rice flour enriched cornflakes</u>
19.10-19.25	Imen Tlili, <u>Riadh Ilahy</u> , Thouraya R'him	Effect of the storage period on the nutritional quality of different watermelon cvs grown in Tunisia
19.25-19.40	Yosr Laayouni, <u>Riadh Ilahy</u> , Imen Tlili, Thouraya R'him	The importance of genetic resources for the sustainability of tomato processing sector in Tunisia
19.40-19.45	<u>Rashmi Amit Patil</u> , Rashmi Amit Patil, Urmila Manoj Aswar	Review on Pterostilbene role in metabolic diseases through SIRT1 pathway
19.45-19.50	<u>NASRI Meriem</u> , Hanane ABED	Antioxidant activity of Pinus resin essential oils

25 Ekim 2021 Pazartesi Monday, October 25, 2021

PROF.DR. KEMAL BIYIKOĞLU SALONU Prof.Dr. Zeki ÖZER OTURUMU

PROF. DR. KEMAL BIYIKOĞLU HALL Prof.Dr. Zeki ÖZER SESSION

Başkan/ Moderator: Dr. Sabire Yerlikaya

13.00-13.15	<u>Sabire Yerlikaya</u> , Hülya Şen Arslan	Inhibitory effects of ethanolic extracts of yarrow, lavender and propolis against Salmonella typhimurium
13.15-13.30	Şennan Yücel, Birol Baki, Tuçe Altın, <u>Gülşen Uzun Gören</u>	Current Status of Fish Production in Sinop Province, Turkey
13.30-13.45	Özden Salman	Determination of bacillus spp. And stenotrophomonas sp. Against macrophomina phaseolina in sunflower
13.45-14.00	Özden Salman	Determination of the Antagonistic Effects of Some Rhizospheric Bacteria against Macrophomina phaseolina in vitro Conditions
14.00-14.15	<u>Adil Koray Yildiz</u> , Merve Ayyıldız, Bekir Ayyıldız, Servet Arslan	Yozgat İli Arıcılık İşletmelerinin Teknik Ve Sosyo-Ekonomik Durumunun İncelenmesi
14.15-14.30	Ara	Break

PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Erdal ŞEKEROĞLU OTURUMU

PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Erdal ŞEKEROĞLU SESSION

Başkan/ Moderator: Dr. Ayşen Melda Çolak

14.30-14.45	Fatma Alan	Determination of Performance of Some Blackberry Genotypes in Kayseri Conditions
14.45-15:00	Invited speaker <u>Elif Canpolat</u> , Ayten Öztürk, Yunus Bozkurt	Determination of Plasticity Characteristics of Different Trichoderma Species
15:00-15:15	Sedef Aydın	Optimization of sunflower oil bleaching by ultrasonic processing
15.15-15.30	Invited speaker <u>Seyda Şimşek</u> , Ali Kayahan, Gamze Pekbey, İsmail Karaca, Güngör Yılmaz	Effects of different industrial cannabis (Cannabis sativa L.) genotype extracts on Diuraphis noxia Myzus persicae
15.30-15.45	Ara	Break

PROF.DR. KEMAL BIYIKOĞLU SALONU Prof.Dr. İzet KADIOĞLU OTURUMU

PROF. DR. KEMAL BIYIKOĞLU HALL Prof.Dr. İzet KADIOĞLU SESSION

Başkan/ Moderator: Dr. Fatma Ergün

15.45-16.15	Fatma Ergün	Determination of antioxidant capacities of mistletoe (viscum album ssp. Austriacum) leaf and bud extracts collected from yellow pine (Pinus sylvestris L.)
16.15-16.30	<u>Pınar Ünsal</u> , Ebru Aydın, Gülcan Özkan	Optimization The Extraction Parameters Of Phenolic Compounds From Gilaburu Fruit And Encapsulation Of Extracts
16.30-16.45	Serpil Önder, <u>Ruhgöl Özge Gemici</u> , Ahmet Tuğrul Polat	Evaluation of green areas of konya selçuklu, bosna-hersek neighborhood in terms of sufficiency, management and usage
16.45-17.00	<u>Ruhgöl Özge Gemici</u> , Serpil Önder	Examination of the use of sculpture in the open-green areas of selçuk university alaeddin keykubat campus
17.00-17.15	Ara	Break



Poster Sunum PROF.DR. KEMAL BIYIKOĞLU SALONU Prof.Dr. Ferhat ODABAŞ OTURUMU
PROF.DR. KEMAL BIYIKOĞLU HALL Prof.Dr.Ferhat ODABAŞ SESSION Poster presentation

Başkan/ Moderator: Dr. Nilgün Öncül		
17.15-17.20	Gizem Aslan, Nilgün Öncül	Some of the plant-based fermented beverages
17.25-17.30	Mehtap Çiftçi, Nilgün Öncül	The composition and health benefits of flaxseed (<i>Linum usitatissimum</i>)
17.30-17.35	Eda Kılıç Kanak, Suzan Öztürk Yılmaz, Nurdan Aygün, Çağla Uzun	The effect of the use of lemon oil on the microbiological and sensory properties of raw meatballs
17.35-17.40	Eda Kılıç Kanak, Suzan Öztürk Yılmaz, Mekiye Yavuz	Investigation of Antimicrobial Effects of Some Extracts
17.40-17.45		
17.45-17.50	Hasan Eleroğlu	Poults Raising Criteria Affecting Economic Turkeys Production
17.50-17.55	Semra Küçük	Omega-3 Fatty Acids in Fish
17.55-18.00	Hasan Eleroğlu	Determining the Effects of Laying Time and Age Differences on Calculated Egg Parameters of White Layer Pure Line
18.00-18.05	Hasan Eleroğlu	Sperm Parameters and Factors Affecting Fertility in Artificial Insemination in Turkeys
18.05-18.10	Semra Küçük	Neurotrophin (Vitamin B12) in Eating Fish
18.10-18.25	Ara	Break

PROF.DR. KEMAL BIYIKOĞLU SALONU Prof.Dr. Hüseyin ŞİMŞEK OTURUMU
PROF.DR. KEMAL BIYIKOĞLU HALL Prof.Dr. Hüseyin ŞİMŞEK SESSION

Başkan/ Moderator: Dr. Emine AKSAN ALDANMAZ		
18.25-18.40	Şükrü Canpolat, Cemil İşlek	An Alternative Method for Preparing Mycorrhizal Root Samples for Scanning Electron Microscopy
18.40-18.55	Emine Aksan Aldanmaz, Emine Aksan Aldanmaz, Samyeli Demirbilek	Preservation Of Aromatic Plants Used As Food By Brine Technique
18.55-19.10	Nur Cennet Ertürk, Suzan Biran Ay	Effect Of Different Plastics On Physical, Chemical And Biological Properties Of Edible Films
19.10-19.25	Erhan Gocmen	Yarı Kurak Koşullarda Ayçiçeğinin Büyüme Periyotlarında Su-Verim İlişkisinin Belirlenmesi
19.25-19.40	Handan Karaoğlu	Effects of Environmentally Relevant Ammonium Nitrate Levels Caused by Agricultural Activities on Four Amphibian Species in The Eastern Black Sea Region
19.40-19.55	Arif Şanlı, Bekir Tosun, Yeşim Cirit, Fatma Zehra Ok	Effect of Phytohormone Applications on Fruit Yield and Essential Oil Content in Anise (<i>Pimpinella anisum</i> L.)
19.55-20.10	Onur İleri, Ali Koç	Performances Of The Promising Narbon Vetch Genotypes In Central Anatolia Conditions
20.10-20.25	Gözde Nur Peker, Omer Sozen	İleri Düzey Nohut Genotiplerinde Verim ve Kalite Çalışmaları
20.25-20.40	Nurhan Uslu	Determination of phenolic compounds and fatty acid composition of persimmon (<i>Diospyros kaki</i> L.) seed

25 Ekim 2021 Pazartesi PROF.DR. MÜMTAZ TURGUT TOPBAŞ SALONU
Monday, October 25, 2021 PROF.DR. MUMTAZ TURGUT TOPBAŞ HALL

PROF.DR. MÜMTAZ TURGUT TOPBAŞ SALONU Prof.Dr. Kemal ESENGÜN OTURUMU OTURUM PROF. DR. MUMTAZ TURGUT TOPBAŞ HALL Prof.Dr. Kemal ESENGÜN SESSION SESSION		
Başkan/ Moderator: Dr. Sanaullah Panezai		
13.00-13.30	Nurdan Güngör Savaş	Sensitivity of Alternaria spp. isolates to some fungicides used on Sultana seedless grapes in Aegean region vineyards
13.30-13.45	Anum Mushtaq, Ayesha Razzaq, Waqas Malik	Genome-wide characterization of TALE gene family in <i>Pisum sativum</i> L.
13.45-14.00	Sanaullah Panezai, Sikandar Sikandar, Shahab E Saqib, Said Muhammad	The impact of formal agriculture credit on farm productivity and its utilization in Khyber Pakhtunkhwa, Pakistan
14.00-14.15	Yaşar Serhat Saygılı, Bülent Çakmak	Occupational Health And Safety In Agricultural Production
14.15-14.30	Ara	Break

PROF.DR. MÜMTAZ TURGUT TOPBAŞ SALONU Prof. Dr. Ethem AKYOL OTURUMU
PROF. DR. MUMTAZ TURGUT TOPBAŞ HALL Prof. Dr. Ethem AKYOL SESSION

Başkan/ Moderator: Dr. Allah Bakhsh		
14:30-14:45	Allah Bakhsh	Use of Genome Engineering and manipulation Technologies for better Insect Pest and Disease Control
14:45-15:00	Abdul Munim Farooq	Development and Molecular Analysis of Indigenous Herbicide Resistant Corn Lines
15:00-15:15	Muhammad Tehseen Azhar	Facts and figures of salinity in the country and opportunity for plant scientists
15:15-15:30	Nazia Nahid	Molecular identification of Clerodendron yellow mosaic virus from <i>Duranta repens</i> and <i>Clerodendrum inerme</i> from Pakistan
15:30-15:45	Ara	Break



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TURJAF 2021

PROF.DR. MÜMTAZ TURGUT TOPBAŞ SALONU Prof.Dr. Kudret SAYLAM OTURUMU PROF. DR. MUMTAZ TURGUT TOPBAŞ HALL Prof.Dr. Kudret SAYLAM SESSION		
Başkan/ Moderator: Dr. Mustafa Sevindik		
15.45-16.15	Ummugulsum Erdogan	The effects of vermicompost applications on the yield and quality of san andreas (<i>Fragaria vesca</i> L.) strawberry variety
16.15-16.30	Abu Bakar Zia, Ufuk Demirel, Muhammad Azhar Nadeem, Fawad Ali, Mehmet Emin Caliskan	Genome-wide association studies (GWAS) revealed genetic basis associated with floral traits in potato germplasm
16.30-16.45	Nawal Amin, Sami El khatib, Sanaa Khaled, Maha Krayem	Lebanese consumers' attitudes and perception towards Wild Edible Plants (WEP): a case study of <i>Salvia officinalis</i> (Sage)
16.45-17.00	Mesut Selamoglu, Usman Mir Khan, Zeliha Selamoglu, Ali Murad Khan, Umar Murad Khan, Hatice Sadiye Gezin	Ice cream cold chain management, reviews and cenges in urban areas of Lahore city of Pakistan
17.00-17.15	Israa Al Zughbi, Sanaa Khaled, Sami El khatib, Maha Krayem	Lebanese consumers' interest towards the quince fruit, their knowledge of its benefits and the products manufactured from it, and their desire to manufacture a new product
17.15-17.30	Ara	Break

Poster Sunum PROF.DR. MÜMTAZ TURGUT TOPBAŞ SALONU Prof.Dr. Okan GÜNEY OTURUMU Poster presentation PROF.DR. MUMTAZ TURGUT TOPBAŞ HALL Prof.Dr. Okan GÜNEY SESSION		
Başkan/ Moderator: Dr. Burak Şen		
17.30-17.35	Hanane Abed	Screening of antibiotic residues in chicken meat in Bordj Bou Arreridj, Algeria
17.35-17.40	Invited speaker <u>Djouhri Nesrine</u> , Bouammar Boualem, Dadamoussa Mohamed Lakhdar	Study of the sustainability of potato farms in the region of Oued Souf (Southern Algeria)
17.40-17.45	<u>Muhammad Abdullah Saleem</u> , Nazahat Nisa, Muhammad Tahir, Iqra Akram, Taseer Ahmad, Abid Shehzad, Waqar Akram	Mitigation of Cadmium Toxicity in Mung Bean by the Foliar Application of Gibberellic acid
17.45-17.50	Misbah Naz, <u>Muhammad Abdullah Saleem</u> , Huma Abbas, Nazir Javed, Iqra Akram, Hamza Sarfraz, Hira Abbas, Muhammad Kamran, Qurat ul Ain Ilyas, Akbar Sajjad	Response of mung bean germplasm against root knot nematode, <i>Meloidogyne incognita</i> (Kofoid & white) Chitwood and its management through resistance inducers
17.50-17.55	<u>Muhammad Abdullah Saleem</u> , Anum Ismail, Abid Shehzad, Pakeeza Ahmad Khan, Waqar Akram, Iqra Akram	The response of maize to combined application of nitrogen and phosphorous fertilizers in the semi-arid conditions of Faisalabad
17.55-18.00	<u>Sunday Emmanuel Kayode</u>	Development of A Simple Tractor-Mounted Rotary Slasher Using Locally Sourced Materials
18.00-18.05	<u>Tayyaba Gull</u> , Waqar Akram, Maira Anam, Kunlun Liu, Amna Sahar	Development Of Chicken Sausages Enriched With Resistant Starch And Coated With Cinnamon Essential Oil
18.05-18.10	Iqra Akram, <u>Muhammad Abdullah Saleem</u> , Muhammad Tahir, Taseer Ahmad, Misbah Naz, Nazahat Nisa	Interactive Effect of Foliar Spray of Salicylic Acid and Gibberellic Acid on Growth, Yield and Quality of Green Gram
18.10-18.15	<u>Muhammad Abdullah Saleem</u> , Tasleem Kanwal, Abid Shehzad, Taseer Ahmad, Iqra Akram, Waqar Akram	Comparative performances of new wheat lines under different irrigation regimes
18.15-18.20	Nazahat Nisa, <u>Muhammad Abdullah Saleem</u> , Muhammad Tahir, Iqra Akram, Taseer Ahmad, Abid Shehzad, Waqar Akram	Impact of Cadmium Toxicity on Growth attributes of Green Gra
18.20-18.25	Abdalla Mohamed Hussein	Effect Of Nitrogen And Diammonium Phosphates Fertilizer And Gumbo Cultivars (<i>Abelmoschus esculantus</i> L.) On Fruit Phonological Characteristics
18.25-18.30	Muhammad Ahsan Jamil	A Review on Biocontrol of <i>Parthenium hysterophorus</i> using Allelopathy.
18.30-18.35	Hoang Quoc Tuan	A framework for Blockchain Technology in Vietnamese Domestic Rice Supply Chain Traceability
18.35-18.50	<u>Hilal Türkan</u> , Burak Demirhan	Investigation Of Sulfonamide Antibiotic Residues In Some Animal Source Foods
18.50-18.55	<u>Hanife Altınsoy</u> , Burak Demirhan	Determination Of Phenolic Compounds In Some Fruit Extracts By High Performance Liquid Chromatography (Hplc)
18.55-19.00	<u>Hanife Altınsoy</u> , Burak Demirhan	Effects Of Resveratrol On Health
19.00-19.05	<u>Ece Akgül</u> , Burak Demirhan	The Effect Of Vacuum Packaging On Protein Oxidation In Chicken Meats
19.05-19.20	<u>Emine Açar</u> , Yıldız Aka Kaçar	Determination of Expression Level of Genes Associated with Anthocyanin Biosynthesis in Some Myrtle (<i>Myrtus communis</i> L) Genotypes
19.20-19.25	<u>Halenur Yıldız</u> , Buket Er Demirhan	Use Of Essential Oils In Food Marination
19.25-19.35	Ara	Break



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PROF.DR. MÜMTAZ TURGUT TOPBAŞ SALONU Prof.Dr. Kadir SALTALI OTURUMU PROF.DR. MUMTAZ TURGUT TOPBAŞ HALL Prof.Dr. Kadir SALTALI SESSION Başkan/ Moderator: Dr. Turgut Atay		
19.35-19.50	Mustafa Alkan, <u>Turgut Atay</u>	Insecticidal Potential of Nonyl Acetate against Sitophilus granarius (Linnaeus, 1875) and Sitophilus oryzae (Linnaeus, 1763) (Coleoptera: Curculionidae)
19.50-20.05	<u>Sükrü Canpolat</u> , Ilgaz Akata, Yasemin İşlek, Elif Canpolat, Cemil İşlek	Determination of Total Phenolics, Antioxidant and Antimicrobial Activities of Suillus collinitus Collected from Niğde
20.05-20.20	Seval Andiç, Şehriban Oğuz,	Lactose and Lactose Derivatives
20.20-20.35	<u>Faruk Öncü</u> , Serkan Yeşil	Serological Detection of Viruses in Tomatoes Grown in Open Field and Greenhouse Areas of Eskişehir Province
20.35-20.50	<u>Muhammed Mustafa Özçelik</u> Burçak Duman Gülcan Özkan	Production of Jelly Sugar From Organic Molasses
20.50-21.05	Emine Açar, <u>Melike Cengiz</u> , Yıldız Aka Kaçar, Ahsen Işık Özgüven	Determination Of Fruit Cracking Rates In Some Pomegranate (Punica Granatum L.) Genotypes Grown Non-Irrigated Conditions

26 Ekim 2021 Salı		26 October 2021 Tuesday
PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Mustafa SOYSAL OTURUM PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Mustafa SOYSAL SESSION Başkan/ Moderator: Dr Jerry Ampofo-Asiama		
09.00-9.30	Yaşar Serhat Saygılı, Ali Kaan Yetik, Furkan Baş, <u>Burak Şen</u>	Investigation of Solar Powered Drying System Potential in Niğde Province
9.30-9.45	<u>Jerry Ampofo-Asiama</u> , Rosemond Dadzie	Starch Coating Enhances the Quality of Garden Egg Fruits During Low Temperature Storage
9.45-10:00	<u>Kiaenat Nazir</u> , Muhammad Tayyib, Muhammad Sheeraz Javed, Zahida Nasreen, Irum Waheed, Safora Seemab, Ahmad Kamran Khan, Uzma Batool	Morphological Characterization Of Cotton Pests Belonging to Family Gelechiidae (Pectinophora gossypiella), Noctuidae (Helicoverpa armigera and Spodoptera frugiperda), Nolidae (Earias vitella), and Curculionidae (Myllocerus undecimpustulatus undatus) From
10.00-10.15	Skndar Abu Gazlha, <u>Riadh Ilahy</u> , József kiss	Pesticide residues in food: A comparison study between Jordan and Hungary
10.15-10.30	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Fahri DELİGÖNÜL OTURUM PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Fahri DELİGÖNÜL SESSION Başkan/ Moderator: Dr. Tarık Balkan		
10.30-10.45	<u>Dilek Özcan Yardım</u> , Ceylan Pınar Uçar, Bilgin Taşkın, Ahmet Akköprü, Şilan Atbaş	Determination of ACC Deaminase Enzyme Production and Nitrogen Fixation Characteristics of Endophytic Bacteria
10.45-11.00	Tarık Balkan, <u>Özlem Yılmaz</u>	Investigation of Efficacy of Some Washing Solutions in Removal of Pesticide Residues in Lettuce
11.00-11.15	<u>Esin Yılmaz</u> , Ayşe Avcı, Fikriye Alev Akçay	Biosynthesis and Characterization of Titanium Dioxide Nanoparticles Using Cell-Free Supernatant of Acinetobacter sp. MDA1
11.15-11.30	<u>Nazik Meziyet Dilek</u> , Kübra Ünal, Ali Samet Babaoğlu, Mustafa Karakaya	The effect of camu camu (Myrciaria dubia) powder on lipid oxidation and microbiological properties of ground beef
11.30-13:00	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Zafer GÜRLER OTURUMU PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Zafer GÜRLER SESSION Başkan/ Moderator: Dr. Necla Çağlarımak		
13:00-13:15	Bahadır Demirel	Determination of emission values of pellets obtained from chickpea plant residues
13:15-13:30	<u>Ali Kahraman</u> , Unal Bugdayli	Exploring the Possibility of Chickpea (Cicer arietinum L.) Growing as Second Crop under Uşak Ecology
13:30-13:45	<u>Necla Çağlarımak</u> , Ahmet Zeki Hepçimen	Evaluation data of dried vegetables and fruits
13:45-14:00	Aybegün Ton	Effects of Ethephon Application on Seed Yield and Yield Components of Two Faba Bean (Vicia faba L.) Cultivars
14:00-14:15	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Kazım TÜLÜCÜ OTURUM PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Kazım TÜLÜCÜ SESSION Başkan/ Moderator: Dr. Zeliha Selamoğlu		
14.15-14.30	Invited speaker Gamal Badr	Molecular mechanism underlying bee propolis mediated protection of thymus and lymph node in streptozotocin-induced diabetic mice
14.30-14.45	Babatunde Olawoye	Machine learning approach to the prediction of percentage succinylation and reaction efficiency of succinate anhydride-modified cardaba banana starch
14.45-15.00	<u>Zaheer Ahmad</u> , Zeliha Selamoğlu	Doxorubicin loaded methoxy poly (ethylene glycol) block-poly (glutamic acid) [DOX/mPEG-b-PLG] nanoparticles against human breast cancer cell lines
15.00-15.15	Ahmed Menevseoglu	Authentication of fruit juices by portable vibrational spectroscopy units combined with chemometrics
15.15-15.30	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. M. Şefik YEŞİLSOY OTURUM		





PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. M. Sefik YEŞİL SOY SESSION		
Başkan/ Moderator: Dr. Mustafa Duman		
15.30-15.45	Brian Tainika, Ahmet Şekeroğlu	Overview of In-ovo sex determination of layer chicken embryos
15.45-16.00	Zahra Atghia	The effect of Electro Magnetic Fields (EMFs) on seed germination and seedlings Physiological changes of Coriandrum sativum L. to achieve the optimum frequency of Electro Magnetic Field.
16.00-16.15	Mustafa Güneşdoğdu, Ahmet Şekeroğlu	Bacteria for honey bee health; probiotics
16.15-16.30	Abdul Waheed Ghanghro	Assessment of some selected essential minerals in milk and their dietary intake for different age group children through milk consumption
16.30-16.45	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof. Dr. Sabit AĞAOĞLU OTURUM		
PROF. DR. MİTHAT ÖZSAN HALL Prof. Dr. Sabit AĞAOĞLU SESSION		
Başkan/ Moderator: Dr. Nuray Şahinler		
16.45-17.00	Rejoice Ibrahim Solomon	Biochar ammendments for reducing nitrate leaching from soils of different textural classes in the nigerian savanna
17.00-17.15	Nuray Şahinler, Nesibe Özge Toy	Good Agricultural Practices in Beekeeping
17.15-17.30	Sanaullah Panezai, Sikandar Sikandar, Shahab E Saqib, Said Muhammad	The impact of formal agriculture credit on farm productivity and its utilization in Khyber Pakhtunkhwa, Pakistan
17.30-17.45	Haris Butt, Kubilay Kurtuluş Baştaş	Antagonistic Activities of Bacillus spp. against Fire Blight Disease in vitro and in planta
17.45-18.00	Nuray Şahinler, Nesibe Özge Toy	Queen Breeding and Factors Affecting Queen Bee Quality
	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof.Dr. Akif KANSU OTURUM		
PROF. DR. MİTHAT ÖZSAN HALL Prof.Dr. Akif KANSU SESSION		
Başkan/ Moderator: Dr. Kubilay Kurtuluş BASTAS		
18.00-18.15	Aysegul GUR, Kubilay Kurtuluş BASTAS, Saban KORDALI, Ferah YILMAZ	Effectiveness of Boron Formulations against Pseudomonas syringae pv. tomato in Tomato Seeds
18.15-18.30	Sena Ardicli, Hakan Ustuner, Ozgur Arslan	Changes in drip loss and water holding capacity during beef aging in Aberdeen Angus, Charolais, Hereford, Limousine, and Simmental cattle breeds
18.30-18.45	Yasin Kahya, Halit Vasfi Gencer	The Effect of Semen Dilution on the Number of Spermatozoa Entering the Spermatheca of the Queen Honey Bee (Apis mellifera L.)
18.45-19.00	Serkan Yeşil	Determination of Inhibition Effect of Propolis Extract on Cucumber mosaic virus in Zucchini Squash
19.00-19.15	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof.Dr. Alper DURAK OTURUM		
PROF. DR. MİTHAT ÖZSAN HALL Prof.Dr. Alper DURAK SESSION		
Başkan/ Moderator: Dr.Sertaç Güngör		
19.15-19.30	Yasemin Bektaş, Eylül Berfin Birgül, Zeynep Ağaç	Potential evaluation of Thyme (Origanum vulgare L.), Sage (Salvia officinalis L.) and Peppermint (Mentha piperita L.) essential oils as Plant Immune Activators
19.30-19.45	Tibebu Belete, Kubilay Kurtuluş BAŞTAŞ	Anti-Quorum Sensing Effects of Some Medicinal and Aromatic Plant Extracts on Xanthomonas axonopodis pv. phaseoli
19.45-20.00	Aysun Ozturk, Kubilay Kurtuluş BASTAS	A Potential Threat for Blackberry, Raspberry and Rosehip Growing in Konya Province: Fire Blight Disease
20.00-20.15	Sertaç Güngör, Fatma Bütüner	Evaluation of the Social and Psychological Changes Occurring in Elderly Living in Konya Province in Terms of Landscape Architecture during the Pandemic Process
20.15-20.30	Sertaç Güngör, Elif Nur Doğan	Investigation of Changes in Users' Attitudes and Behaviors Before and After Pandemic in the Example of Ankara Çubuk-1 Dam
20.30-20.45	Ara	Break
PROF.DR. MİTHAT ÖZSAN SALONU Prof.Dr. Suat ŞAHİNLER OTURUM		
PROF. DR. MİTHAT ÖZSAN HALL Prof.Dr. Suat ŞAHİNLER SESSION		
Başkan/ Moderator: Dr.Sezer Şahin		
20.45-21.00	Sezer Şahin	Kireçli Toprakta Bőrölçe Çeşitlerinin Fide Gelişimi Üzerine Vermikompost ve Mikoriza Uygulamalarının Etkileri
21.00-21.15	Seda Bice Ataklı	Soya bitkisinin gelişiminde gübre, kompost, mikoriza ve bakteri uygulamalarının etkileri
21.15-21.30	Seda Bice Ataklı	Humik asit uygulamalarının zambak bitkisinin gelişimi, bitkideki fenolojik ve pomolojik gözlemler üzerine etkisi
21.30-21.45	Kubilay Kurtuluş Bastas	Impacts of Climate Changes on Plant-Beneficial Microorganism Interactions
21.45-22.00	Emine Açar, Yıldız Aka Kaçar	Determination of Expression Level of Genes Associated with Anthocyanin Biosynthesis in Some Myrtle (Myrtus communis L) Genotypes



26 Ekim 2021 Salı Tuesday, October 26, 2021

PROF.DR. FAHRETTİN TOSUN SALONU Prof. Dr. Celâl ER OTURUM PROF. DR. FAHRETTİN TOSUN HALL Prof. Dr. Celal ER SESSION Başkan/ Moderator: Dr. Nilgün Öncül		
09.00-9.15	Fatma Zehra Ok, Arif Şanlı, Yeşim Cirit, Bekir Tosun	Impact of Essential Oil Applications in Storage Period on Sugar Beet (Beta vulgaris L.) Root Quality
9.15-9.30	Nergiz Yüksel, Merve Muti İstek, Selda Bulca	Peynir Altı Suyu Proteinlerinin Nanoenkapsülasyon ve Mikroenkapsülasyon Teknolojisinde Kaplama Malzemesi Olarak Kullanımı
9.30-9.45	Mehtap Çiftçi, Nilgün Öncül	The presence of coliform bacteria in some ready-to-eat food
9.45-10.00	Gizem Aslan, Nilgün Öncül	Milk-based fermented beverages
10.00-10.15	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Abdulkadir AKÇİN OTURUM PROF.DR. FAHRETTİN TOSUN HALL Prof.Dr. Abdulkadir AKÇİN SESSION Başkan/ Moderator: Dr. Hande BALTACIOĞLU		
10.15-10.30	Gizem Coşkun, Bilge Bahar	Kişilik makarnalık buğdayda farklı gelişme dönemlerinde yapraklardan uygulanan çinkonun kalite parametrelerine etkileri
10.30-10.45	Hande Baltacıoğlu	Çoklu değişken analizi kullanarak konsantrasyon yöntemlerinin vişne suyunun fizikokimyasal özelliklerine etkisinin belirlenmesi
10.45-11.00	Neslihan Doruk Kahraman	Türkiye'nin Bulgurluk Durum Buğday Üretim Potansiyeli
11.00-11.15	Nimet Çakıroğlu, Bilge Ertekin Filiz	Köpük kurutma yöntemi ile üretilen havuç tozlarının kalite ve biyoaktif özellikleri
11.15-11.30	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Necmi SÖNMEZ OTURUM PROF. DR. FAHRETTİN TOSUN HALL Prof.Dr. Necmi SÖNMEZ SESSION Başkan/ Moderator: Dr. Ahmet Uçar		
11.30-11.45	Hüseyin Ersan Erduran Necla Çağlarırnak,	Investigation of the Effects of Humic Acid and 20-20-20 Fertilizer Applications on the Yield Characteristics and Harvest Time of Lettuce (Lactuca sativa L.) by Foliar Fertilization Method
11.45-12.00	Orhun Soydan, Ahmet Benliay	The effect of different cover and flooring materials on climatic comfort in landscape design
12.00-12.15	Orhun Soydan	An analysis of accessibility to family health centers in antalya using gis
12.15-12.30	Lale Gumustepe, Ebru Aydın, Gulcan Ozkan	Bioactive components of avocado and its health effects
12.30-12.45	Hakan Karadag, Güzella Yilmaz, Kenan Yıldız	Effect of Pre-Treatments Applied to Acacia (Robinia Pseudoacacia) Seeds on the Percentage of Output and Seed Development
12.45-13.30	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Atilla YETİŞEMEYEN OTURUMU PROF. DR. FAHRETTİN TOSUN HALL Prof.Dr. Atilla YETİŞEMEYEN SESSION Başkan/ Moderator: Dr. Asiye Yılmaz Adkinson		
13.30-13.45	Murat Türkeş, Serkan Gündüz	Classification and Ideal Standards of the Manisa's Classic Honchieria (Oriental Frill) Piegons
13.45-14.00	Asiye Yılmaz Adkinson, Necla Çağlarırnak	Küresel ısınma ve hayvancılık: sağlıklı üretim ve çevre için öneriler
14.00-14.15	Ali Soyuçok	Bazı esansiyel yağların metisiline dirençli staphylococcus aureus'un üzerine etkileri
14.15-14.30	Mustafa Satouf	Suriye'ye özgü özel bir tat; kahke
14.30-14.45	Ali Atıla Uşlu, Osman Tolga Özel, Nedim Örnekçi, Ekrem Cem Çankırlıgil, İsa Coşkun, Gülşad Uşlu Şenel	Black soldier fly (Hermetia illucens) prepupae meal as a possible alternative to fish meal in in Rainbow trout (Oncorhynchus mykiss) diets
14.45-14.30	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Dr. Ali Safi KIRAL OTURUM PROF. DR. FAHRETTİN TOSUN HALL Dr. Ali Safi KIRAL SESSION Başkan/ Moderator: Dr. Ayhan Gösterit		
14.30-14.45	Fırat Arslan	Land Fragmentation Indicators
14.45-15.00	Salim Aktürk, Ayhan Gösterit, Gökhan Akdeniz, Samet Okuyan, Ahmet Emir Şahin	The developmental characteristics of bombus terrestris l. (hymenoptera: apidae) population in the central black sea coast region
15.00-15.15	Muhammad Shah Nawaz-Ul-Rehman	First report of Tomato leaf curl Palampur virus infecting chili crop in Pakistan
15.15-15.30	Muhammad Mubin	BetaC1 protein of Cotton Leaf Curl Multan betasatellite interacts with Double strand RNA binding protein 4 of Nicotiana benthamiana
15.30-15.45	Ara	Break



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PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. İbrahim GENÇ OTURUM PROF. DR. FAHRETTİN TOSUN HALL Prof.Dr. İbrahim GENÇ SESSION		
Başkan/ Moderator: Dr. Ebrahim Alinia-Ahandani		
15.45-16.00	Zahra Alizadeh-Tarpouei, Akbar Noratehnia, Zahra Masoodian	Evaluation of the phytoremediation ability of Azolla filiculoides in the purification of Congo red dye contaminated water using the Taguchi method
16.00-16.15	Ebrahim Alinia-Ahandani	Evaluation of toxic elements in Dill (Anethum graveolens dhi) grown in different regions in Lahijan-Iran Northern
16.15-16.30	Sabi Mohamed Sani Orou Ouennon Assouma, A Esen Celen	The effect of different nitrogen doses on the yield of Italian ryegrass (Lolium multiflorum var. westerwoldicum) cultivars in Aegean Region conditions
16.30-16.45	Serkan Yeşil, Halime İrgin Ağca	Virus Diseases on Lettuce Plants in Konya Province
16.45-17.00	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Ahmet TESTİK OTURUMU PROF.DR. FAHRETTİN TOSUN HALL Prof.Dr. Ahmet TESTİK SESSION		
Başkan/ Moderator: Prof.Dr. Arda Yıldırım		
17.00-17.15	Ardalan Pasdaran	Some of the less famous Iranian traditional medicine remedies in tremor control
17.15-17.30	Ali Akbar Malekiran	Evaluation of toxic elements in Dill (Anethum graveolens dhi) grown in different regions in Lahijan-Iran Northern
17.30-17.45	Samet Okuyan, Ahmet Şekeroğlu	The effects of some supplements on quality parameters of royal jelly
17.45-18.00	Oyeyemi Sunday Dele	Phytochemical and nutritional profile, mineral ratio and mineral safety index of young and matured corn silk collected from ekiti state, nigeria
18.00-18.15	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Mustafa KAPLANKIRAN OTURUMU PROF.DR. FAHRETTİN TOSUN HALL Prof.Dr. Mustafa KAPLANKIRAN SESSION		
Başkan/ Moderator: Dr. Atilla Taşkın		
18-15-18.30	Demirel Ergün, Atilla Taşkın	Depending on sex head morphology in cage birds
18.30-18.45	Demirel Ergün, Atilla Taşkın	Sex determination in chukar partridges (Alectoris Chukar)
18.45-19.00	Hasan Karaosmanoğlu	Status of Organic Hazelnut Production in Turkey
19.00-19.15	Raziye Koçak	Evaluation of potential biocontrol agents on s. Minor jagger
19.15-19.30	Güzella Yılmaz, Hakan Karadağ	Effect of Walnut Tea and Microcapsule Impregnated Lavender Oil on Vase Life of Gerbera Flowers
19.30-19.45	Ara	Break
PROF.DR. FAHRETTİN TOSUN SALONU Prof.Dr. Sabri GÖKMEN OTURUMU PROF.DR. FAHRETTİN TOSUN HALL Prof.Dr. Sabri GÖKMEN SESSION		
Başkan/ Moderator: Dr. Sena Ardicli		
19.45-20.00	Sinan Dündar, Hüdaverdi Bircan, Hasan Eleroğlu	Çorum İlinde Kurulabilecek Kompost Tesislerinin ARAS ve COPRAS Yöntemiyle Optimallik Sıralaması
20.00-20.15	Sinan Dündar, Hüdaverdi Bircan, Hasan Eleroğlu	Samsun İlinde Hayvansal Kaynaklı Kompost Potansiyeli Ve Optimum Tesis Konumları
20.15-20.30	Sinan Dündar, Hüdaverdi Bircan, Hasan Eleroğlu	Samsun İlinde Kurulabilecek Kompost Tesislerinin COCOSO ve WASPAS Yöntemiyle Optimallik Sıralaması
20.30-20.45	Sena Ardicli, Ozden Cobanoglu	The Analysis of the Genetic Variation and the Assessment of Population Genetics and Diversity in Bovine Annexin A9, Insulin-like Growth Factor 1, and Beta-Lactoglobulin Genes in Turkish Native Cattle Breeds
20.45-21.00	Gülten Tiryaki Gündüz, Özge Akgül	Yer narı (Cytinus ruber) Ekstraktlarının Antimikrobiyal Etkisinin Belirlenmesi
21.00-21.15	Emine Yurteri, Mücahit Salih Can, Fatih Seyis, Haydar Küplemez	In Vitro Regeneration Of Tea (Camellia Sinensis (L). O. Kuntze) By Somatic Embryogenesis From Immature Cotyledon Tissues
21.15-21.30	Emine Yurteri, Fatih Seyis, Haydar Küplemez	The Essential Oil Components Of Helichrysum Pallasii Flowers
21.30-21.45	Esra Yaprak, Sümeyra Uçar, Murat Aydın, Emre İlhan	Kinoa Yabby Transkripsiyon Faktör Ailesinin- Genom Çaplı Analizi Ve Karakterizasyonu
	Ara	Break

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PROF.DR. KEMAL BIYIKOĞLU SALONU Prof.Dr. Hasan FENERCİOĞLU OTURUMU PROF. DR. KEMAL BIYIKOĞLU HALL Prof.Dr. Hasan FENERCİOĞLU SESSION		
Başkan/ Moderator: Dr. Khalid Ali Khan		
09.00-9.15	Invited Speaker Khalid Ali Khan	Relative evaluation of diverse supplementary diets on managed honey bee (Apis mellifera) health and colony performance
9.15-9.30	Nazik Meziyet Dilek, Mustafa Karakaya	Nevşehir Bagel and Nevşehir Tahini-Pita
9.30-9.45	Aygün Şanlı, Müge Urgan Öztürk, Öykü Atılğan, Gamze Sonkaya, Fatma Özen Özdemir, Yurdanur Akgül, Nurcan Koca	The use of continuous ultraviolet light on yoghurt (homogenized and cream on top) surface: The effects on lipid and protein oxidation during storage
9.45-10.00	Muhammad Abbas Khan	Study of Quality and Yield of Kohlrabi with Effect of Mulch Under Green House Conditions
10.15-10.30	Ara	Break



PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Nebahat SARI OTURUMU		
PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Nebahat SARI SESSION		
Başkan/ Moderator: Dr. Faheem Shehzad Baloch		
10.30-10.45	Shiva Sadighfard, Bahman Pasban Eslam, Reza Amirnia, Esmail Zangani	Evaluation of photosynthetic roles of different canopy strata and capitulum on seed yield and its components of spring safflower (<i>Carthamus tinctorius</i> L.)
10.45-11.00	Muhammad Yasir Naeem, Khawar Jabran	Common Purslane: A Potential Source of Nutrition and Antioxidant
11.00-11.15	Pınar Oğuzhan Yıldız, Pakize Çalış Erümit	Different cooking techniques used in seafood
11.15-11.30	Fawad Ali, Muhammad Azhar Nadeem, Faheem Shehzad Baloch	GWAS in safflower: A case study to identify the genetic basis associated with selected yield traits
11.30-11.45	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Abdurrahman YAZGAN OTURUMU		
PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Abdurrahman YAZGAN SESSION		
Başkan/ Moderator: Dr. Samet Hasan Abacı		
11.45-12.00	Kamala Kamal Badalova, Namiq Rasulov	Obtaining antibacterial composite materials of polypropylene
12.00-12.15	Ertugrul Kul, Samet Hasan Abacı, Ali Ayhan Barut	Determination of Some Quality Characteristics of Dairy Cow Milk Produced in Kastamonu Province
12.15-12.30	Ceylan Demircan, Ebru Aydin, Gulcan Ozkan	Ultrasonic extraction optimization of sweet basil phenolics, encapsulation by ionic gelation method, antidiabetic activity, antioxidant activity
12.30-12.45	Fatma Ertaş	Investigation of the Efficacy of Ganciclovir in Van Cats with Eye Infection and Lacrimation
12.45-13.30	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Kazım ABAK OTURUMU		
PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Kazım ABAK SESSION		
Başkan/ Moderator: Dr. Ali Raza Memon		
13.30-13.45	Ali Zarrabi	Porous nanoplateforms in sustainable agriculture; promising tools for controlling pesticide delivery
13.45-14.00	Anbesse Girma Shewa	Do cooking oils have a frying potential?
14.00-14.15	Ali Raza Memon	Garlic Powder is The Natural Anti Diabetic Agent: "The Effects of Garlic Powder on Glycemic control in the Patients of Type-2 Diabetes Mellitus"
14.15-14.30	Bayode j olorunfemi	Development of a Modified Dehusking Machine for Local Varieties of Coconut
14.30-14.45	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Dr. Yemliha EDİZER OTURUMU		
PROF. DR. KEMAL BIYIKOĞLU HALL Dr. Yemliha EDİZER SESSION		
Başkan/ Moderator: Dr. Mustafa Duman		
14.45-15.00	Abdalla Nouredin Osman Kheiry	Field Performance Evaluation of Two Disc Plows Makes as affected by Forward Speeds
15.00-15.15	Farah Husna Saifuddin, Nurul Affiqah Arzaee, Mohamad Firdaus Mohamad Noh, Mimi Hani Abu Bakar, Mohd Asri Mat Teridi, Mohd Sobri Takriff, Wan Ramli Wan Daud, Mohd Adib Ibrahim	Enhanced power performance with the presence of sodium bicarbonate on <i>Chlorella</i> sp biofilm in a biophotovoltaic (BPV) system
15.15-15.30	Rafia Tanveer, Muhammad Nabeel Afzal, Muhammad Amjad Ali, Kinza Ahsan, Amjad Abbas	Isolation and identification of fungus associated with leaf spot disease of <i>Ficus carica</i> and in-vitro chemical management
15.30-15.45	Waqar Akram, Muhammad Usman Aslam, Muhammad Amjad Ali, Muhammad Nabeel Afzal, Amjad Abbas	Management of potato scab disease under field conditions by using different bio-control agents
15.45-16.00	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Prof.Dr. Oktay GENÇER OTURUMU		
PROF. DR. KEMAL BIYIKOĞLU HALL Prof.Dr. Oktay GENÇER SESSION		
Başkan/ Moderator: Dr. Muhammad Salim		
16.00-16.15	Elif Canpolat, Yunus Bozkurt, Ayten Öztürk	Determination of Antagonistic Effects of Some Trichoderma Species Against <i>Fusarium oxysporum</i>
16.15-16.30	Muhammad Salim, Faiqa Altaf, Ahmad Ur Rahman Saljoqi, Ayhan Gökçe	Effect of Gamma Radiation on the Development of <i>Tribolium castaneum</i> (H.) (Coleoptera: Tenebrionidae) and <i>Callosobruchus maculatus</i> (F.) (Coleoptera: Bruchidae)
16.30-16.45	Marcello Dante Cerrato	<i>Sporobolus Pungens</i> (Schreb.) Kunth Physiological, Biochemical And Reproductive Response Under Saline Conditions
16.45-17.00	Yasemin Gedik, Habiba Mohshina	Lethal Genetic Defects and Poor Fertility in Holstein Friesian Cattle
17.00-17.15	Muhammad Yasir Naeem	Intelligent Food Packaging as an Emerging Technology in Food Sector
17.15-17.30	Ara	Break



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PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Özer ŞEKERDEN OTURUMU PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Özer ŞEKERDEN SESSION		
Başkan/ Moderator: Dr. Hamide Gübbük		
17.30-17.45	Invited Speaker Erastus Dushimeyesu, Sylvestre Habimana, Fabrice Musana Rwalinda, Evergiste Niyonsenga, Ismael Niyokwizigirwa, Theophile Kanyarwanda	Impact Of Maize Storage Methods On Aflatoxin Contamination In Eight Districts Of Southern Province Of Rwanda
17.45-18.00	Esma Güneş Demiral, Hatice Reyhan Öziyici, Hamide Gübbük	Seasonal variation of mineral content in some papaya cultivars grown in protected cultivation
18.00-18.15	Ahmet Uçar, Mehmet Akif Boz, Kadir Erensoy, Musa Sarıca	Effects of Short Period of Incubation during Egg Storage and Pre-warming on Hatchability, Hatch Time and Gosling Quality Traits of Eggs from Turkish Geese
18.15-18.30	Saffet Sansar	Evaluation Of Carbon Microparticles On Foraging Behavior Of Honey Bees Exposed To Sublethal Dose Of Imidacloprid
18.30-18.45	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Orhan KAVUNCU OTURUMU PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Orhan KAVUNCU SESSION Başkan/ Moderator: Dr. Abdullah Özbilgin		
18.45-19.00		
19.00-19.15	Abdullah Özbilgin, Recep Gümüş	Cultivation of Duckweed (Duckweed) and Determination of Nutrient Content
19.15-19.30	Muhammed Mustafa Özçelik Gülcan Özkan Erkan Karacabey	Optimization of industrial drying conditions of organic strawberry
19.30-19.45	Halil Yalçın	Investigation Of Some Chemical Values in Milk Produced in Small Farms
19.45-20.00	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Tahsin KESİCİ OTURUMU PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Tahsin KESİCİ SESSION Başkan/ Moderator: Dr. Yağmur Erim Köse		
20.00-20.15	Elif Tugce Aksun Tumerkan	Effect of Industrial and Domestic Processing Techniques on the DNA Degradation of Anchovy
20.15-20.30	Elif Çil	A popular functional food: celery (Apium graveolens L.)
20.30-20.45	Azim Şimşek	Effects of Eggplant Peel Extracts Obtained with Different Extraction Techniques on Physicochemical Properties and Oxidative Stability of Cooked Beef Meatballs During Refrigerated Storage
20.45-21.00	Yağmur Erim Köse	Determination Of Antioxidant Activity Of Corn Cob That Is Agricultural Waste
21.00-21.15	Ara	Break
PROF.DR. KEMAL BIYIKOĞLU SALONU Prof. Dr. Çetin FIRATLI OTURUMU PROF. DR. KEMAL BIYIKOĞLU HALL Prof. Dr. Çetin FIRATLI SESSION Başkan/ Moderator: Dr. Dilşat Bozdoğan Konuşkan		
21.15-21.30	Handan Karaoğlu	Effects of Acute Ammonium Nitrate Levels Caused by Agricultural Activities on Four Amphibian Species in The Eastern Black Sea Region
21.30-21.45	Dilşat Bozdoğan Konuşkan	Saurani Zeytinyağının Bazı Kalite Parametreleri Üzerine Zeytin Olgunluğunun Etkisi
21.45-22.00	İsmail Yüksel GENÇ	Prediction The Growth Rate Of Listeria monocytogenes Based On Fuzzy Logic
22.00-22.15	Yasin Kahya, Halit Vasfi Gencer, Doruk Engin	The Microsatellite DNA Variation in the Honey Bee (Apis mellifera L.) Stocks of Breeder Farms in Turkey
22.15-22.30	Ömer Konuşkan	Melez mısır çeşitlerinin tek ve çift sıra ekinde bazı bitkisel özelliklerinin (zea mays L.), bitki sıklıklarına tepkisi
22.30-22.45		

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An Analysis of the Change in the Attitudes and Behaviors of Users before and after the Pandemic: Case Study; Ankara Çubuk-1 Dam

Sertaç Güngör¹, Elif Nur Doğan²

¹Selçuk University, Faculty of Architecture and Design, Department of Landscape Architecture Konya, TURKEY

²Selçuk University, Graduate School of Natural and Applied Sciences M.Sc.Student, Konya, TURKEY

Abstract

During the pandemic process that has been going on for more than a year since the pandemic period was declared in 2020, the troubles and restrictions faced by people negatively affect the morale motivation of people. In this study, the definition of recreation areas, which are the leading places where people feel happy and peaceful, has been defined, what they contain is mentioned, and the adequacy of the recreational areas has been discussed in the survey and it has been determined that they are one of the most important needs in the cities. In the example of the recreation area of Çubuk-1 dam, it was investigated whether there is a change in the attitudes and behaviors of people before and after the pandemic, not face to face due to the pandemic, but through a voluntary survey based on social media. Although individuals thought that it was crowded after the pandemic, they preferred to use the recreation area of Çubuk-1 dam by paying attention to mask, distance and hygiene rules. The positive effects of physical activity, socialization, and outdoor travel on health are generally accepted by individuals. During the pandemic process, it has been observed that people have changed the way they spend their free time and the places they want to be, as they are overwhelmed by staying in their homes due to the prohibitions. The psychological and physical positive effects of recreation areas on human health and the changes caused by the pandemic in people's attitudes and behaviors paralleled the responses of the participants to the questionnaire.

Key Words: Covid-19, coronavirus, pandemic, recreation, green area

Kullanıcıların Pandemi Öncesi ve Sonrası Tutum ve Davranışlarındaki Değişimin Ankara Çubuk-1 Barajı Örneğinde İncelenmesi

Özet

2020 yılında pandemi döneminin ilan edilmesinden bu yana bir yılı aşkın süredir devam etmekte olan pandemi sürecince insanların yaşadığı sıkıntılar ve karşılaştığı kısıtlamalar insanların moral motivasyonunu olumsuz etkilemektedir. Bu çalışmada insanların kendilerini mutlu ve huzurlu hissettiği yerlerin başında gelen rekreasyon alanlarının tanımı yapılmış, neler içerdiğinden bahsedilmiş ve yapılan ankette rekreasyon alanlarının yeterliliği tartışılmış ve elde edilen sonuçlardan kentlerdeki en önemli ihtiyaçlardan biri olduğu tespit edilmiştir. Çubuk-1 barajı rekreasyon alanı örneğinde, pandemi öncesi ve sonrası kişilerin tutum ve davranışlarında değişiklik olup olmadığı pandemi nedeniyle yüz yüze olarak değil de sosyal medya üzerinden yapılan, gönüllülük esasına dayanan anket ile araştırılmıştır. Bireyler pandemi sonrasında kalabalık olduğunu düşünmelerine rağmen maske, mesafe ve hijyen kurallarına dikkat ederek Çubuk-1 barajı rekreasyon alanını kullanmayı tercih etmişlerdir. Fiziksel aktivite yapmanın, sosyalleşmenin, açık havada gezmenin sağlığa olan olumlu etkisi bireyler tarafından genel kabul görmektedir. Pandemi sürecinde yasaklardan dolayı insanlar evlerinde kapalı kalarak bunaldıkları için, boş zamanlarını geçirme şekillerini ve bulunmak istedikleri mekanları değiştirdikleri görülmüştür. Rekreasyon alanlarının insan sağlığı üzerindeki psikolojik ve fiziksel olarak olumlu etkisi ve pandeminin kişilerin tutum ve davranışlarında meydana getirdiği değişiklikler, katılımcıların ankete verdiği cevaplarla paralellik göstermiştir.

Anahtar Kelimeler: Covid-19, koronavirüs, pandemi, rekreasyon, yeşil alan

Evaluation of the Social and Psychological Changes Occurring in Elderly Living in Konya Province in Terms of Landscape Architecture during the Pandemic Process

Sertaç Güngör¹, Fatmma Bütüner²

¹Selçuk University, Faculty of Architecture and Design, Department of Landscape Architecture Konya, TURKEY

²Selçuk University, Graduate School of Natural and Applied Sciences M.Sc.Student, Konya, TURKEY

Abstract

Covid-19, which affects the whole world and is accepted as a pandemic by the world health organization, caused millions of people to die. The elderly are in the group with the highest risk of losing their lives due to the Covid-19 virus. Stricter restrictive / protective measures have been taken for the elderly in Turkey, as in the whole world. With this research, it is aimed to evaluate the sociological and psychological effects of the "elderly", who are one of the health risk groups of the society, in terms of landscape architecture, during the pandemic days when they had to experience various problems after the outbreak. In the study, face-to-face and online questionnaires were applied to individuals aged 50 and over on a voluntary basis. As a result of the study, it was determined that the implementation of curfews and restrictions for the elderly and the formation of an isolated lifestyle from other age groups caused an increase in loneliness and anxiety levels and negative psychological effects. It has been revealed that the activities that individuals will carry out in the green area, their conversations and socializing with their peers, and walks in the open area have a positive psychological and sociological effect for the elderly. It has been determined that the elderly who become lonely and depressed at home with the restrictions imposed under pandemic conditions want to be in green areas. The sociological and psychological positive effects of being in green areas and spending time, and the changes in the behavior and emotions of the elderly who have pandemic restrictions paralleled the response of the participants to the questionnaire.

Key Words: Covid-19, Pandemic, Psychological effect, Elderly, Green space

Pandemi Sürecinde Konya İlinde Yaşayan Yaşlı Bireylerde Meydana Gelen Sosyal ve Psikolojik Değişimlerin Peyzaj Mimarlığı Açısından Değerlendirilmesi

Özet

Tüm dünyayı etkisi altına alan ve dünya sağlık örgütü tarafından pandemi olarak kabul edilen Covid-19 milyonlarca insanın yaşamını kaybetmesine neden olmuştur. Yaşlılar, Covid-19 virüsü sebebiyle hayatını kaybetme riski en yüksek olan grupta yer almaktadırlar. Tüm dünya da olduğu gibi Türkiye’de de yaşlılar için daha sıkı kısıtlayıcı/koruyucu tedbirler alınmıştır. Bu araştırma ile salgının ortaya çıkmasından sonra çeşitli sıkıntılar yaşamak zorunda kaldığı pandemi günlerinde toplumun sağlık riski taşıyan gruplarından olan “yaşlıların” sosyolojik ve psikolojik etkilenmelerinin peyzaj mimarlığı açısından değerlendirilmesi amaçlanmıştır. Çalışmada 50 yaş ve üzeri yaşlı bireylere gönüllülük esasına göre yüz yüze ve online anket uygulanmıştır. Çalışma sonucunda yaşlılar için sokağa çıkma yasağının ve kısıtlamaların uygulanmasının ve diğer yaş gruplarından izole bir yaşam tarzının oluşmasının yaşlılarda yalnızlık ve kaygı düzeylerinin yükselmesine ve olumsuz psikolojik etkilerinin oluşmasına sebep olduğu tespit edilmiştir. Bireylerin yeşil alanda gerçekleştirecekleri aktiviteler, yaşlıları ile yapacakları sohbetlerin ve sosyalleşmelerin, açık alanda yapılan yürüyüşlerin yaşlılar için psikolojik ve sosyolojik anlamda olumlu bir etkiye sahip olduğu ortaya çıkmıştır. Pandemi şartlarında uygulanan kısıtlamalar ile evlerinde yalnızlaşan ve bunalan yaşlıların yeşil alanlarda bulunmak istedikleri tespit edilmiştir. Yeşil alanlarda bulunmanın, vakit geçirmenin sosyolojik ve psikolojik olumlu etkileri ve yaşlıların pandemi kısıtlamalarında bulundukları davranış ve duygularındaki değişimler, katılımcıların ankete verdiği cevapla paralellik göstermiştir.

Anahtar Kelimeler: Covid-19, Pandemi, Psikolojik etki, Yaşlılık, Yeşil alan



Assessment Of Drought Stress Effects On Morpho-Physiological And Biochemical Changes In Carrot

Muhammad Daniyal Junaid

Nigde Ömer Halisdemir University

Abstract

Carrot is one of the most nutritious and popular vegetable crops after potato. Drought stress affects every region of the world, and almost one half of our earth is under threat of drought. It mainly disturbs plant water association and inhibits water-use efficiency but, eventually, all plant mechanisms get affected by water scarcity. This study was conducted under greenhouse conditions to evaluate the responses of nine carrot cultivars in response to drought stress. Different physiological traits such as relative water content, leaf temperature, chlorophyll and carotenoid concentrations were measured. Moreover, morphological traits such as plant length, number of leaves, root length and root diameter was also measured from control and stress treated carrot cultivars. Biochemical traits including hydrogen peroxide and malondialdehyde were also measured. Varying response of ten carrot cultivars was observed under drought stress. Results depicted that all the cultivars showed decrease in their morphological traits under drought. Likewise, RWC declined significantly in the plants that were subjected to stress conditions. Furthermore, amount of chlorophyll contents and carotenoids were also decreased under drought stress. The cultivar Cosmic Purple showed highest sensitivity to drought stress whereas Coral Orange exhibited resistance to drought stress compared to other cultivars in study. As there is scarce knowledge in literature dealing with affects of drought on carrot's morpho-physiology and biochemical traits, current study lays the basis for understanding the affects of drought on the carrot cultivars.

Key Words:

Evaluation Of Green Areas Of Konya Selçuklu, Bosna-Hersek Neighborhood In Terms Of Sufficiency, Management And Usage

Serpil Önder¹, Ruhugül Özge Gemici², Ahmet Tuğrul Polat³

¹ Department of Landscape Architecture, Faculty of Architecture and Design , University of Selçuk, Konya, Turkey

² Department of Landscape Architecture, Faculty of Architecture and Design , University of Selçuk, Konya, Turkey

³ Department of Landscape Architecture, Faculty of Architecture and Design , University of Selçuk, Konya, Turkey

Abstract

Green areas are spaces organized as areas where people can get rid of their monotonous lives and meet their active or passive recreation needs. In order for a society to be physically and mentally healthy, green spaces must fulfill the purposes of establishment.

The main material of the research is the green areas of Bosna-Hersek neighborhood. The questionnaire method was used in the study and the green areas in Konya province Selçuklu district Bosnia and Herzegovina neighborhood were evaluated in terms of sufficiency, management and usage.

Key Words: Bosna-Hersek neighborhood, green areas, Konya, landscape planning

Inhibitory Effects of Ethanolic Extracts of Yarrow, Lavander and Propolis Against *Salmonella Typhimurium*

Sabire Yerlikaya¹, Hülya Şen Arslan¹

¹Food Engineering Department, Engineering Faculty, Karamanoğlu Mehmetbey University, Karaman, Turkey

Abstract

In this study, the inhibitory effects of ethanolic extract of yarrow (EEY), lavander (EEL) and propolis (EEP) on the survival *Salmonella typhimurium* ATCC 14028 was investigated at 37°C. After *Salmonella typhimurium* ATCC 14028 has been activated in broth medium, pathogen was added to chicken broth. Then samples were divided into seven groups. First group was the control samples (has *Salmonella typhimurium* ATCC 14028 without ethanolic extracts), the second group was inoculated with 70% ethanol (EA); the third, fourth and fifth group were inoculated with ethanolic extract of yarrow 5%, ethanolic extract of lavander 5% and ethanolic extract of propolis 5% separately; the sixth group was inoculated with EEL after EEY and the seventh group was inoculated with EEY, EEL, EEP respectively. All treatments were incubated at 37°C for 15 minutes, separately. All samples reduced the numbers of *Salmonella typhimurium* ATCC 14028 in chicken broth compared with the control samples. It was calculated 6.0 kob/ml *Salmonella typhimurium* ATCC 14028 in control samples. It was found that; the samples was inoculated with EEY, EEL, EEP respectively was the most effective (3,5 kob/ml) and EA (5,75 kob/ml) is the less effective on the pathogen. It has been seen ethanolic extract of propolis has shown the highest (5,12 kob/ml) inhibitory activity compared with EEY (5,67 kob/ml) and EEL (5,40 kob/ml). The results of this study indicate that EEY, EEL and EEP as a natural food preservative may be used to effectively reduce *Salmonella typhimurium* ATCC 14028 in chicken broth.

Key Words: *Salmonella typhimurium* ATCC 14028, chicken, broth, population

Examination Of The Use Of Sculpture In The Open-Green Areas Of Selçuk University Alaeddin Keykubat Campus

Ruhugül Özge Gemic¹, Serpil Önder²,

¹ Department of Landscape Architecture, Faculty of Architecture and Design , University of Selçuk, Konya, Turkey

² Department of Landscape Architecture, Faculty of Architecture and Design , University of Selçuk, Konya, Turkey

Abstract

The sculpture, which is the expression of beliefs and fears in prehistoric times, has taken on different roles as an urban reinforcement element in all cultures with numerous themes. In the Middle Ages, it became an organic part of the architectural structure, teaching the truth about religious beliefs. With the Renaissance movement, it became independent by breaking away from the architectural structure and moved to the urban space. In the twenty-first century, its dimensions have grown to be equivalent to architecture, it has created its own space and established new aesthetic and functional relations with the audience.

In this study, the relationship of some sculptures on the Alaeddin Keykubat campus of Selcuk University with the landscape elements was examined in terms of design elements and basic design principles. In the light of the data obtained, suggestions have been developed in order to increase the life and aesthetic quality of the campus.

Key Words: Campus, landscape design, landscape elements, sculpture

The Effect of Different Cover and Flooring Materials on Climatic Comfort in Landscape Design

Orhun Soydan¹, Ahmet Benliay²

¹Landscape Architecture Department, Faculty of Architecture, Niğde Ömer Halisdemir University, Niğde, Turkey

²Landscape Architecture Department, Faculty of Architecture, Akdeniz University, Antalya, Turkey

Abstract

The reduction of natural landscapes due to urban growth is the main driver of changes in the microclimate. This effect has started to show its effect in urban microclimates to a large extent. Urban open and green spaces have an important role in terms of urban microclimates. Many studies on the subject have proven that urban landscape areas, especially the use of trees and shrubs, can positively affect the outdoor microclimate and alleviate the urban heat island effect. It is important for climatic comfort that the temperature change is low in the winter months and the temperature change is high in the summer months for the regions in the Mediterranean climate such as Antalya province. In this study, it is aimed to understand the effects of structural and vegetative elements that can be used in landscape designs on the temperature factor, which will greatly affect the climatic comfort, by using artificial neural networks. In this context, measurements were carried out in the morning (08:00-09:00), noon (13:00-14:00) and evening (18:00-19:00) of a total of 100 days, 50 days in each of the winter and summer seasons, at 7 randomly selected points in the Akdeniz University Campus. In these measurements, the temperature difference values of 11 cover elements on 7 different floor covering types were measured, and the ambient air temperature, humidity and wind values were also determined. The temperature differences between the areas where the flooring elements are exposed to direct sun and the shadow effect of different plant and cover elements were determined using an infrared laser thermometer. These values were processed with Neural Designer software and possible temperature difference prediction values were created for 57,750 different alternatives with the help of artificial neural network model from 837 sets of data. Evaluation shows that the maximum temperature difference is 15.6 °C at noon in the summer months in the red tartan flooring material and *Callistemon viminalis* cover material. While the artificial neural network model predicts that there will be a high 2-3 °C temperature difference for the alternatives, it has made predictions for temperature differences between 0-10 °C in winter and 0-16 °C in summer months. Although the temperature differences that will occur in the noon hours are distributed over a wide range of values, it seems that the morning and evening forecasts are concentrated between 0-7 °C values. Also, it has been determined that the wind and humidity in the environment are more important factors than the ambient temperature in terms of temperature differences.

Key Words: Landscape Design, Climatic Comfort, Top Cover, Flooring Element

Peyzaj Tasarımında Farklı Üst Örtü ve Döşeme Malzemelerinin İklimsel Konfor Üzerine Etkisi

Özet

Kentsel büyüme sebebiyle oluşan doğal peyzajların azalması, mikro iklimdeki değişikliklerin ana itici gücüdür. Bu etki kentsel mikro iklimlerde de etkisini büyük oranda göstermeye başlamıştır. Kentsel açık ve yeşil alanlar, kentsel mikro iklimler açısından önemli bir role sahiptir. Konu hakkında yapılan birçok çalışma, kentsel peyzaj alanlarının, özellikle ağaç ve çalı kullanımlarının, dış mekândaki mikro iklimi olumlu etkileyebileceğini ve kentsel ısı adası etkisini hafifletebileceğini kanıtlamıştır. Antalya ili gibi Akdeniz ikliminde bulunan bölgeler için kış aylarında sıcaklık değişiminin az, yaz aylarında ise sıcaklık değişiminin fazla olması iklimsel konfor açısından önem taşımaktadır. Bu çalışma, peyzaj tasarımlarında kullanılabilecek yapısal ve bitkisel elemanların, iklimsel konforu büyük bir oranda etkileyecek sıcaklık faktörü üzerindeki etkilerinin yapay sinir ağıları kullanılarak anlaşılmasını amaçlamıştır. Bu bağlamda Akdeniz Üniversitesi Yerleşkesi içerisinde rastgele seçilen 7 noktada kış ve yaz mevsimlerinin her birinde 50 gün olmak üzere toplamda 100 gün, sabah (08:00-09:00), öğlen (13:00-14:00) ve akşam (18:00-19:00) saatlerinde ölçümler gerçekleştirilmiştir. Bu ölçümlerde 7 farklı zemin kaplaması tipi üzerindeki 11 örtü elemanının yapmış olduğu sıcaklık farklılık değerleri ölçülmüş, bunun yanında ortam hava sıcaklığı, nem ve rüzgâr değeri de belirlenmiştir. Döşeme elemanlarının direk güneşe maruz kaldığı alanlar ile farklı bitki ve örtü elemanlarının yapmış olduğu gölge etkisi ile gerçekleşen sıcaklık farklılıkları değerleri infrared lazer termometre kullanılarak belirlenmiştir. Bu değerler Neural Designer yazılımı ile işlenmiş ve 837 set veriden yapay sinir ağıları modeli yardımı ile 57.750 ayrı alternatif için olası sıcaklık farkı tahmin değerleri oluşturulmuştur. Çıkan sonuçlar değerlendirildiğinde en fazla ısı farkının 15,6 °C ile yaz ayı öğle saatlerinde kırmızı tartan döşeme malzemesi ve *Callistemon viminalis* örtü malzemesinde olduğunu göstermektedir. Yapay sinir ağı modeli alternatifler için yüksek oranda 2-3 °C sıcaklık farkının oluşacağı ön görülürken, kış aylarında 0-10 °C, yaz ayları için 0-16 °C arasındaki sıcaklık farklılıkları için tahminler oluşturmuştur. Öğle saatlerinde oluşacak sıcaklık farklılıklarının geniş bir değer aralığına dağılmasına karşın sabah ve akşam tahminlerinin 0-7 °C değerleri arasında yoğunlaştığı gözükmetedir. Bununla beraber, sıcaklık farkları açısından ortamda bulunan rüzgâr ve nemin, ortam sıcaklığından daha önemli faktörler olduğu belirlenmiştir.

Anahtar Kelimeler: Peyzaj Tasarımı, İklimsel Konfor, Üst Örtü, Döşeme Elemanı.

Analysis of Accessibility to Family Health Centers in Antalya Using GIS

Orhun Soydan¹

¹Landscape Architecture Department, Faculty of Architecture, Niğde Ömer Halisdemir University, Niğde, Turkey

Abstract

In the last two decades, the geographic accessibility of urban resources for the population living in residential areas has become an increasing focus in urban health research. The operationalization and calculation of geographic accessibility measures depend on four parameters, which are the definition of residential areas, the method of data collection, an accessibility measure, and a type of distance. Health is an important factor of critical value for human life. Health services offered nowadays have two macro objectives. The first of these is to increase the health level of the society, and the other is to deliver health services to people in a balanced way. Therefore, health services are divided into three as first, second and third class health services. Family Health Centers (FHCs), which are the subject of the study, are included in the first class health services in this classification. Family health centers in Turkey started to be implemented for the first time in Düzcce in 2004 within the scope of Law No. 5258. While determining the physical conditions of the places where family health centers are built, the first item in the regulation is that the building should be easily accessible. This situation shows the importance of the subject in terms of accessibility. While determining the features of the places where FHC will be made, environmental characteristics are also taken into consideration. Environmental features are effective in determining the ASM location in different ways. These impacts are divided into two groups: the physical features that pavements, roads and parks can include, and the social, cultural and institutional features of neighborhoods that include local social ties and collective activities. From this point of view, the importance of the location of family health centers relative to roads and houses is understood. The aim of this study is to examine the accessibility of Family Health Centers in Konyaaltı, Antalya, on a neighborhood basis using Geographic Information Systems. As a result of the examinations, there are 21 Family Health Centers in Konyaaltı. The information about the Konyaaltı District was obtained from the relevant units. As a result of the analyzes, it was determined that most of the neighborhoods had problems in terms of accessibility, while a very few of them did not experience problems in terms of accessibility. In terms of the total number of buildings, the ratio of buildings that are 500 meters walking distance from any family health center by using highways is 35.56%. With these rates, 3,634 of the 10,2018 buildings remain within the limits of the regulation. As a result of the study, suggestions were made to increase accessibility to these areas.

Key Words: Accessibility, Geographic Information System, Remote Sensing, Landscape Design, Antalya

Antalya Şehrinde Aile Sağlığı Merkezlerine Erişilebilirliğin CBS İle Analizi

Özet

Son yirmi yılda, yerleşim bölgelerinde yaşayan nüfus için kentsel kaynakların coğrafi erişilebilirliği, kentsel sağlık araştırmalarında artan bir odak noktası haline gelmiştir. Coğrafi erişilebilirlik önlemlerinin operasyonel hale getirilmesi ve hesaplanması, yerleşim alanlarının tanımı, veri toplama yöntemi, erişilebilirlik ölçüsü ve mesafe türü olmak üzere dört parametreye bağlıdır. Sağlık, insan yaşamı için kritik değerde önemli bir faktördür. Günümüzde sunulan sağlık hizmetlerinin iki makro amacı vardır. Bunlardan birincisi toplumun sağlık düzeyini yükseltmek, diğeri ise sağlık hizmetlerini insanlara dengeli bir şekilde ulaştırmaktır. Bu nedenle sağlık hizmetleri birinci, ikinci ve üçüncü sınıf sağlık hizmetleri olmak üzere üçe ayrılmaktadır. Çalışmaya konu olan Aile Sağlığı Merkezleri (ASM'ler) bu sınıflandırmada birinci sınıf sağlık hizmetleri içerisinde yer almaktadır. Türkiye'de aile sağlığı merkezleri ilk kez 2004 yılında 5258 sayılı Kanun kapsamında Düzcce'de uygulanmaya başlanmıştır. Aile sağlığı merkezlerinin yapıldığı yerlerin fiziki koşulları belirlenirken yönetmelikteki ilk madde; binaların kolayca erişilebilir olmasıdır. Bu durum konunun erişilebilirlik açısından önemini göstermektedir. Aile Sağlığı Merkezi yapılacak yerlerin özellikleri belirlenirken çevresel özellikler de dikkate alınmalıdır. Çevresel özellikler farklı şekillerde ASM lokasyonunun belirlenmesinde etkilidir. Bu etkiler, kaldırımların, yolların ve parkların içerebileceği fiziksel özellikler ve mahallelerin yerel sosyal bağları ve kolektif faaliyetleri içeren sosyal, kültürel ve kurumsal özellikleri olmak üzere iki gruba ayrılmaktadır. Bu açıdan bakıldığında aile sağlığı merkezlerinin yollara ve evlere göre konumlarının önemi anlaşılmaktadır. Bu çalışmanın amacı, Antalya İli Konyaaltı ilçesinde bulunan Aile Sağlığı Merkezlerinin Coğrafi Bilgi Sistemleri kullanılarak mahalle bazında erişilebilirliğinin incelenmesidir. Yapılan incelemeler sonucunda Konyaaltı'nda 21 Aile Sağlığı Merkezi bulunmaktadır. Konyaaltı Mahallesi ile ilgili bilgiler ilgili birimlerden alınmıştır. Analizler sonucunda mahallelerin çoğunun erişilebilirlik açısından sorun yaşadığı, çok azının ise erişilebilirlik açısından sorun yaşamadığı tespit edilmiştir. Toplam bina sayısına göre karayolu kullanılarak herhangi bir aile sağlığı merkezine 500 metre yürüme mesafesinde olan binaların oranı %35,56'dır. Bu oranlarla 10.2018 binadan 3.634 adedi yönetmelik sınırları içinde kalmaktadır. Çalışma sonucunda bu alanlara erişilebilirliğin artırılmasına yönelik önerilerde bulunulmuştur.

Anahtar Kelimeler: Erişilebilirlik, Coğrafi Bilgi Sistemi, Uzaktan Algılama, Peyzaj Tasarımı, Antalya.

Investigation of The Sufficiency of Antalya Parks

Orhun Soydan¹, Nefise Çetin²

¹Landscape Architecture Department, Faculty of Architecture, Niğde Ömer Halisdemir University, Niğde, Turkey

²Landscape Architecture Department, Faculty of Architecture, Akdeniz University, Antalya, Turkey

Abstract

As an urban quality, green spaces provide many functions such as active and passive recreation activities, providing environmental benefits and being a habitat for wildlife. Urban green spaces are areas established to meet the recreational needs of urban people. Although green spaces vary from country to country and region in terms of plan and design features, they were basically created to allow people to meet with nature. Parks are the basic components of urban landscapes that provide environmental and social functional value. Urban parks, in particular, provide spaces for outdoor physical activities. In order to take advantage of the opportunities of activities in the parks, users must have convenient access to these resources. One of the most important aspects for researching the use and potential benefits of urban green spaces is the assessment of their geographic accessibility. The widespread use of smart city systems and the gradual expansion of their usage areas increase the importance of spatial analysis. Spatial analyzes are used in today's urban management in the processes of determining social needs, identifying current problems, and putting forward solutions. When spatial analyzes are used together with GIS, the field of application develops even more, and it supports local governments in responding to the changing demands of the society for a better life. In the study, the adequacy and accessibility of 160 city parks in Konyaaltı District of Antalya Province were examined. In terms of the adequacy of the parks, the area value of 10 m² per person determined with the Construction Plan numbered 3194 was taken as basis. In terms of accessibility, distance values of 200, 400, 800, 1,200 meters were examined. Neighborhood boundaries and population information were obtained from the relevant units, and Arc-GIS 10.8 software was used in the analysis. As a result, it was determined that the parks in Konyaaltı district were insufficient in terms of adequacy and accessibility. Finally, suggestions were made in terms of increasing the adequacy of the parks and ensuring accessibility.

Key Words: Urban open and green spaces, Parks, Accessibility, Remote sensing, Antalya

Antalya Parklarının Yeterliliklerinin İncelenmesi

Özet

Kentsel bir nitelik olarak yeşil alanlar, aktif ve pasif rekreasyon faaliyetleri, çevresel faydalar sağlama ve yaban hayatı için yaşam alanı olma gibi birçok işlevi yerine getirmektedir. Kentsel yeşil alanlar, kent insanının rekreasyonel ihtiyaçlarını karşılamak için kurulmuş alanlardır. Yeşil alanlar plan ve tasarım özellikleri açısından ülkeden ülkeye ve bölgeden bölgeye farklılık gösterse de temel olarak insanların doğayla buluşması için tasarlanmışlardır. Parklar, kentsel peyzajlara çevresel ve sosyal işlevsel değer sağlayan temel bileşenlerdir. Özellikle şehir parkları, açık hava fiziksel aktiviteleri için alanlar sağlamaktadırlar. Parklardaki etkinliklerin olanaklarından yararlanabilmek için kullanıcıların bu kaynaklara kolay erişime sahip olmaları gerekmektedir. Kentsel yeşil alanların kullanımını ve potansiyel faydalarını araştırmak için en önemli yönlerden biri, coğrafi erişilebilirliklerinin değerlendirilmesidir. Akıllı şehir sistemlerinin yaygınlaşması ve kullanım alanlarının giderek genişlemesi mekansal analiz bu anlamda önemini artırmaktadır. Günümüz kent yönetiminde toplumsal ihtiyaçların belirlenmesi, mevcut sorunların belirlenmesi ve çözüm önerilerinin ortaya konulması süreçlerinde mekansal analizler kullanılmaktadır. Mekansal analizler coğrafi bilgi sistemleri ile birlikte kullanıldığında uygulama alanı daha da gelişir ve daha iyi bir yaşam için toplumun değişen taleplerine cevap vermede yerel yönetimlere destek olur. Çalışmada, Antalya İli Konyaaltı İlçesi'nde bulunan 160 şehir parkının yeterliliği ve erişilebilirliği incelenmiştir. Parkların yeterliliği açısından 3194 sayılı İmar Planı ile belirlenen kişi başı 10 m² alan değeri esas alınmıştır. Erişilebilirlik açısından 200, 400, 800, 1.200 metre mesafe değerleri incelenmiştir. İlgili birimlerden mahalle sınırları ve nüfus bilgileri alınmış olup, analizlerde Arc-GIS 10.8 yazılımı kullanılmıştır. Sonuç olarak Konyaaltı ilçesindeki parkların yeterlilik ve erişilebilirlik açısından yetersiz olduğu tespit edilmiştir. Son olarak parkların yeterliliğinin artırılması ve erişilebilirliğin sağlanması yönünde önerilerde bulunulmuştur.

Anahtar Kelimeler: Kentsel açık ve yeşil alanlar, Parklar, Erişilebilirlik, Uzaktan algılama, Antalya.

Determinants of Tomato Farmers Participation in Agricultural Services and Training Centre (ASTC) Activities

Godfrey C. Onuwa¹, Solomon T. Folorunsho²

¹Department of Agricultural Extension and Management, Federal College of Forestry, Jos, Plateau state, Nigeria

²Department of Agricultural Economics, Faculty of Agriculture, University of Jos, Plateau state, Nigeria

Abstract

Agricultural production have remained rudimentary despite many years' of technology development and transfer; to reverse this declining trend, several agricultural policies and programmes aimed at ensuring sustainable production, improved income and farm expansion with added value output have become very germane. This study therefore analyzed tomato farmers' participation in ASTC activities in Jos-south local Government Area of Plateau state, Nigeria. Multi stage sampling techniques was adopted for this study. Primary data collected were analyzed using descriptive statistics, participation index, weighted average index analysis and Binary Logit regression. The result of the study revealed that 73.8% were male; 63.75% were married; 77.5% were members of cooperative societies or groups; 88.75% had access to extension contact. The estimated mean for age, educational training, household size, farm size, farm income and farming experience were 39 years, 6 years; 8 people; 1.1ha; ₦108,500/ha and 12 years respectively. Also, most (68.7%) of the farmers have low participation index of ≤ 0.45 ; this trend is responsible for the existing low farm productivity of this crop in the area. Furthermore, the benefits derived from participating in ASTC activities among the respondents were significant as indicated by their weighted average index. In addition, the estimated coefficient of multiple determination (R^2) was 0.7602; hence, 76% variation in the farmers decision to participate in ASTC activities was accounted for by variables in the regression model. Farm intensification, capacity development, input supply, cooperative formation, improved access to extension services, agricultural information and credit are strongly recommended.

Key Words: Agricultural programme, agricultural technology, determinants, participation index, technology transfer

Empirical Analysis of Productivity among Broiler Farmers

Godfrey C. Onuwa

¹Department of Agricultural Extension and Management, Federal College of Forestry, Jos, Plateau state, Nigeria

Abstract

Broiler production supplements income of smallholder farm households. Profitability and productivity and analysis are important considerations in measuring efficiency or performance of a farm business; hence, improved output and income are not only a function of increase in the scale of production, but also how efficiently the resources are being utilized. This study therefore estimates the profitability and level of productivity among broiler farmers in Jos North, Plateau State, Nigeria. Multistage sampling technique was employed to select respondents for this study. Primary data collected were analyzed using descriptive statistics, farm budgeting model and Total Factor Productivity (TFP) analysis. The study revealed that the net farm income of broiler production was ₦96,900/flock size; suggesting a relatively profitable venture with prospects for improved economic potentials. The estimated percentage profit margin was 45.6%; indicative of the percentage net margin accruable to the farmer from the estimated gross margin and benefit-cost ratio was 0.84. Furthermore, most (54.3%) of broiler farmers were sub-optimally productive as their TFP indices were below the optimal scale; attributable to sub-efficient input mix and cost of production inputs. In addition, constraints of broiler production in the study area included the following; high cost of feeds (92.9); high cost of chicks (85.7%); financial constraints (80%); high cost of poultry equipment (55.7%); high cost of medication (35.7); disease outbreak (28.6%) and inefficient market system (21.4%). Improving access to and subsidy of poultry feeds, chicks, production inputs and credit, extension, medical services and cooperative formation for market linkages are strongly recommended.

Key Words: *Broilers, constraints, livestock production, poultry farmers, profitability*

Investigation of Solar Powered Drying System Potential in Niğde Province

Yaşar Serhat Saygılı¹, Ali Kaan Yetik¹, Furkan Baş¹, Burak Şen¹

¹Biosystem Engineering Department, Faculty of Agricultural Sciences and Technologies, Niğde Ömer Halisdemir University, Niğde, Turkey

Abstract

Storage of the foods obtained by plant and animal production is as important as their cultivation. Crops cultivated around the world lose 28-36% of total yield during the process from agricultural land to consumption. With the most of this loss occurs after harvest and harvest, it can be reduced by suitable machines and appropriate methods to be used. Niğde, the list of cities with the highest apple production in Turkey is in third place. In addition, it is seen that the potential of the region to benefit from solar energy is quite high with 8.02 hours of daily sunshine duration and 1550-1800 kWh / m² total solar radiation values. In line with the information given, Niğde province stands out as an important opportunity for apple drying processes using solar-powered drying methods. In this study, suitable drying methods that can be used for agricultural products in general and methods that can be used in Niğde province have been investigated and with the using the information obtained from previous studies related to the region its examined that the solar drying system and machines that can be developed for the province of Niğde are specified.

Key Words: Food storage, Solar Energy, Drying machines, Agricultural production, apple drying

Biochar in combination with antagonistic microbes leads to enhanced nematode resistance in tomato

Muhammad Amjad Ali^{1*}, Usman Arshad^{1,2}

¹Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

¹The Islamia University, Bahawalpur, Pakistan

Abstract

Tomato (*Lycopersicon esculentum* Mill) is the second most produced and consumed vegetable worldwide and in Pakistan after potato. It is consumed on daily basis directly as raw and in the form of various processed items. Tomato is the most important vegetable after potato worldwide. In spite of an increasing trend in the use of inputs and the adoption of new technologies, productivity of tomato is not responding in terms of yield growth. Tomato is affected by a variety of bacterial, fungal and viral pathogens. In addition to these diseases, root knot nematode (*Meloidogyne incognita*) has emerged as a serious threat to several vegetable crops with special reference to the tomato production in Punjab. *Meloidogyne incognita* is the most dangerous plant parasitic nematode on the earth planet because of very high host range of this nematode species. It infects more than 3000 plant species worldwide with very devastating effects especially in tomato. Root knot nematodes (*Meloidogyne* spp.) are serious problem involved yield and quality reduction in tomato and other vegetable crops. They are mostly controlled by using various nematicides which not only hazardous to the environment but also have negative impact on human health. The present study represents an easy to use and eco-friendly solution to this problem by amending the soil with biochar. Biochar is a carbon rich product obtained through pyrolysis of biomass and can be used for carbon sequestration by applying large amounts of carbon very resistant to decomposition. This study have shown the answer the questions like what is the best feedstock for biochar development? What is the optimal concentration of biochar for controlling nematode populations in the plant rhizosphere? What different defense related genes are activated in the plants by the addition of optimal concentrations of biochar? To answer these questions, the interaction of tomato and root knot nematode *Meloidogyne incognita* have been used as model system. In the study, the potential of three feedstocks (wheat straw, cotton sticks and green waste) at different concentrations were evaluated to control root knot nematodes in pot experiments. The biochar developed from best feedstock at best concentration was evaluated in the field using nematode sick beds in the department research area. Moreover, the best biochar was applied to tomato along with certain population of nematodes in addition to biocontrol agents to study the activation of defense related genes in tomato. The best biochar for growth promotion and nematode resistance was rice husk biochar which was added with bacterial (*Bacillus* sp.) and fungal (*Trichoderma* sp.) afterward. Our results from nematode resistance test and gene expression for defense related genes from different treatments demonstrated that 3% rice husk biochar in combination with *Bacillus* sp. was found best for growth promotion, nematode resistance and activation of defense related genes. This study could be a way forward for organic management of root-knot nematodes in tomato.

Key Words: Tomato, Root-knot nematodes, Biochar, Antagonists, Resistance

Effect of pumpkin powder incorporation on the antioxidant activity of hazelnut cream

İnci Cerit*, Ayşe Özbağ, Ayşegül Çiydem, Feyza Eleşkirtli, Ömer Faruk Yakut, Zeynep Şirin, Omca Demirkol

Department of Food Engineering, Faculty of Engineering, Sakarya University, Sakarya, Turkey

Abstract

Cocoa hazelnut cream has been the favorite product of breakfasts all over the world for years. It can be produced in different flavors with research and development studies. To make this food, especially consumed by children and young people, more distinct, attractive and beneficial in terms of nutritional composition, hazelnut cream was produced by using pumpkin, which is frequently consumed in Turkish cuisine. In this study, the pumpkins grown in Sakarya, which is prominent with pumpkin cultivation, were used. Pumpkin was first freeze-dried and added to hazelnut cream produced under laboratory conditions. Cocoa hazelnut cream was also produced and used for comparison. Total phenolic content and DPPH scavenging activity of pumpkin powder, cocoa powder, pumpkin and cocoa added hazelnut creams were investigated. In addition, moisture content, water activity, color values (L*, a* and b*) of products were also determined. According to the results, the total phenolic content of samples were 2237.2, 346.9, 325.6 and 102.0 mg GAE /100 g sample in dry weight for cocoa powder, pumpkin powder, cocoa added and pumpkin added samples, respectively. The results of DPPH scavenging activity of samples were in accordance with total phenolic contents. When the water activity values of the pumpkin and cocoa hazelnut cream were compared, it was determined that the water activity of the pumpkin added cream was higher. Moreover, the L*, a* and b* values were higher in pumpkin hazelnut cream samples. Due to Covid-19 disease, the sensory properties of samples were not determined; however, the authors believe that this new functional product is sensorial satisfactory and attractive.

Key Words: *Pumpkin, Hazelnut cream, Antioxidant, Total phenolic content*

Determination of Emission Values of Pellets Obtained From Chickpea Plant Residues

Bahadır Demirel

¹Department of Biosystem Engineering, Faculty of Agriculture, Erciyes University, Kayseri, Turkey

Abstract

Environmental pollution and the effects of the resulting global warming have become one of the most important issues that have been emphasized recently. It is thought that the effects of global warming will be prevented worldwide by reducing environmental pollution and preventing the use of fossil fuels. In this sense, it is of great importance to increase the use of renewable energy. Agricultural activities are carried out intensively and it has a large agricultural residue potential in our country. In this study, pellets were obtained from the agricultural residues of chickpea plant in Kayseri and its surroundings. These pellets burning and the flue gas emission values were determined and compared with the emission values of fossil fuels.

Key Words: Chickpea, Residue, Renewable Energy, Emission

Nohut Bitkisi Atıklarından Elde Edilen Peletlerin Emisyon Değerlerinin Belirlenmesi Özet

Çevre kirliliği ve buna bağlı olarak oluşan küresel ısınmanın etkileri son dönemde üzerinde durulan çok önemli konulardan biri haline gelmiştir. Çevre kirliliğinin azaltılması ve fosil kökenli yakıtların kullanımının önüne geçilmesi ile birlikte küresel ısınmanın etkilerinin dünya çapında önüne geçilmesi düşünülmektedir. Bu anlamda yenilenebilir enerji kullanımının artırılması büyük önem arz etmektedir. Ülkemizde tarımsal faaliyetlerin yoğun olarak yapıldığı ve bununla birlikte büyük bir tarımsal artık potansiyeline sahiptir. Bu çalışmada, Kayseri ve çevresinde açığa çıkan nohut bitkisi tarımsal artıklarından peletler elde edilmiştir. Bu peletler yakılarak baca gazı emisyon değerleri tespit edilmiş ve fosil kökenli yakıtların emisyon değerleri ile karşılaştırılmıştır.

Anahtar Kelimeler: Nohut, Artık, Yenilenebilir Enerji, Emisyon

Exploring the Possibility of Chickpea (*Cicer arietinum* L.) Growing as Second Crop under Uşak Ecology

Ali Kahraman¹, Unal Buğdaylı^{1*}

¹Department of Field Crops, Faculty of Agriculture, Selcuk University, Konya, Turkey

*Corresponding author

Abstract

Trends on human nutrition change every day but legumes act significant role for nutrition over the World. Chickpea (*Cicer arietinum* L.) is a member of *Leguminosae* family and originated from Asia. Chickpea is rich with protein, carbohydrate, lipid and minerals. It is also sufficient for Daily requirement by view of the essential amino acids – lysine, leucine and arginine. Chickpea is also source of soluble and insoluble fibers. The nutritional fibers have favorable effects on decreasing the time of food passing through intestine, accelerating of weight loss, decreasing of total and LDL cholesterol and balancing of blood sugar level. Sustainability of agriculture is essential for sustainability of life. From this perspective, chickpea is quite important due to various agronomic advantages that may be summarized by main ones are; able to grow as winter crop, lower water requirement, wide adaptation ability to climate and soil, a good alternative for crop rotation systems in addition to health care features. Present research is realized to evaluation of second crop growing facilities in Uşak/Turkey ecology by using 4 chickpea genotypes (Azkan, Hisar, Sarı-98, Yaşa-05) by 4 sowing time (18th June, 02nd July, 16th July, 30th July) by 3 replications. The following measurements were realized; days to emergence, days to flowering, days to harvest, height of plant, number of pod per plant, number of seed per pod, height of first pod, seed yield and weight of hundred seeds. According to the results Yaşa-05 chickpea genotype was determined as the most adaptable in addition to the Azkan chickpea genotype was also obtained as promising to growing as second crop. Deep and long term studies are needed to achievement of more consistent results and providing to sustainability of food security, improvement of soil, better usage of natural sources and contribute to national economy.

Key Words: Crop rotation, farming chickpea, legumes, sustainable agriculture

Introduction

Chickpea (*Cicer arietinum* L.) a member of legumes (*Fabaceae* – *Leguminosae* Family), rich by mineral content and cultivation is realized almost all around the world. Health care statues and protein amount, symbiotic nitrogen fixation mechanism, soil improvement characteristics, less water demand, able to be grown as winter crop are the main factors that are making chickpea as a sustainable concept reaching plant.

Origin of chickpea is known South Asia that is including Turkey, residues belong to 3000 B.C. and cultivation is made for a long time (Babaoğlu, 2003). Seed components are averagely as following; 21% protein ratio, 60% carbohydrate, 5.9% oil, 7% fiber. Total starch ratio is about 32-57% and 20-46% of starch is amylose. Rich by mineral components while lycine, losin and arginine amino acids are sufficient for daily essential requirement (Minarro Vivas, 2013). Chickpea is source of soluble and insoluble fiber which are accelerating weight loss, decreasing total and LDL cholesterol and regulating blood sugar level (Bosaeus, 2004; Howarth et al., 2001). Additionally, resolution, retention of water and oil, swelling, gel formation and emulsification etc. various technological characteristics which are the quality of end products are effected from dietary fibers (Elleuch et al., 2011).

Among legumes, chickpea is the most cultivated and produced crop in Turkey that is followed by lentil, bean and faba bean (Ton et al., 2014). According to FAO statistical database (FAO, 2019), Turkey has 3.76% of world chickpea production with 514.415 ha area, 74 kg da⁻¹ yield and 630.000 tons of production. Turkey had 8.780.000 ha chickpea area, 100 kg da⁻¹ yield and 855.000 tons of production in 1991 which means 41% decrease in area and 26% decrease in production. Uşak City has the third place in Turkey by view of sowing area ratio (8.14%) and production ratio (8.46%).

Chickpea is one of the most important legumes that is grown traditionally in marginal areas and salty soils (Salami and Ahmadi, 2010). Most of the chickpea grown places face to especially anthracnose (*Ascochyta rabiei*) (Kahraman and Ozkan, 2015) due to early spring time sowing that is welded by insufficient precipitation. For the other regions that have irrigation opportunity and/or have sufficient irrigation on the desired period, growing chickpea as second crop is a good option to achieve various sustainability principles. Furthermore, winter cropping of chickpea in the favorable climatic zones a good implementation as well. A previous study (Mazid et al., 2009) evaluated adoption of winter chickpea growing technology and effects in Syria. In 2006, a total of four cities were subjected to survey by chickpea farmers. It was reported that, chickpea growing as winter crop realized and still

expanding on those days. In the second region where has 250-350 mm annual precipitation showed significant increase. All the producers reported that they got more yield on winter cropping than summer cropping. Depending on higher yield, household incomes increased and positive effects detected relatively higher among poor farmers. There were two more advantages of winter cultivation of chickpea; water productivity and increase in labor demand especially for women employment.

For the mentioned statues of sustainability principles as food security and supply, health care statues, symbiotic nitrogen fixation mechanism, environment friend crop, soil improvement characteristics, wide adaptation ability, low input requirement, effective usage of sources and economic contribution, chickpea is essential to take part in crop rotation programs. Therefore, present research was realized in Uşak – Turkey ecology to evaluation of different sowing times and chickpea genotypes as second crop growing.

Materials and Methods

Field trial of the present research was made in Ulubey Town/Uşak-Turkey. Sowing of the seeds were realized on 4 different dates: 18th of June, 02nd of July, 16th of July and 30th of July in 2017. As material, a total of 4 chickpea genotypes were used that the population characterized genotypes: Azkan, Sarı-98 and Hisar in addition to the certified variety Yaşa-05.

Trial area consisted from 4 Sowing times X 4 Chickpea genotypes X 3 Replications which equal to 48 total plots. Each of the plots had 3m length, 2 m width and so 6.0 m² area. Spaces between plots were 0.5 m, block spaces were 2 m while sowing density was 40 cm X 15 cm by 5 lines.

Trial was set up according to randomized blocks design while main plots consisted from sowing times and subplots were by chickpea genotypes. The first two sowing time were realized following to barley and wheat harvest respectively. The rest of sowing times were realized to assess the situation.

Ulubey Town has a transition climatic characteristics between Aegean and Central Anatolian regions. Continental climate prevails in the region. Summers are warm, winters are long and harsh. Annual precipitation is between 430 mm and 700 mm with an average of 532 mm. the lowest temperature is -24°C and the highest temperature is +39.8°C. most of the precipitation falls in the winter, but in the summer time, precipitation is very little. Irrigation was realized 3 times in total.

Climatic data for the research year (2017) is presented on Table 1.

Table 1. Climatic data for vegetation period*

Months	Temperature (°C)	Relative Humidity (%)	Total Precipitation (mm)
June	19.86	52.69	70.4
July	24.80	38.48	0.0
August	23.18	47.75	39.0
September	21.55	33.79	1.2
October	13.05	51.32	54.4
November	8.15	59.18	28.2
Average/Total	18.43	47.20	193.2

*Climatic data provided from; Turkish State Meteorological Service

A general evaluation of the soil analyzes showed that; high potassium, very little phosphorus, much limy, slightly alkali and clay loam saturation. Tillage made by plow for two times after harvest of the barley and then rototiller was used to prepare the seed sowing bed. A total of 15 kg da⁻¹ 20.20.0 (36 SO₃) fertilizer applied to the plots and mixed to soil by harrow.

Following characteristics were realized: Time of emergence (day), time of flowering (day), time of vegetation (day), height of plant (cm), number of pod per plant, number of seed per pod, height of first pod (cm), seed yield (kg da⁻¹), weight of 100 hundred seed (g).

In the present research, there were some missing data depending by the environment factors, used chickpea genotypes besides sowing times that had no sufficient seed on the plots. So, results of the present research are reported by the average values.

Results and Discussion

Results of the present research are shown as mean values due to some missing data which are welded by short vegetation period, genetic structure and the time of seed sowing. Mean of the investigated parameters in this study are presented in Table 2

A general evaluation of the present research is summarized in this part according to Table 2. All the sowing times, Hisar genotype had the highest value for days to emergence. Yaşa 05 was the most adapted genotype to climatic conditions. The fastest value for days to flowering was obtained from Yaşa 05 genotype (32nd day). The earliest

pod formation was on Yaşa 05 genotype (38th day). The highest height of plant value acquired from Hisar genotype while the lowest value was on Yaşa 05 genotype. The highest value for seed yield was detected on Yaşa 05 genotype.

Table 2. Mean of the investigated parameters of chickpea genotypes that were sown on different times as second crop in Uşak – Turkey ecology

Genotype/Sowing time	First sowing (18.06.2017)	Second sowing (02.07.2017)	Third sowing (16.07.2017)	Fourth sowing (30.07.2017)	Mean
Days to emergence (Unit: Day)					
Hisar	-	7.00	7.00	8.00	7.33
Azkan	7.00	7.00	-	8.00	7.33
Sarı 98	-	-	-	8.00	8.00
Yaşa 05	7.00	7.00	-	-	7.00
Mean	7.00	7.00	7.00	8.00	7.42
Days to flowering (Unit: Day)					
Hisar	-	61.00	88.67	49.00	66.22
Azkan	65.00	55.67	-	54.33	58.33
Sarı 98	-	-	-	51.00	51.00
Yaşa 05	48.64	39.67	-	-	44.16
Mean	56.82	58.335	88.67	48.5	54.93
Days to harvest (Unit: Day)					
Hisar	-	146.00	146.00	146.00	146.00
Azkan	132.00	132.00	-	132.00	132.00
Sarı 98	-	-	-	118.00	118.00
Yaşa 05	146.00	104.00	-	-	104.00
Mean	139.00	136.66	146.00	125.00	125.00
Height of plant (Unit: cm)					
Hisar	-	20.80	29.60	31.30	27.23
Azkan	27.67	26.73	-	32.00	28.80
Sarı 98	-	-	-	22.57	22.57
Yaşa 05	27.51	23.67	-	-	23.67
Mean	27.59	23.73	29.60	28.62	25.57
Sowing time/Genotype					
		Azkan	Yaşa 05	Mean	
Number of pod per plant (Unit: Number)					
First sowing (18.06.2017)		-	12.37	12.37	
Second sowing (02.07.2017)		9.00	13.00	11.00	
Mean		9.00	12.685	11.685	
Number of seed per pod (Unit: Number)					
First sowing (18.06.2017)		-	1.00	1.00	
Second sowing (02.07.2017)		1.00	1.00	1.00	
Mean		1.00	1.00	1.00	
Height of first pod (Unit: cm)					
First sowing (18.06.2017)		-	16.50	16.50	
Second sowing (02.07.2017)		16.00	16.33	16.17	
Mean		16.00	16.42	16.67	
Seed yield (Unit: kg da ⁻¹)					
First sowing (18.06.2017)		-	88.36	88.36	
Second sowing (02.07.2017)		39.30	114.18	76.74	
Mean		39.30	101.27	82.55	
Weight of hundred seeds (g)					
First sowing (18.06.2017)		-	34.67	34.67	
Second sowing (02.07.2017)		32.33	36.00	34.17	
Mean		32.33	35.34	34.42	

Ranges of the investigated data in the previous researches were reported as following; Phenological values by Bayrak (2010) were 15.17- 23.17 for days to emergence, 45.66 – 61.66 for days to flowering, 90.33 – 105.33 for days to harvest; 18.40-38.90 (Güner and Sepetoğlu, 1994), 22.60-47.30 (Müderiszade, 1996), 24.40 (Azkan et al.,

1999), 23.83-37.76 (Erdin and Kulaz, 2014), 20.33-36.67 (Ceran and Onder, 2016) for number of pod per plant; 24.20-42.00 cm (Eser et al., 1989), 59.90 cm (Azkan et al., 1999), 41 cm (Yaşar, 2012), 39.63-48.26 cm (Erdin and Kulaz, 2014), 34.67-57.33 cm (Ceran and Onder, 2016) for plant height; 13.00-33.60 cm (Eser et al., 1989), 35.90 cm (Azkan et al., 1999), 15 cm (Yaşar, 2012), 22.56-24.96 cm (Erdin and Kulaz, 2014), 15.33-27.67 cm (Ceran and Onder, 2016) for first pod height; 1.00-1.23 (Eser et al., 1989), 0.96-1.44 (Müderriszade, 1996), 1.10 (Azkan et al., 1999), 0.84-1.26 (Ceran and Onder, 2016) for number of seed per pod; 98.00-178.20 (Saxena, 1981), 132.00-281.00 (Güner and Sepetoğlu, 1994), 142.10-277.80 (Müderriszade, 1996), 40.70-203.30 (Çiftçi and Türk, 1998), 168.20-185.90 (Azkan et al., 1999); 158.00-205.00 (Tayyar et al., 2008), 78.14-154.12 (Bayrak, 2010), 156.00-203.00 (Aydoğan, 2012), 97.70-153.93 (Erdin and Kulaz, 2014), 182.63-277.77 (Ceran and Onder, 2016) kg da⁻¹ for seed yield; 12.60-48.10 g (Eser et al., 1989), 25.80-27.90 g (Güner and Sepetoğlu, 1994), 35.21-48.97 g (Müderriszade, 1996), 29.35-44.40 g (Çiftçi and Türk, 1998), 41.46 g (Azkan et al., 1999), 30.63-47.56 g (Erdin and Kulaz, 2014), 34.67-43.44 g (Ceran and Onder, 2016) for one hundred seed weight. Differences of the investigated values in the present research might be welded by genetic variation of the used chickpea genotypes besides climatic conditions and cultural applications that are quite important on plant growing statues.

As a conclusion, present research was realized to evaluation possibility of chickpea growing as second crop in Uşak/Turkey conditions. Data collected from the research showed that Yaşa 05 genotype and Azkan genotype are promising and reached to favorable seed yield values. Future studies on this perspective may be focused on determination of chickpea performance on different sowing times.

Turkey is one the most important countries over the world by mean of production and export of chickpea and lentil. In recent years, this situation tends to decrease. Various climatic conditions of Turkey are mostly suitable to chickpea farming. So, the production potential should be evaluated by taking care; breeding of high quality and yield potential varieties, effective disease/weed/insect control, standard size, able to afford demands of foreign markets, using feasible and current cultivation techniques, expanding of cultivation especially for winter growing and/or second crop. Principles of sustainability including medical statues, gluten-free diet, high protein, qualified amino acid, food security in the nature of cheap price-easy access-easy storage and transportation for both human and animal, no pollution to environment, improvement of soil characteristics, favorable to crop rotation program, high adaptation ability, low input to growing, improvement and increasing effectiveness of time-natural resources-labor-energy-economic statues, that are take part by legume farming and crop rotation systems may be possible to adopt application of different farming techniques consider to sustainable agricultural systems.

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Assessment Of The Potential Of Biofertilizers And Natural Soil Amendments To Replace Chemical Fertilizer In Rice (*Oryza Sativa* L.) Farming In The Dry Zone, Sri Lanka

Neelamanie Yapa, Asanka Madhushan, Chaturanga Bamunuarachchige

Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Abstract

Rice, Sri Lanka's most important food crop, that has always been relevant to food security and socio-economic stability of the country. However, over the past three decades, rice farmers in Sri Lanka have become increasingly dependent on synthetic chemical fertilizers as source of nitrogen (N), phosphorous (P) and potassium (K) nutrients. With the consideration of serious environmental and health issues attached to chemical fertilizers, forced researchers to develop sustainable agricultural practices, mainly explore alternative sources of N, P and K for rice. Therefore, with the objective of finding a solution for synthetic chemical fertilizers, a field trial was carried out at in Anuradhapura, North Central Province, Sri Lanka. The experiment was designed as factorial with three traditional rice varieties and the second factor comprised of control and seven treatments as follows: CON: control; AMF: AMF inoculants (2 Mg ha⁻¹); RAMF: ERP (153.3 kg ha⁻¹) with AMF inoculants (2 Mg ha⁻¹); MC: mixed microbial culture (5 kg ha⁻¹); RMC: ERP (153.3 kg ha⁻¹) with mixed microbial culture [mixed culture of *Azospirillum* sp., *Pseudomonas* sp. and *Bacillus* sp. (5 L ha⁻¹)]; BC: biochar (6 Mg ha⁻¹); CP: standard compost (10 Mg ha⁻¹) and IF: inorganic synthetic fertilizer (125 N kg ha⁻¹, 62.5 P₂O₅ kg ha⁻¹ and 50 K₂O₅ kg ha⁻¹). Soil, roots and grains of rice were analyzed for different nutrients, mainly N, P, K, iron (Fe) and zinc (Zn). Some other elements such as sodium (Na) and aluminum (Al) were estimated. Plant growth, grain yield and yield components of the rice plants were estimated during growth and after harvest. Potential of native arbuscular mycorrhizal colonization of rice roots were evaluated under flooded conditions. Finally, the positive interactions of rice varieties and amendments used were also statistically analyzed. Statistically significant rice variety, amendment, and variety and treatment interactions were observed with soil physiochemical characteristics ($p < 0.05$). Compost exerted an influence on soil electrical conductivity, which is regulated by several soil fertility attributes, such as pH, Na⁺, K⁺, Total Organic carbon (TOC%) and compost amended soil, enriched with appropriate amounts of nutrient ions has facilitated the proper growth of rice plants. Multifunctional microbial consortium in amended soil included *Azospirillum* sp., *Pseudomonas* sp. *Bacillus* sp. and arbuscular mycorrhizal fungi, that were proven to be capable of increasing soil N, P and K. The percentage AMF colonization in rice under flooded conditions was in a range of 1.53% to 12.85%. From this study it is now evident that compost, microbial consortium and AMF potentially capable of replacing the synthetic N, P, K fertilizers without compromising the productivity of the traditional rice varieties in dry zone, Sri Lanka.

Keywords: Mineral nutrients, rice, compost, microbial consortium, arbuscular mycorrhizae

Investigation of the Effects of Humic Acid and 20-20-20 Fertilizer Applications on the Yield Characteristics and Harvest Time of Lettuce (*Lactuca sativa* L.) by Foliar Fertilization Method

Necla Çağlarırnak, Hüseyin Ersan Erduran

Manisa Celal Bayar University Saruhanli College Manisa

Abstract

Fertilizer use is one of the important factors in successful, productive and healthy agriculture applications. Despite the rapid increase in population in the World, it has been obligatory to ensure a healthy increase in productivity and production increases. Vegetable consumption is recommended and gaining importance in balanced and functional nutrition and it is important to prevent obesity. Lettuce is preferred with its nutritional content and low calorie content. The aim of thesis research is to investigate the effects of various foliar applications on determining yield and optimum harvesting time. In this research, four different kinds of fertilizer given from the leaves and the varieties were tested. Humic Acid 1 and 2 were administered in two separate doses (HA1 and HA2) and leaf fertilizer (20 -20 - 20) in two separate doses (LF1 and LF2). The crop yield parameters were measured in four different periods during the harvest period and also the optimum harvest time was determined according to the yield parameters. Main yield parameters investigated; Lettuce (*Lactuca sativa* L.); weight, head diameter, head height, weight of leaf thrown, number of leaf thrown, root collar diameter, number of roots, head weight after thrown leaf was determined at each harvest period. Weight changes were observed in HA2 and HA1 fertilizer applications with a maximum of 53% and 31%. Head diameter; 14% HA2 fertilizer application, head height; The highest variation values were obtained with 15% and 58 % in terms of disposed weight. It was found that the highest exchange values were 8% HA2, root diameter 15%, root number 46%, as number of leaves thrown. On the other hand, the change in the number of leaves remained the same in all fertilizer applications. According to the data obtained in the research thesis project, none of the fertilizer applications had any negative effects, on the contrary, it contributed positively in certain change rates (0-58 %).

Keywords:

Küresel Isınma Ve Hayvancılık: Sağlıklı Üretim Ve Çevre İçin Öneriler

Necla Çağlarırnak¹, Asiye Yılmaz Adkinson²

¹Manisa Celal Bayar University Saruhanlı College Manisa

²Erciyes University, Agricultural Faculty

Abstract

Artan nüfus artışına karşılık tarım ürünlerindeki üretim artışlarının gerçekleştirilmesi son yıllarda küresel ısınma tarım etkileşimleri ile zor bir yola yönelmiştir. Gıda güvencesi önemli ve hayati durumdur, ve özellikle dengeli ve yeterli beslenme, protein açığının kapatılması ve diğer yan ürünlerin de üretilemsi yönünden çiftlik hayvanları tarımı hem ekonomik hem de beslenme ve sağlık yönünden önem arz etmektedir. Küresel ısınmaya sebep olan başlıca sera gazları (greenhouse gases) (GHGs): CO₂ methane (CH₄), nitrous oxide (N₂O), ozone-depleting substances (ODSs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF₆) and perfluorocarbons (PFCs). Bunlardan özellikle metan ve nitritoksit çiftlik hayvanlarının neden olduğu sera gazlarıdır. Tarımsal ürünlerdeki küresel ısınma etkileri tek taraflı değerlendirilmelidir. Toplamda Dünyada küresel ısınmaya etki eden başlıca faktörler; çevre kirliliği, endüstriyel sera gazları etkisi, baca gazları, diğer sanayileşme faaliyetleri, aşırı nem ve toz, savaşlar, nükleer santraller, insan göçleri, tarımsal faaliyetler vb olarak sayılabilir. Tarımsal faaliyetlerin toplam antropotajenik sera gaz salınımı % 25.5 bunun % 10-12 si u çiftlik hayvanların dan kaynaklanmaktadır. Toplam tarım faaliyetlerinin % 40 nı çiftlik hayvanları oluşturmaktadır. Bu durumda çiftlik hayvanlarından kaynaklanan sera gazı emisyonları önemli bir oranı teşkil etmektedir. Bu durumda önemli protein ve diğer besleyici öğelere duyulan gereksinim, tarım ekonomisi ve istihdam durumları diğer taraftan küresel ısınma ve çevre etkileri şimdiye kadar yapılan bilimsel araştırmalara dayanarak konu hakkında bilgiler derlenerek anlatılacaktır.

Keywords:

Evaluation Data Of Dried Vegetables And Fruits

Necla Çağlarırnak, Ahmet Zeki Hepçimen

Manisa Celal Bayar University Saruhanli College Manisa

Abstract

Drying is the water that has destroying effect in food products, removal of water by evaporation and heat. Research project on the basis of direct sun drying and greenhouse, It was established comparing nutrients of samples those were applied directly to the greenhouse and drying in the sun. In research pepper, grapes, figs, were dried. Sampling patterns; tomatoes drying in the sun (external environment), and greenhouse, Bell peppers in the greenhouse and drying in the sun, soaked raisins (sultanas) and not-soaked (raisin), sun-dried, sun-dried fig products directly.. Investigated nutrients were; lycopene, thiamine (B1), riboflavin (B2), retinol (A), Pyridoxine (B6), ascorbic acid (C), folic acid, magnesium (Mg), potassium (K), sodium (Na) , phosphorus (P), zinc (Zn), iron (Fe), copper (Cu) were determined quantities. The red pepper products, dried figs and dried grapes mycotoxin amounts were in safe levels, that had not created any hazard and risk for health

Keywords:

Effect of Ethephon Application on Seed Yield and Yield Components of Two Faba Bean (*Vicia faba* L.) Cultivars

Aybegün Ton^{1*}

¹Department of Field Crops, Faculty of Agricultural, University of Cukurova, Adana, Turkey.

*Corresponding author (aybeguntoncu@gmail.com)

Abstract

The aim of present study was to determine the effects of different ethephon doses on grain yield and yield components of two faba bean cultivars. The experiment was established in 2019/2020 and 2020/2021 cropping season at Research Area of Field Crops Department, Agriculture of Faculty, Cukurova University Adana, Turkey. The field experiment was laid out in randomized complete blocks design (RCBD) with three replications on the basis split plot design with cultivars (Luz de Otono and Hital) in main plots and ethephon doses (0, 500, 1000, 1500 g ha⁻¹) in sub plots. Plant height (cm), pods per plant, seeds per plant, 100 grain weight (g), seed yield (kg ha⁻¹) were investigated. Differences among the cultivars and ethephon applications were significant for seed yield and it varied from 1782 to 3388 kg ha⁻¹ in the mean of the years. Seed yield also decreased with increasing ethephon doses. Seed yield was higher in 2019/2020 (3355 kg ha⁻¹) than 2020/2021 (1841 kg ha⁻¹) where low rainfed and high temperature. The present results suggested that ethephon applications at initiation of flowering were not useful for seed production of faba bean.

Key Words: Faba bean, cultivar, ethephon application, seed yield, growth regulator

Introduction

Faba bean (*Vicia faba* L.) is used as animal feed in addition to human nutrition. Faba bean has an important role in agricultural production and it is a beneficial food crop in terms of high protein content and quality (Sheelamary and Shivani, 2015). It fixed the nitrogen from the air through the *Rhizobium* symbiotically. Faba bean can be grown as a winter crop in coastal regions under rainfed conditions for grain production (Ton et al., 2021). In this regions plant height may be increasing in the excessive rainy years, so seed maturity is late and harvest can be difficult due to lodging. So, low seed yield is one of the most problems for producers. Plant bio regulators are natural or synthetic compounds and they also have importance for increasing yield and quality of legume crops (Kumar, 2021). The studies relation to ethephon application on seed production of some crops are wide, but there are very limited studies for using growth retard in legumes. Plant growth regulators provided increasing seed yield in pulses and use of various growth regulators positively affected crop growth rate and assimilation rate in chickpea (Verma et al., 2018). The effect of plant growth regulators is important in early application timing than late applications in faba bean (Walela et al., 2016). Ethephon can be used to benefit for early maturity of crops. Ngatia et al. (2003) recorded that ethephon application did not positively affect bean production. Ethephon delayed flowering time and reduced plant height in several herbaceous perennials (Hayashi et al., 2001). Spitzer et al. (2011) reported that growth regulators delayed in flowering onset of sunflower.

The present study was carried out to determine the effects of applications for different ethephon doses on seed yield and yield components of two faba bean cultivars.

Materials and Methods

Climate and Soil Characters of Experiment Site

The experiment was established in 2019/2020 and 2020/2021 cropping season at the Research Area of Field Crops Department (37° 02'18.06 N, 35° 22'39.93'E and 73 m above sea level), Faculty of Agriculture, University of Cukurova, Adana, Turkey. The soil type of experimental site was loam in textures. The other soil characters are salt content, value of pH, available phosphorus content, organic matter were 0.275 milimhos cm⁻¹ and 8.2, 3.3 kg da⁻¹, 2.3% respectively.

Values of monthly average temperature and total precipitation of area are given in Table 1.

Plant Material

Two commercial cultivars (Luz de otono and Hital) were used as the plant material in the study. Luz de otono is early cultivar, while Hital is late cultivar.

Table 1. Values of monthly average temperature and total rainfall of experiment area

Meterological Parameters	Min Temperature (°C)		Max Temperature (°C)		Mean Temperature (°C)		Relatively Humidity (%)		Total Rainfall (mm)	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Months	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
November	10.3	7.1	30.6	27.8	18.1	17.0	56.7	59.5	22.6	52.6
December	6.5	4.2	20.7	22.7	12.2	13.4	79.4	63.9	414.0	31.0
January	0.6	-0.1	18.0	22.9	9.9	11.7	67.9	63.7	140.2	131.4
February	-2.1	2.4	22.8	24.3	10.4	13.1	67.1	61.4	93.0	23.9
March	5.8	3.1	27.6	34.4	15.3	13.9	69.3	68.7	47.4	45.7
April	8.3	6.6	29.9	34.0	18.3	18.3	70.2	64.9	21.4	44.0
May	12.9	14.9	40.3	30.7	23.3	23.9	61.0	64.9	66.6	4.1

Methods

Experiment Design and Cultural Practices

The field experiment was laid out in randomized complete blocks design (RCBD) with three replications on the basis split plot design with cultivars in main plots and ethephon doses in sub plots. Different ethephon (480 g/lt) doses (0, 500, 1000, 1500 g/ha) were applied at the flowering initiation.

The sowings were made in 13 November 2019 and 18 November 2020. Experimental plots consists of 4 rows with row to row distance of 45 cm and plant to plant distance of 10 cm. The plot area was 7.2 m² (4.0 m x 1.8 m). Harvest was made in the middle two rows after eliminating the border rows. Fertilizer was applied at rate 30 kg ha⁻¹ N and 80 kg ha⁻¹ P₂O₅ before sowing.

Observations

Data were recorded from five randomly selected plant of each plot. Plant height (cm), pods per plant, seeds per plant, 100-seed weight (g), seed yield (kg ha⁻¹) were observed.

Statistical Analysis

The data for morphological traits were analysed according to the split plot experiment design for every year separately and combined year by using the MSTAT-C a computer software package. Comparisons among the means were using LSD multiple range test at 0.05 probability level.

Results and Discussion

The effects of cultivars and ethephon applications on plant height, pods per plant and seeds per plant are presented in Table 2.

Table 2. The effects of cultivars and ethephon applications on plant height, pods per plant and seeds per plant in faba bean.

Treatments	Plant Height(cm)			Pods/plant			Seeds/plant		
	2019/20	2020/21	Mean	2019/20	2020/21	Mean	2019/20	2020/21	Mean
Cultivar									
Luz de otono	46.7b	45.6b	46.1b	6.54a	4.72	5.63a	22.9a	17.3	20.1a
Histal	66.1a	61.3a	63.7a	4.32b	3.28	3.80b	18.1b	13.9	15.9b
p.(cultivar)	0.0162*	0.0224*	0.0005**	0.0038**	N.S.	0.0011**	0.0272	N.S.	0.0137*
Doses (g ha ⁻¹)									
0	65.8a	57.3	61.5a	5.67	3.40b	4.53	21.2	13.6b	17.4
500	58.6ab	53.7	56.2b	5.60	3.50b	4.55	21.0	13.4b	17.2
1000	52.7bc	52.6	52.7bc	5.03	4.35ab	4.69	19.8	17.3ab	18.5
1500	48.6c	50.4	49.5c	5.42	4.75a	5.08	19.9	18.1a	19.0
LSD %5	7.31	N.S.	4.30	N.S.	1.04	N.S.	N.S.	3.85	N.S.
Mean	56.4	53.5	55.0	5.43a	4.00b	4.72	20.5a	15.6b	18.0
p.(year)		N.S.			0.0027**			0.0077**	
CV %	10.3	7.99	9.27	15.6	20.0	17.8	16.2	19.5	17.7

p≤0.05*; p≤0.01**

Differences among the cultivars were significant for plant height in both of the years and the combined years (Table 2). There were not significant differences among the years for this trait. Later maturing variety Histal has higher plant height (63.7 cm) as compared to early maturing Luz de Otona (46.1) in the mean of the years. Previous studies showed that plant height varied between 85.5-115.2 cm (Musallam et al. 2004) and 80.07- 100.63 cm (Pekşen et al. 2006) according to cultivars and environmental conditions. There were significant differences among the ethephon doses for plant height in the first year and the mean of experimental years. Plant height in the second year where low rainfed and high temperature in vegetative stage of crop was not influenced by ethephon doses. As the mean of years, the highest plant height was achieved by control application (0 g ha⁻¹) with 61.5 cm followed by 500 g ha⁻¹ doses of ethephon with 56.2 cm whereas the lowest value was obtained from 1500 g ha⁻¹ with 49.5 cm. Walela et al. (2016) recorded that various plant growth retards reduced plant height and it varied between 34-53 cm in faba bean. Previous studies have explained a more significant effect of PGRs in reducing vegetative growth or plant height in faba bean (El- Betagy et al, 1976; Field et al., 1989), lentil (Effendi, 1989) and bean (Ngatia, 2003). However, Turk et al. (2003) recorded that plant height was not affected by ethephon applications in lentil. Application timing can be shown different effects for plant height in faba bean and various legumes. Thus, Walela et al. (2016) noted that plant height reduced by PGRs applications in faba bean and effective of its in early growth stage is more than later applications pre flowering in faba bean.

Number of pods per plant in early maturing Luz de otona was significantly higher than late maturing Histal in the first year and the combined year, but not in the second year (Table 2). Pods per plant varied between 3.80-5.63 in mean of the year. Similarly to our findings, Etamadi et al. (2018) reported that early maturing varieties have high pods per plant. Musallam et al. (2004) revealed that pods per plant was 5.5 pod plant⁻¹ under rainfed conditions. Alan and Geren (2006) reported that pods per plant varied from 9.8 to 13.8 pod plant⁻¹. Significant differences for pods per plant were not observed among the ethephon applications in the first year and mean of the years (Table 2). However, there are significant differences among the ethephon applications only in the second year and pods per plant increased by increasing ethephon doses due to increasing branches per plant. Hence, differences between 0 and 500 g ha⁻¹ doses were not significant. The highest pods per plant was found in 1500 g ha⁻¹ (4.75) ethephon application while the lowest one was obtained from control application (3.40). Previous studies reported that the number of pods per plant reduced by ethephon application in faba bean (Ngatia et al., 2003), but it increased in kidney beans (Sulistyono, 2000). Field et al. (1989) reported that applications of PGRs didn't affect on pods per plant in lentil, but paclobutrozol applicants increased pods per plant in faba bean. Pods per plant in 2021 (4.00) significantly decreased as compared with 2020 (5.43). These reason may be lower rainfall and higher temperature in flowering period of 2021. Similar opinions were reported in faba bean by Abdelmula and Abuanja, (2007), Etamadi et al. (2018) and Alharbi and Adhikari (2020).

The effects of cultivars and ethephon applications on seeds per plant of faba bean are given in Table 2. The effect of cultivar on seeds per plant was significant in 2019/2020 and mean of years, but not in 2020/2021 (Table 2). Seeds per plant was significantly greater in Luz de otono with 20.1 than Histal with 15.9 in the mean of the years. Ethephon applications affected grains per plant in 2020/2021, but not in 2019/2020 and combined years. Seeds per plant increased with increasing ethephon doses as in pods per plant in the only 2020/2021. The highest seeds per plant was obtained from ethephon application of 1500 g ha⁻¹ with 18.1 followed by 1000 g ha⁻¹ doses with 17.3 in 2020/2021. Seeds per plant was significantly higher in 2020 (20.5) than 2021 (15.6) depend on low rainfall and high temperature at generative stage of plant as in pods per plant. The effects of cultivars and ethephon applications on 100- seed weight and seed yield of faba bean are given in Table 3.

Table 3. The effects of cultivars and ethephon applications on 100-seed weight (g) and seed yield (kg ha⁻¹) in the faba bean

Treatments	100-Seed Weight (g)			Seed Yield (kg ha ⁻¹)		
	2019/20	2020/21	Mean	2019/20	2020/21	Mean
Cultivar						
Luz de otono	125.0b	115.6	120.3	2573b	1773	2173b
Histal	165.5a	120.0	142.6	4137a	1910	3023a
p.(cultivar)	0.0001**	N.S.	0.0001**	0.0385*	N.S.	0.0068
Doses g ha ⁻¹						
0	153.4a	130.3a	141.9a	4491a	2286a	3388a
500	149.8a	121.8b	135.8b	3796b	1851b	2823b
1000	144.7b	111.2c	127.9c	3165c	1635b	2399c
1500	133.1c	107.1c	120.1d	1970d	1594b	1782d
LSD %5	4.61	4.80	3.15	570	304	306
Mean	145.2a	117.6b	131.4	3355a	1841b	2598
p.(year)		0.0000**			0.0008**	
CV %	2.52	3.24	2.85	13.5	13.1	13.9

p≤0.05*; p≤0.01**

Differences among the cultivars were significant for 100-grain in the 2020, but not in 2021 and the mean of year (Table 3). 100-grain weight of Histal (142.6 g) was significantly higher as compared with Luz de otono (120.3 g) in the mean of the year. Late maturing Histal had higher 100-grain weight despite its lower pods per plant and seeds per plant. Seed size increased when number of pod decreased in faba bean was reported by Sözen and Karadavut (2016) and Alan and Geren (2006). Kambal et al. (1969) who that there are negative correlation between seed weight and pod number, seeds per pod in faba bean. 100-seed weight was significantly affected by ethephon doses in both of the years and mean of the years and it decreased with the increasing ethephon doses. The highest 100-seed weight was obtained from 0 g ha⁻¹ doses with 141.9 g, while the lowest one was in 1500 g ha⁻¹ with 120.1 g in the mean of the years. Similar result was found by Güler (2009) who indicated that increasing ethephon doses generally caused to decreasing 100 weight in chickpea. 100-seed weight was significantly higher in the first year (145.2 g) compared to the second year (117.6 g) where low rainfed and high temperature as in other generative traits.

The seed yield was significantly affected by cultivars in 2020 and the mean of the years, but not in 2021 (Table 3). The seed yield was significantly greater in later maturing Histal (3023 kg ha⁻¹) than early maturing Luz de otono (2173 kg ha⁻¹) in the second year. 100- seeds weight of Histal was also higher than Luz de otono. Similar findings were recorded by Sözen and Karadavut (2016) who found that genotypes with high 100-seed weight have higher seed yield infaba bean. Musallam et al. (2004) also reported that positive correlation was found between seed yield and 100 seed weight.

Differences among the ethephon doses was significant for seed yield and the maximum seed yield was produced at control application (0 g ha⁻¹), while the lowest one was determined in level of 1500 g ha⁻¹ in both of the years and mean of the years. Increasing ethephon applications also reduced seed yield. Seed yield varied from 1782 to 3388 kg ha⁻¹ in the mean of the years. Hence, differences among the ethephon application except for control doses was not significant only in the second year. Güler (2009) reported that highest grain yield was obtained from ethephon application of 450 g/ha, but higher doses decreased grain yield in chickpea. Previous studies reported that seed yield was not positively affected by ethephon or some plant growth applications in faba bean (Walela et al., 2016), lentil (Turk et al., 2003), bean (Ngatia et al., 2003). On the other hand paclobutrazol increased seed yield and yield components in field bean (*Vicia faba*), but paclobutrazol and triapenthenol did not affect seed yield in lens (Field et al., 1989). Some studies exhibited that effect of PGR on grain yield may varied according to plant species, application time and doses of PGR, environment and physiological conditions (Walela et al. 2016; Field et al. 1989). Seed yield was higher in 2019/2020 (3355 kg ha⁻¹) than 2020/2021 (1841 kg ha⁻¹) where low rainfed and high temperature at the generative growth as in yield compenents. Similarly to our results, Abdelmula and Abuanja (2007) reported that heath stress during floral development decreased the seed yield in faba bean. Walela et al. (2016) indicated that seed yield was positively affected by cool and wet spring conditions during pod-filling in faba bean. Similarly to our study, Ton et al (2021) reported that seed yield in local genotypes varied from 2320 kg ha⁻¹ to 3130 kg ha⁻¹ in the Mediterranean climate conditions.

Conclusions

As a results, ethephon applications at inititation of flower were not useful for seed production of faba bean. However, it will be suitable that other experiments can be conducted with lower application doses and time to reveal effect of ethephon on the faba bean.

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Machine learning approach to the prediction of percentage succinylation and reaction efficiency of succinate anhydride-modified cardaba banana starch.

Babatunde Olawoye

Department of Food Science and Technology, First Technical University Ibadan, Nigeria

Abstract

Starch in their native state has properties such as low shear stress, high retrogradation and syneresis as well as a high rate of starch digestibility thereby, making the starch unsuitable for application as food or functional ingredient. This research, therefore, investigates the prediction of percentage succinylation and reaction efficiency of succinate anhydride-modified starch using machine learning algorithms. The experimental factor was succinate anhydride concentration, time and pH while the dataset used for the prediction was obtained from Box-Behnken design and two machine learning algorithms; artificial neural network and decision tree were used while their effects on the responses were determined. The result revealed that the ANN model has a maximum correlation coefficient (R) of 0.9960, 0.9999, 0.9962 and 0.993 for training, testing, validation and all dataset respectively. The decision tree on the other hand also shows good predictability of the responses owing to a high correlation coefficient (0.8742). Using the ANN model, optimum modification parameters obtained were succinate anhydride concentration of 3%, a reaction time of 56.34 min and a pH of 8.9 while the response obtained at the optimum conditions were percentage succinylation of 0.013% and reaction efficiency of 61.30. Finally, the ANN model has better predictability of the responses when compared to the decision tree algorithm.

Key Words:

Status of Organic Hazelnut Production in Turkey

Hasan Karaosmanoğlu

Giresun University, Technical Vocational School, Hazelnut Expertise Programme Giresun/Turkey

Abstract

The use of chemical pesticides in agriculture is constantly increasing to meet the needs of the increasing world population, which threatens food and environmental safety. In order to minimize this problem, the organic farming system, which does not use artificial elements such as chemical fertilizers and drugs, veterinary drugs, hormones and antibiotics, genetically modified organisms, has been in an increasing trend in recent years. In addition, consumers' demands for organic foods, which they think are safer and healthier, are increasing. Hazelnut, Turkey's most important agricultural export product, is produced organically as well as conventional methods. As in all foods, the demand for organic products is increasing in hazelnuts. In the last 10 years, organic hazelnut production in Turkey increased by more than 100% and reached approximately 17,500 tons in 2018 and this amount constituted 3.5% of the total hazelnut production. Reasons such as the high cost of organic hazelnut production, the fact that the price in the market is not at an incentive level higher than conventional, insufficient supports, and the inability to develop chemical methods that will definitely distinguish organic hazelnuts from conventional hazelnuts limit production. In this study, the latest situation of organic hazelnut production, its problems and solutions are listed.

Key Words: *Organic agriculture, organic hazelnuts, organic food, organic nuts*

Türkiye'de Organik Fındık Üretiminin Durumu

Özet

Tarımda kimyasal ilaç kullanımı, artan dünya nüfusunun ihtiyacını karşılamak için sürekli artmakta bu durum gıda ve çevre güvenliğini tehdit etmektedir. Bu problemi minimize etmek için kimyasal gübre ve ilaçlar, veteriner ilaçları, hormon ve antibiyotikler, genetik modifiye organizmalar gibi yapay unsurların kullanımının olmadığı organik tarım sistemi son yıllarda artış trendindedir. Ayrıca tüketicilerin daha güvenli ve sağlıklı olduğunu düşündükleri organik gıdalara olan talepleri giderek artmaktadır. Ülkemizin en önemli tarımsal ihraç ürünü olan fındık konvansiyonel yöntemlerin yanında organik olarak da üretilmektedir. Tüm gıdalarda olduğu gibi fındıkta da organik ürünlere olan talep artmaktadır. Son 10 yılda Türkiye'deki organik fındık üretimi %100'ün üzerinde bir artışla 2018 yılında yaklaşık 17.500 tona ulaşmış ve bu miktar toplam fındık üretiminin %3.5'ini oluşturmuştur. Organik fındık üretim maliyetinin yüksek olması, pazardaki fiyatın konvansiyonelden teşvik edici düzeyde yüksek olmaması, desteklerin yetersiz olması, organik fındığı konvansiyonelden kesin olarak ayıracak kimyasal metodların geliştirilememesi gibi nedenler üretimi sınırlandırmaktadır. Bu çalışmada organik fındık üretiminin son durumu, problemleri ve çözüm önerileri sıralanmıştır.

Anahtar Kelimeler: *Organik tarım, organik fındık, organik gıda, organik kuruyemiş*

Total Annual Effective Dose due to ^{222}Rn , ^{226}Ra , and ^{238}U in Selected Samples of Grain in Kerbala Governorate, Iraq

Zahraa Saad Hamzah¹, Abdalsattar Kareem Hashim¹ and Ali Abid Abojassim^{2*}

¹Department of Physics, College of Science, Kerbala University, Kerbala, Iraq

²Department of Physics, Faculty of Science, University of Kufa, Al-Najf, Iraq

Abstract

This work is being performed to measure natural radioactive of alpha emitters (^{222}Rn , ^{226}Ra , and ^{238}U) from selected of grain samples at Kerbala Governorate, Iraq using CR-39 that made by TASTRAK company. Also, Annual effective dose (AED) as well as Excess lifetime cancer risk (ELCR) due to alpha emitters were calculated in all samples under study. The average value of ^{222}Rn , ^{226}Ra , and ^{238}U were $5.18 \pm 1.73 \text{ Bq/m}^3$, $5.91 \pm 1.98 \text{ mBq/kg}$, and $0.007 \pm 0.002 \text{ ppm}$, respectively. While, the average value of total of AED and $\text{ELCR} \times 10^{-6}$ were $0.234 \pm 0.082 \mu\text{Sv/y}$ and 0.904 ± 0.315 , respectively. The results indicate that the results ELCR in all grain samples of the present study were very low, so may be neglected. It can be concluded that grains samples may be used for eating without any health effects.

Key Words: ^{222}Rn , ^{226}Ra , and ^{238}U , effective dose, grains, and kerbala governorate.

Introduction

Ionizing radiation comes in a number of forms to our lives. It stems from natural processes such as the decay of earth's uranium, and industrial processes such as the use of X-rays in medicine. Environmental radiation exposure may be classified into two major sources, natural and industrial sources. Natural sources such as cosmic rays, gamma rays, airborne products of radon decay, and number of different radionuclides are naturally present in drink and food [1]. The effective global average dose per person is around (2.4 mSv) and varies from around (1 to over 10 mSv) depending on where people live. Despite the fact that the sources are natural, our exposure can be changed by the choices we make, such as where and how we live or what we drink and eat [2]. Radon-222 is a radionuclide that normally emanates from the soil in the form of a gas. It is derived from the decaying uranium-238 series existing in the earth's rocks and soils. Once inhaled or ingested, some of the short-lived radon decay products, primarily ^{218}Po and ^{214}Po , are stored in the lungs and irradiate cells with alpha particles in the respiratory tract. Therefore, radon is a major cause of lung cancer. Certain radionuclides found in the body in smaller amounts include the ^{238}U and ^{232}Th series, ^{14}C and ^{87}Rb [3]. The gaseous decay products of the uranium and thorium radioactive series (radon and Thoron) make an important contribution to radioactivity in the body. These gases disperse from rocks and soil to the atmosphere at easily detectable concentrations. They are respired by humans during their decay products and are often taken up via animals and plants which lead to that most foodstuffs contain quantifiable amounts of natural radioactivity [4]. Radiation Protection Agency is one of the United Nations agencies concerned with Peaceful use of atomic energy and preventing radioactive pollution, in addition to protecting National Societies in all countries of the world its citizens, and numerous studies and research have emerged to estimate the level of radioactivity in the soil, Air, water, and plants and their effect on living organisms[5]. Radioactive contamination is one of the riskiest types of environmental contamination that occurs due to the leakage of radioactive matters into the environment. Plants can be contaminated with radioactive materials as a result of the agricultural practices in the area of contamination and the stage of growth or harvest season at the time of the accident, grains, root crops, other produce, and animal-derived food products may become contaminated at a later stage [6]. Iraq suffered from radioactive contamination as a result of the Gulf wars in 1991 and 2003. There are many studies have determined alpha emitters in different types of grain samples in Iraq [7-10]. Therefore, the present work was chosen to determine the radioactive waste alpha emitters in different types of grain samples using solid-state nuclear track detectors type CR-39 and calculated radiological parameters such as AED, and cancer risk parameters.

Materials and Methods

In this study, 24 grains sample were collected from various sites of the Karbala governorate during January 2021. The samples type, code, and original were shown in Tables (1). After collecting grains samples, it was dried for 60 hour in electric oven, crushed by electric grinder, sieved using manual sieve, and filled in plastic cups (diameter 5.5 cm, higher 7 cm, and volume about 0.13 L) by samples at weight 55 gm. Next, these cups were stored for one month to arrive in a secular equilibrium between ^{226}Ra and ^{222}Rn [11]. Radon-222 concentrations were measured in grain samples in the present study using an integrated passive radon dosimeter type CR-39 which made by TASTRAK, United Kingdom, with thickness 1mm, With dimensions of $2.5 \times 2.5 \text{ cm}^2$. After ending 30 day (secular equilibrium), CR-39 detector was fixed in the plastic cover and then sealed for exposure of 90 day. After ending time exposure, CR-39 detectors were removed from dosimeters (plastic cup), and placed in the water bath contain NaOH at temperature 85 C for 3 hours [12, 13] in order to count the tracks resulted from alpha-particles emitted from radon.

Table 1. Information of samples in present study

No.	Sample name	Sample code	Original
1	Wheat	K1	Kerbala- Al-Hussainya
2		K2	Kerbala- Al-Karat
3		K3	Kerbala- Banat Al-Hassn
4	Barley	K4	Kerbala- Al-Hussainya
5		K5	Kerbala- Al-Karat
6		K6	Kerbala- Banat Al-Hassn
7	Millet	K7	Kerbala- Al-Hussainya
8		K8	Kerbala- Al-Karat
9		K9	Kerbala- Banat Al-Hassn
10	Corn	K11	Kerbala- Al-Hussainya
11		K11	Kerbala- Al-Karat
12		K12	Kerbala- Banat Al-Hassn
13	Mung bean	K13	Kerbala- Al-Hussainya
14		K14	Kerbala- Al-Karat
15		K15	Kerbala- Banat Al-Hassn
16	Rice	K16	India
17		K17	American
18		K18	Kerbala- Al-Hussainya
19		K19	Kerbala- Al-Karat
20		K20	American
21		K21	India
22		K22	Kerbala- Banat Al-Hassn
23		K23	American
24		K24	India

Theoretical equations

The equations (1) and (2) were used to determine ²²²Rn concentration in airspace (C) and samples (C_{Rn}), as following [14,16]:

$$C \left(\frac{\text{Bq}}{\text{m}^3} \right) = \frac{\rho}{K T} \quad (1)$$

$$C_{Rn} \left(\frac{\text{Bq}}{\text{m}^3} \right) = C \left(\frac{\lambda_{Rn} h T}{L} \right) \quad (2)$$

where, ρ is track density which tack directly from TASLIMAGE system, T is the exposure time (90 day), K is calibration factor $0.28 \pm 0.043 \text{ Track.cm}^2 / \text{Bqm}^{-3} \cdot \text{day}$ which measured using ²²²Ra (radon source) for six time exposure 0.5, 1, 1.5, 2, 2.5, and 3 day, λ is decay constant for ²²²Rn, h is higher of the sample in plastic cup (3 cm), and L is distance between sample to detector (4 cm).

While, the equations (3) and (4) were used to determine effective radium-226 content (C_{Ra}) and uranium-238 concentrations (C_U), as following [17,18]:

$$C_{Ra} (\text{Bq.kg}^{-1}) = \left(\frac{\rho}{K T_e} \right) \left(\frac{h A}{M} \right) \quad (3)$$

$$C_U (\text{ppm}) = \frac{W_U}{W_s}, 1 \text{ ppm } 12.35 \text{ Bq/kg} \quad (4)$$

where, A is area of plastic cup, M is mass of sample, W_U and W_s is weights of uranium and sample respectively, and T_{eff} is time of actual exposure which calculated using equation (5), as following [12]:

$$T_{\text{eff}} = \left[T - \lambda_{Rn}^{-1} (1 - e^{-\lambda_{Rn} T}) \right] \quad (5)$$

Annual effective dose (AED) based on specific activity ²²²Rn, ²²⁶Ra, and ²³⁸U in unit Bq/kg (C_{Alpha}) were calculated using (6), as following [18]:

$$AED \left(\frac{\text{nSv}}{\text{y}} \right) = C_{\text{Alpha}} \times I \times CF \quad (6)$$

where, I is consumption rate of samples, and CF is conversion dose factor which it is equal 3.5 nSv/Bq [19] for radon-222, 280 nSv/Bq [20] for radium-226 and 45 nSv/Bq for uranium-238 [20].

Finally, Excess lifetime cancer risk (ELCR) can be determined using equation (7), as following [21]:

$$ELCR = AED \times DL \times RF \quad (7)$$

where, DL is life expectancy (70 y) while RF is fatal risk factor in (Sievert) and it is pegged at 0.05 per Sievert.

Results and Discussion

The results of natural alpha emitters (^{222}Rn , ^{226}Ra and ^{238}U) in (24) grain samples (Wheat, Barley, Millet, Corn, Mung bean, and rice) collected from some of agricultural area and markets that imported from USA with India in Kerbala governorate are showed in Table (2). The concentrations of radon-222 in air space of tube and in samples were varied from 0.20 to 36.87 Bq/m³ and from 2.43 to 451.39 Bq/m³, while the average values were 5.18 ± 1.73 Bq/m³ and 63.49 ± 21.26 Bq/m³, respectively. The results of specific activity for radium-226 were varied from 0.23 to 42.04 mBq/kg with an average 5.91 ± 1.98 mBq/kg. Whilst, uranium-238 in units ppm and Bq/kg were varied from 0.00028 to 0.05198 ppm and from 0.003 Bq/kg to 0.642 Bq/kg, with an average value was 0.007 ± 0.002 ppm and 0.090 ± 0.030 Bq/kg, respectively. According to the results, the highest value of alpha emitters concentration such as ^{222}Rn , ^{226}Ra and ^{238}U was in K7 sample (which belongs millet from Kerbala- Al-Hussainya) and the lowest value was in K21 (which belongs rice from India). Figures (1), (2), and (3) show, the average values of types of grain samples for radon-222, radium-226, and uranium-238, respectively. The results of types samples for alpha emitters were found to be in the following order: Millet > Barley > Mung bean > Corn > Rice > Wheat. The result of radon-222 concentrations (C) for all grain samples collected from this location were within the world average according to WHO [22], ICRP [23], and CFR U [24], which equal 100 Bq/m³, 200-300 Bq/m³, and 39 Bq/m³, respectively. Also, the results of activity of radium-226 were lower than 30 Bq/kg which it is represent the accepted value by UNSCEAR [19], as well as the results of uranium-238 concentrations were lower than 11.7 ppm [19]. From Table (2) and Figures from (1) to (3), it was seen the results of alpha emitter in all grain samples varied from sample to another. These varied may be many causes such as the geochemical composition soil of the area, origin to types of agricultural soil, increase use fertilizers in agricultural land, and natural of plants.

The calculated AED and ELCR based on ^{222}Rn , ^{226}Ra and ^{238}U values for all samples were presented in Table (3). It may be seen that the values of AED in unit (nSv/y) for ^{222}Rn were oscillates between 0.441 to 81.723 with an average of 12.34 ± 4.31 , for ^{226}Ra from 2.28 to 426.56 with an average value 64.41 ± 22.50 , and from 5.61 to 1046.92 with an average 158.10 ± 55.24 for ^{238}U . While, the range of total AED for all alpha emitter of samples in the present study were 0.008-1.555 $\mu\text{Sv/y}$ with an average value of 0.234 ± 0.082 $\mu\text{Sv/y}$. also, from Table (3), the range of $\text{ELCR} \times 10^{-6}$ for ^{222}Rn , ^{226}Ra , and ^{238}U was 0.032-5.988 with an average value of 0.904 ± 0.315 . The minimum value is obtained in sample K21 as well as a maximum value is obtained in sample K7. Figures (4), and (5) show, the average values of types of grain samples for total AED and ELCR, respectively. The results of types samples for total AED and ELCR were found to be in the following order: Millet > Barley > Mung bean > Rice > Wheat > Corn. The values of total AED in all samples were lower than the worldwide average 1.2 mSv/y that is reported in UNSCEAR [25]. The ELCR values for the studied grain samples have very little, so, it may neglected and no has any post effect on human healthy.

Table 2. Results Of Alpha Emitters In The Present Study

No.	Sample code	^{222}Rn		^{226}Ra	^{238}U	
		C (Bq/m ³)	C _{Rn} (Bq/m ³)	C _{Ra} (mBq/kg)	C _U (ppm)	C _U (Bq/kg)
1	K1	0.71	8.75	0.81	0.00101	0.012
2	K2	1.43	17.49	1.63	0.00201	0.025
3	K3	0.87	10.69	1.00	0.00123	0.015
4	K4	21.67	265.30	24.71	0.03055	0.377
5	K5	2.86	34.98	3.26	0.00403	0.050
6	K6	12.46	152.57	14.21	0.01757	0.217
7	K7	36.87	451.39	42.04	0.05198	0.642
8	K8	15.08	184.64	17.20	0.02126	0.263
9	K9	0.60	7.29	0.68	0.00084	0.010
10	K11	2.74	33.53	3.12	0.00386	0.048
11	K11	0.92	11.20	1.05	0.00129	0.017
12	K12	0.91	11.18	1.04	0.00129	0.016
13	K13	10.71	131.19	12.22	0.01511	0.187
14	K14	3.13	38.39	3.57	0.00442	0.055
15	K15	3.33	40.82	3.80	0.00470	0.058
16	K16	0.99	12.15	1.13	0.00140	0.017
17	K17	1.03	12.63	1.18	0.00146	0.018
18	K18	0.95	11.66	1.09	0.00134	0.017
19	K19	0.48	5.83	0.54	0.00067	0.008
20	K20	1.15	14.09	1.31	0.00162	0.020
21	K21	0.20	2.43	0.23	0.00028	0.003
22	K22	1.83	22.35	2.08	0.00257	0.032
23	K23	1.07	13.12	1.22	0.00151	0.019
24	K24	2.46	30.13	2.81	0.00347	0.043
Average $\pm$ S.E		5.18 ± 1.73	63.49 ± 21.26	5.91 ± 1.98	0.007 ± 0.002	0.090 ± 0.030

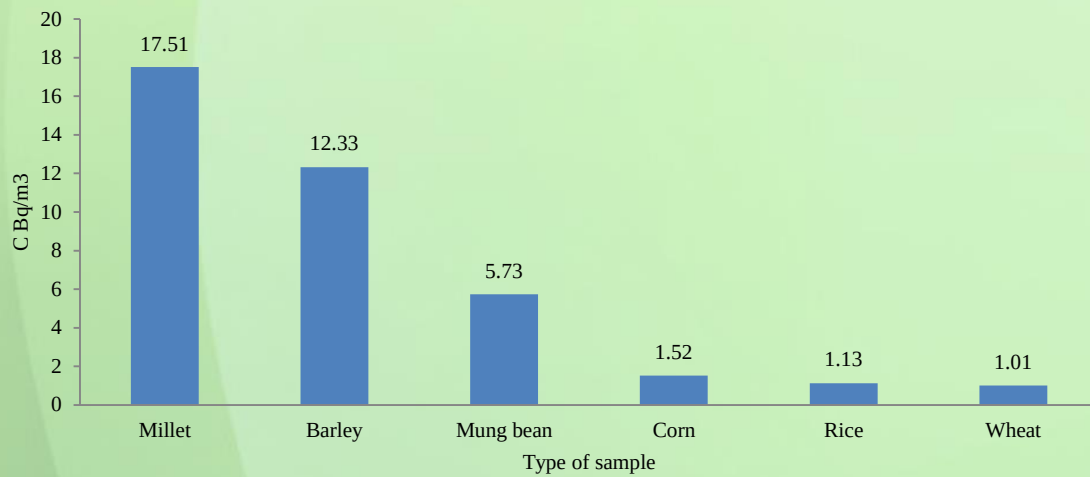


Figure 1. An average values of radon-222 concentrations in different grain samples in the present study.

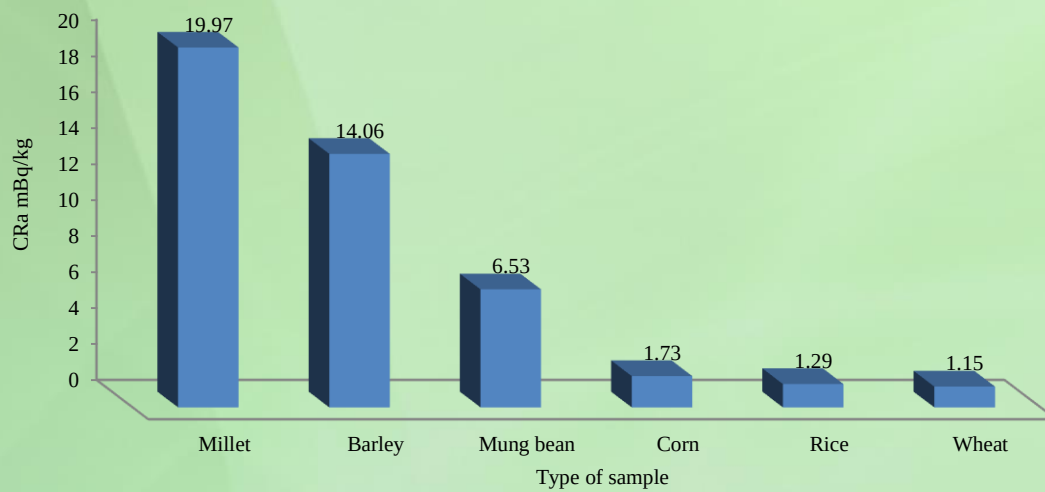


Figure 2. An average values of radium-226 concentrations in different grain samples in the present study.

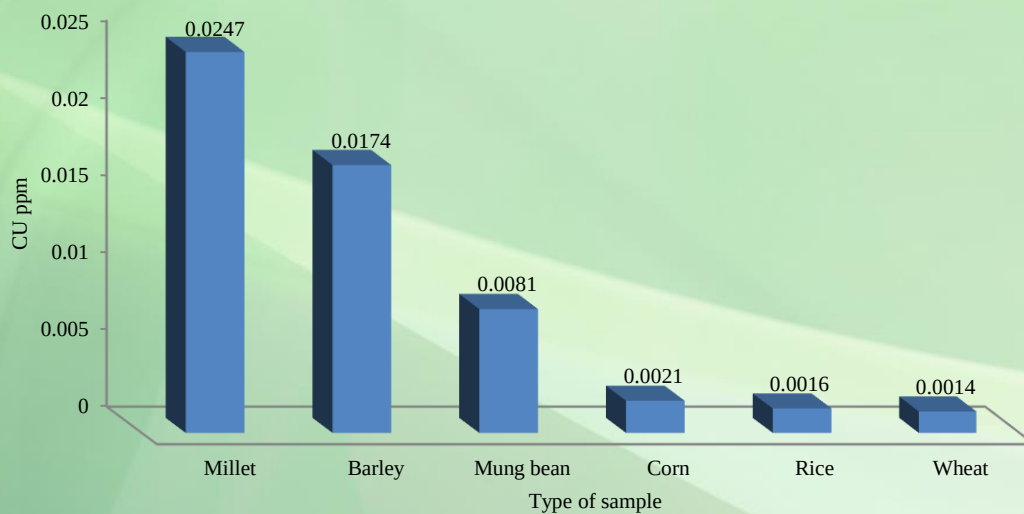


Figure 3. An average values of uranium-238 concentrations in different grain samples in the present study.

Table 2. Results of AED and ELCR in the present study

No.	Sample code	AED (nSv/y)			Total AED (μSv/y)	ELCR×10 ⁻⁶
		²²² Rn	²²⁶ Ra	²³⁸ U		
1	K1	1.750	9.12	22.39	0.033	0.128
2	K2	3.500	18.24	44.78	0.067	0.256
3	K3	2.142	11.15	27.36	0.041	0.157
4	K4	66.273	345.89	848.93	1.261	4.855
5	K5	8.733	45.61	111.94	0.166	0.640
6	K6	38.115	198.92	488.21	0.725	2.792
7	K7	81.723	426.56	1046.92	1.555	5.988
8	K8	33.422	174.48	428.23	0.636	2.449
9	K9	1.319	6.89	16.91	0.025	0.097
10	K11	1.308	6.82	16.74	0.025	0.096
11	K11	0.437	2.27	5.58	0.008	0.032
12	K12	0.437	2.27	5.58	0.008	0.032
13	K13	21.622	112.89	277.07	0.412	1.585
14	K14	6.329	33.03	81.07	0.120	0.464
15	K15	6.734	35.12	86.20	0.128	0.493
16	K16	2.180	11.40	27.99	0.042	0.160
17	K17	2.268	11.86	29.11	0.043	0.167
18	K18	2.092	10.95	26.86	0.040	0.154
19	K19	1.046	5.47	13.43	0.020	0.077
20	K20	2.533	13.23	32.46	0.048	0.186
21	K21	0.441	2.28	5.61	0.008	0.032
22	K22	4.019	20.98	51.50	0.077	0.295
23	K23	2.356	12.32	30.23	0.045	0.173
24	K24	5.418	28.28	69.40	0.103	0.397
Average±S.E		12.34±4.31	64.41±22.50	158.10±55.24	0.234±0.082	0.904±0.315

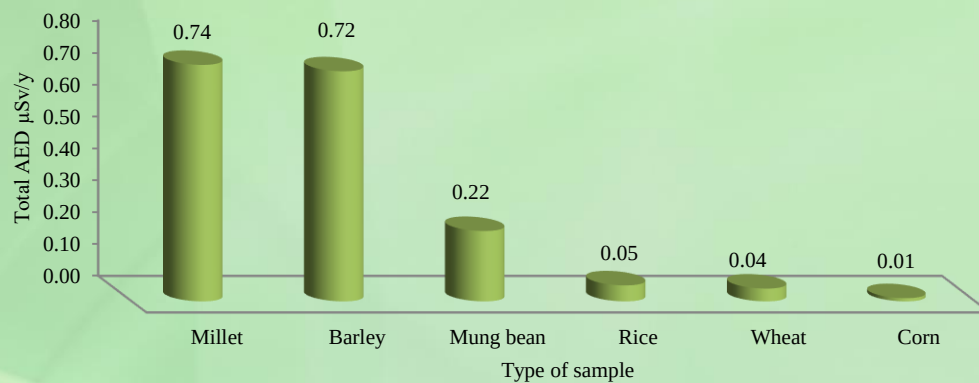


Figure 4. An average values of total AED in different grain samples in the present study.

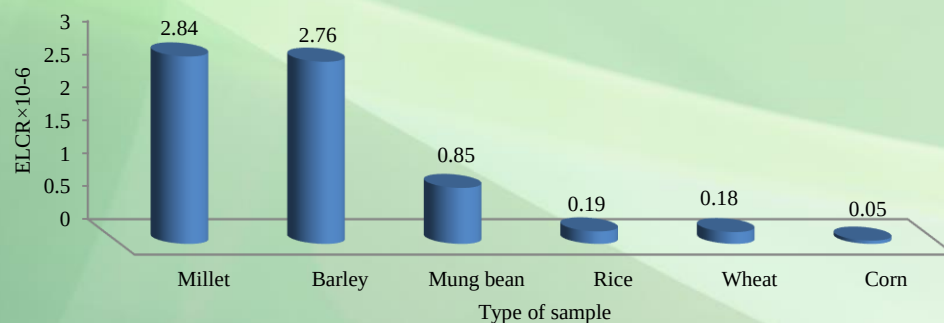


Figure 5. An average values of ELCR×10⁻⁶ in different grain samples in the present study.

Conclusion

The results of radon-222 concentration for grains samples which are collected from agricultural sits as well as some imported samples of Kerbala governorate were lower than worldwide values the recommended by WHO, ICRP, and CFR U. Also, the concentrations of radium-226 and uranium-238 were only a small part from worldwide values the recommended by UNSCEAR. The values of total annual effective dose that calculated according to alpha emitters (rado-222, radium-226, and uranium-238) for all samples studied in this work were very less than the maximum value of the permissible safety limit recommended by UNSCEAR. As well as, it is found that the maximum average value of alpha emitters and radiological hazard parameter (AED and ELCR) in millet sample. Then, the excess lifetime cancer risk of all grains samples were very little, so It can be concluded that the grains samples in kerbala governorate is safe according to alpha emitters.

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Effect of Phytohormone Applications on Fruit Yield and Essential Oil Content in Anise (*Pimpinella anisum* L.)

¹Arif Şanlı, ²Bekir Tosun, ³Yeşim Cirit, ¹Fatma Zehra Ok

¹Isparta University of Applied Sciences Faculty of Agriculture Field Crops Department, ISPARTA

²Burdur Mehmet Akif Ersoy University, Agriculture, Livestock and Food Research and Application Center, BURDUR

³Isparta University of Applied Sciences Atabey Vocational High School, ISPARTA

Abstract

This study was carried out in 2019 to determine the effects of Methyl Jasmonate (MJ), Gibberellic Acid (GA₃) and Naphthalene Acetic Acid (NAA) applications on fruit yield and essential oil content in anise (*Pimpinella anisum* L.). Different concentrations of MJ (0, 0.1, 0.5 and 1 mM), GA₃ (0, 50, 100 and 150 ppm) and NAA (0, 25, 50 and 100 ppm) were pulverized to the plant during the beginning of the flowering. Phytohormone applications had a statistically significant effect on the parameters examined in the study, and the effects of the applications generally varied depending on the application doses. While GA₃ and NAA applications significantly increased the fruit yield and essential oil content compared to the control, high-dose MJ applications generally had a negative effect on all parameters except that the thousand-grain weight. The highest fruit yield was obtained from 100 and 150 ppm GA₃ and 25 and 50 ppm NAA applications while 1 mM MJ applications significantly reduced fruit yield compared to the control. Depending on the applications, the fruit essential oil content varied between 1.94%-2.69% and the essential oil yield varied between 1.42-3.18 L/da. While the highest essential oil yields were obtained from 100 ppm GA₃ and 50 ppm NAA applications, 1 mM MJ applications caused a significant decrease in essential oil yield compared to the control.

Keywords: Anise, methyl jasmonate, gibberellic acid, naphthalene acetic acid, fruit yield, essential oil content

Fitohormon Uygulamalarının Anason (*Pimpinella anisum* L.)’da Meyve Verimi ve Uçucu Yağ Oranı Üzerine Etkileri

Özet

Çalışma, Metil Jasmonat (MJ), Gibberellik Asit (GA₃), Naftalin Asetik Asit (NAA) uygulamalarının anason (*Pimpinella anisum* L.) bitkisinde meyve verimi ve uçucu yağ oranı üzerine etkilerinin belirlenmesi amacıyla 2019 yılında yürütülmüştür. Çalışmada farklı konsantrasyonlarda MJ (0, 0.1, 0.5 ve 1 mM), GA₃ (0, 50, 100 ve 150 ppm), NAA (0, 25, 50 ve 100 ppm) çiçeklenme başında bitki üst kısmına püskürtme şeklinde uygulanmıştır. Fitohormon uygulamaları araştırmada incelenen parametreleri istatistiki açıdan önemli derecede etkilemiş, uygulamaların etkisi genellikle uygulama dozlarına bağlı olarak değişim göstermiştir. GA₃ ve NAA uygulamaları meyve verimi ve uçucu yağ oranını kontrole göre önemli derecede artırırken, yüksek dozda MJ uygulamaları bin dane ağırlığı hariç diğer parametreler üzerine genellikle olumsuz yönde etki göstermiştir. Çalışmada en yüksek meyve verimi 100 ve 150 ppm GA₃ ile 25 ve 50 ppm NAA uygulamalarından elde edilmiş, 1 mM MJ uygulamaları meyve verimini kontrole göre önemli derecede azaltmıştır. Uygulamalara bağlı olarak meyve uçucu yağ oranı %1.94-2.69, uçucu yağ verimi ise 1.42-3.18 L/da arasında değişim göstermiştir. En yüksek uçucu yağ verimleri 100 ppm GA₃ ile 50 ppm NAA uygulamalarından elde edilirken, 1 mM MJ uygulamaları uçucu yağ veriminin kontrole göre önemli oranda azalmasına neden olmuştur.

Anahtar Kelimeler: Anason, metil jasmonate, gibberellik asit, naftalin asetik asit, meyve verimi, uçucu yağ oranı

Lebanese consumers' interest towards the quince fruit, their knowledge of its benefits and the products manufactured from it, and their desire to manufacture a new product

Al-Zughbi Israa¹, El Khatib Sami¹, khaled Sanaa¹, krayem Maha¹

¹Department of Food and Science Technology, School of Arts and Sciences, Lebanese International University, Al Khyara, West bekaa, Lebanon

Abstract

Quince fruit (*Cydonia oblonga* Miller) is not suitable for direct consumption because of its pulp hardness, bitterness and astringency. In Lebanon, this fruit is less popular than the other genera that belong to the same family (Rosaceae) such as apples and pears. Thus, the aim of this study is to evaluate people's knowledge about the quince benefits, investigate its situation in the Lebanese market (consumption and production wise) and search consumers' preferences towards manufacturing new product (quince molasses). In order to reach this goal, an appropriate questionnaire is designed and followed by sensory analysis performed on homemade products of quince (jam and molasses). Questionnaire results show that participants lack knowledge about the quince fruit, its cultivation and health benefits. Out of 352 participants, 45% cultivate quince tree in their garden, 33% make quince jam at home and only 9% buy quince products from markets. When asked about manufacturing new products, 28% of participants prefer it to be sweet and same percentage prefer it to be sour. In case of a sweet product, 45% of the participants prefer it as a quince jam. Moreover, in case of developing a new quince product reducing the symptoms of nausea and vomiting, 48% prefer it fresh while 23% prefer it in form of pills. Finally, the overall acceptability of quince jam was significantly more higher than that of quince molasses as a result from the sensory analysis test. As a conclusion, awareness campaigns should be organized and directed towards Lebanese consumers about the health benefits and different uses of this fruit. In addition, quince fruit shows a potential raw material for the development of new, cheaper and safe quince products that might be sold in Lebanese market.

Key Words: *Cydonia oblonga*, jam, molasses, questionnaire, sensory analysis

Evaluation of a Modified QuEChERS Method for Analysis of Triazole Fungicides in Palm Kernel Cake

Maznah Zainol

Malaysian Palm Oil Board (MPOB), No. 6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia

Abstract

A modified of the QuEChERS method has been developed for the determination of a group of five triazole fungicides (i.e. tetraconazole, penconazole, hexaconazole, propiconazole and epoxiconazole) in palm kernel cake (PKC) matrix. Quantification was performed using matrix-matched calibration and gas chromatography couple with micro electron capture detector (GC- μ ECD). The method involved mixing sample with acidified aqueous acetonitrile, followed by salt-out liquid partitioning using MgSO₄, NaCl, and citrate buffer salts. The extract was cleaned-up by dispersive solid-phase extraction (d-SPE) with MgSO₄, PSA, C18, and graphitized carbon black (GCB). Acceptable recovery values were obtained between 86.82% and 104.91% for all the triazole fungicides. The method recovery studies were performed at three fortification levels (0.5, 1.0 and 5.0 mg/kg) and relative standard deviations (%RSD) were less than 7%. The proposed method QuEChERS approach was more time and cost-effective and it is applicable for routine analysis for the determination of triazole fungicide residue in PKC matrix.

Key Words: Triazole, Fungicide, QuEChERS, Palm Kernel Cake (PKC)

Improving the Storage Quality of Some Tropical Green Leafy Vegetables

Jerry Ampofo-Asiama, Bright Quaye, Rosemond Dadzie

Department of Biochemistry School of Biological Sciences University of Cape Coast, Ghana

Abstract

The green leaves of *Colocasia esculenta* and *Corchorus olitorius* serve as an important component of several dishes in sub-Saharan Africa. The consumption of these vegetables is, however, limited to within a few days after harvest owing to their short storage life, which is mainly linked to the de-greening of the leaves by enzymes. Considering that the degree of greenness is the major factor affecting the economic value of these leaves, inactivating the relevant enzymes responsible for de-greening can help enhance the quality of these vegetables. This study, therefore, sought to investigate the potential of blanching to inactivate the enzymes involved in the de-greening of these vegetables. Both leaves were blanched in hot-water at different temperature/time combinations and the blanching efficiency based on the inactivation of peroxidase. Also, the effect of blanching on leaf quality was monitored by measuring changes in chlorophyll, ascorbic acid and phenolic acid content. A 90% activation of peroxidase activity in *C. esculenta* leaves was observed after more than 3min of blanching at temperatures above 70°C. A similar peroxidase inactivation was observed in *C. olitorius* leaves after more than 5min of blanching. The total phenolic content of both leaves were not affected by blanching, however, the retention of ascorbate decreased and the loss of chlorophyll increased with increasing duration and temperature of blanching.

Key Words:

Determination of phenolic compounds and fatty acid composition of persimmon (*Diospyros kaki* L.) seed

Nurhan Uslu

Food Engineering Department, Faculty of Agriculture, Selçuk University, Konya, Turkey

Abstract

The objective of this study was to investigate the crude lipid content and bioactive properties of persimmon seed. In addition, fatty acid composition of seed oil was detected. Persimmon seed contained high amounts of total phenolic (1509.52 mg/100g) and flavonoid (7018.57 mg/100g). Antioxidant activity of persimmon seed was determined as 14.56 mmol/kg. On the base of the phenolic compounds, gallic acid (48.04 mg/100g) was the main phenolic acid. Persimmon seed contained flavonoids such as catechin (23.42 mg/100g), rutin (21.22 mg/100g), quercetin (18.88 mg/100g) in highest amounts, respectively. Although the persimmon seed had minor amount of crude lipid (1.82%), it exhibited a fatty acid composition that can be consumed as edible oil. The main fatty acid was oleic acid (57.68%), followed by linoleic (22.74%) and palmitic (7.68%) acids.

Key Words: Antioxidant activity, Fatty acids, Phenolic compounds, Persimmon seed

Introduction

Persimmon (*Diospyros kaki* L.) is belonged to Ebenaceae family, and it is mostly grown in subtropical climate regions such as China, Korea, Japan, Brazil, Turkey, and Italy (Butt et al., 2015; Yeşiloğlu et al., 2017; Kayacan et al., 2020). *Diospyros lotus* L. and *Diospyros virginiana* L. in the genus *Diospyros* are the species used as rootstock (Yeşiloğlu et al., 2017). Persimmon is of rich in fiber, vitamins and phenolic compounds as well as favourable sensory properties (Matheus et al., 2020).

Fruit by-products such as seeds and peels mostly have the potential to be used in the food and pharmaceutical industry due to the bioactive properties (Guendez et al., 2005; O'Shea et al., 2012). Several studies about antioxidant activity of fruit seeds such as litchi (Prasad et al., 2009), grape (Jayaprakasha et al., 2008), rambutan, mango, tamarind, and berry (Maisuthisakul et al., 2007) were recorded. In previous studies, it was informed that persimmon seeds exhibited strong antiradical potential in vitro (Ahn et al., 2002). Moreover, total tannin content of persimmon seed was higher than grape seed extracts (Ahn et al., 2002). Jang et al. (2010a) reported that persimmon seed contained the highest antioxidants and phenolic compounds in comparison with the fruit peel and flesh extracts. Antioxidants have importance because of prevention the degenerations by blocking the initiation or propagation of oxidising chain reactions and consequently inhibiting or delaying the oxidation process (Behera et al., 2006). Therefore, the production and activation of free radicals were prevented and the human body was protected from chronic diseases (Han et al., 2020). Persimmon seeds could potentially be utilised as a source of natural antioxidant in food and pharmaceutical industries (Akter et al., 2010). In this study, oil content, bioactive properties and fatty acid composition of persimmon seed were investigated.

Materials and Methods

Material

Persimmons were purchased from a local market in Konya, Turkey. The persimmon seeds were separated and washed. The samples dried at room temperature were ground before analyses.

Methods

Oil content

Crude lipid content of persimmon seeds was extracted with petroleum benzine in Soxhlet Apparatus for 5 h and the solvent was removed with a rotary vacuum evaporator at 50°C (AOAC, 1990).

Extraction procedure

Persimmon seeds were extracted according to Alanon et al. (2021) with some modifications. Ground samples (0.5 g) were added to 10 ml of methanol:water (80:20, v/v). The mixture was kept in ultrasonic water-bath for 15 min, followed by centrifugation at 6000 rpm for 15 min and then the supernatant was removed. These steps were carried out twice, and the supernatants were collected in each step, and then evaporated at 40°C. The dried extracts were dissolved in 10 ml of methanol:water mixture.

Total phenolic content

The Folin-Ciocalteu (FC) reagent was used to determine total phenolic contents of extracts according to Yoo et al. (2004). FC (1 ml) and Na₂CO₃ (10 ml) were added to extract and mixed with vortex. The deionised water was added until the final volume was 25 ml, and kept at dark for 1 h. The absorbance was measured at 750 nm in a

spectrophotometer. A calibration curve was prepared with gallic acid (0-200 mg/ml) as the standard. The results are shown as mg gallic acid equivalent (GAE)/100g.

Total flavonoid content

The extract (1 mL) was mixed with 0.3 ml of NaNO₂, 0.3 ml of AlCl₃ and 2 ml of NaOH, respectively, and kept in dark for 15 min. The absorbance of mixture was measured at 510 nm using spectrophotometer. The results are given as mg quercetin (QE)/100g (Hogan et al., 2009).

Antioxidant activity

The free radical scavenging activity of extracts was found using DPPH (1,1-diphenyl-2-picrylhydrazyl) (Lee et al., 1998). The extract was added to 2 ml of a methanolic solution of DPPH, followed by vortexed and kept in dark for 30 min, and the absorbance was measured at 517 nm. The results are given as mmol trolox (TE)/kg.

Determination of phenolic compounds

Chromatographic separation of phenolic compounds was determined by HPLC (Shimadzu) equipped with a PDA detector and an Inertsil ODS-3 (5µm; 4.6 x 250mm) column. The mobile phase was a mixture of 0.05% acetic acid in water (A) and acetonitrile (B) with the flow rate of 1 ml/min at 30 °C. The injection volume was 20 µl. The peaks were taken at 280 using a PDA detector. The elution programme was employed: 0-0.10 min 8% B; 0.10-2 min 10% B; 2-27 min 30% B; 27-37 min 56% B; 37-37.10 min 8% B; 37.10-45 min 8% B. The total running time per sample was 60 min.

Fatty acid composition

Persimmon seed oil was esterified according to ISO-5509 (1978) method. Fatty acid methyl esters of samples were analysed gas chromatography (Shimadzu GC-2010) equipped with flame-ionization detector (FID) and capillary column (Tecnocroma TR-CN100, 60m x 0.25mm, film thickness: 0.20µm). The temperature of injection block and detector was 260°C. Mobile phase was nitrogen with 1.51 ml/min flow rate. Total flow rate was 80 ml/min and split rate was also 1/40. Column temperature was programmed 120°C for 5 minutes and increased 240°C at 4°C/min and held 25 minutes at 240°C.

Results and Discussion

Total crude lipid content, total phenolic content, total flavonoid content and antioxidant activity of persimmon seed are presented in Table 1. Crude lipid content of seed was found as 1.82%. In a previous study, crude lipid contents of seeds of three persimmon cultivars varied between 1.74% and 1.76%, which were similar to current study (Kim et al., 2017). Persimmon seed contained high amounts of total phenolic (1509.52 mg/100g) and total flavonoid (7018.57 mg/100g). In a study carried out by Kim et al. (2017), total phenolic contents of persimmon seeds belonged to different cultivars (1227.91-1307.78 µg/g) were lower than current study. In another study, total phenolic content of persimmon seed was equal to 82.43 mg/g, which was higher than current study (Jang et al., 2010a). Bilal et al. (2016) reported that total phenolic content of seeds was found between 32.04 mg/g and 83.75 mg/g. Total phenolic content of persimmon seed was recorded as 425.37 mg/g in the study of Akter et al. (2010). According to the previous study about total flavonoid content, it was detected between 5.86 mg/g and 33.8 mg/g in seed extract (Bilal et al., 2016); 17.4 mg/g and 22.7 mg/g in pulp (Pu et al., 2013); 15.1 mg/g and 22.1 mg/g in tissue (Li et al., 2011). Similar to current study, Akter et al. (2010) informed that total flavonoid content of persimmon seed was equal to 77.21 mg/g. In this study, antioxidant activity of persimmon seed was determined as 14.56 mmol/kg. DPPH free radical scavenging activities of persimmon seeds belonged to Jinyeong, Yangyangdongchulsi, and Hamanmulgam cultivars were 67.30%, 64.76% and 71.26%, respectively (Han et al., 2020). In another study, antioxidant activities of persimmon seeds were ranged from 80.21% to 89.12% (Kim et al., 2017). Guo et al. (2003) informed that persimmon seeds showed more than ten times higher ferric reducing antioxidant activity than those of the pulp. Moreover, Ahn et al. (2002) reported that persimmon seed extract exhibited higher antioxidant activity than grape seed extract.

Table 1. Crude lipid content and bioactive properties of persimmon seed

Crude lipid content (%)	1.82 ± 0.02
Total phenolic content (mg/100g)	1509.52 ± 13.56
Total flavonoid content (mg/100g)	7018.57 ± 47.64
Antioxidant activity (mmol/kg)	14.56 ± 0.02

Table 2. shows phenolic compounds of persimmon seed. Gallic acid (48.04 mg/100g) was detected as the main phenolic acid, followed by 3,4-dihydroxybenzoic acid (11.18 mg/100g) and ferulic acid (10.96 mg/100g). The major flavonoids of persimmon seed were catechin (23.42 mg/100g), rutin (21.22 mg/100g), and quercetin (18.88 mg/100g). In addition, persimmon seed also contained p-coumaric acid (9.27 mg/100g), syringic acid (7.11 mg/100g), caffeic acid (3.92 mg/100g), resveratrol (3.57 mg/100g), kaempferol (2.23 mg/100g) and cinnamic acid (1.58 mg/100g). Regarding to the phenolic compounds of persimmon seed, in our knowledge, there is no publication. Additionally, in a study performed by Kayacan et al. (2020), gallic acid (31.254 mg/100g), catechin

(2.110 mg/100g), rutin (0.672 mg/100g), kaempferol (0.378 mg/100g) amounts of persimmon fruit were lower than seed analysed in current study.

Fatty acid composition of persimmon seed is given in Table 3. The major fatty acids in the extracted seed oil were oleic (57.68%), linoleic (22.74%) and palmitic (7.68%) acids. Linolenic and stearic acid contents of seed oil were found as 6.65% and 2.59%, respectively. Moreover, arachidic (0.53%), myristic (0.35%), behenic (0.30%) and erucic (1.24%) acids were detected in minor amounts. Bilal et al. (2016) presented contents of oleic, linoleic and palmitic acids of persimmon seeds between 36.27% and 43.22%, 30.60% and 39.63%, 7.54% and 21.53%, respectively.

In another study, oleic, linoleic and palmitic acid contents of different persimmon seed oils varied between 269.6-839.4 µg/g, 261.7-968.6 µg/g and 190.1-546.2 µg/g, respectively (Jang et al., 2010b). Additionally, it was reported that the ecological conditions and variety could explain the differences in the amount of fatty acids of persimmon seeds (Bilal et al., 2016).

Table 2. Phenolic compounds of persimmon seed

Phenolic compounds (mg/100g)	Persimmon seed	
Gallic acid	48.04	± 1.00
3,4-Dihydroxybenzoic acid	11.18	± 0.78
Catechin	23.42	± 1.09
Caffeic acid	3.92	± 0.11
Syringic acid	7.11	± 0.66
Rutin	21.22	± 1.92
p-Coumaric acid	9.27	± 1.50
Ferulic acid	10.96	± 0.71
Resveratrol	3.57	± 0.51
Quercetin	18.88	± 1.25
Cinnamic acid	1.58	± 0.18
Kaempferol	2.23	± 0.35

Table 3. Fatty acid composition of persimmon seed oil

Fatty acids (%)	Persimmon seed	
Myristic	0.35	± 0.00
Palmitic	7.68	± 0.11
Stearic	2.59	± 0.01
Oleic	57.68	± 0.05
Linoleic	22.74	± 0.00
Arachidic	0.53	± 0.01
Linolenic	6.65	± 0.00
Behenic	0.30	± 0.01
Erucic	1.24	± 0.03

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Chocolate Bar: Effect of Stearin Addition on Mouldability

Norazura Aila Mohd Hassim¹ and Sivaruby Kanagaratnam¹

¹ Food and Feed Technology Unit, Malaysian Palm Oil Board, Kajang, Malaysia

Abstract

Mouldability of plain chocolate bar using palm fraction cocoa butter alternative (CBA) was studied. Two different types of palm stearin (POs) together with palm mid fraction (PMF) and palm kernel oil (PKO) were optimised to achieve more or close to 50% solid fat content (SFC) at 20°C, less than 10% SFC at 37°C and less than 5% SFC at 40°C. This optimization is to create a plain chocolate bar that is mouldable and can melt in mouth. Analysis of solid fat content (SFC), crystal morphology, thermal behaviour, rate of crystallization and compatibility with cocoa butter (CB) of the optimised fats were conducted. Fat blend having 91% PMF, 1% PKO, 5% POs IV 33 and 3% POs IV 14 was able to be moulded and demoulded at 10°C by 45 min with highest rupture tension (105.28 g_f cm⁻²) and breaking force (5501 g_f) at 10°C. It also showed the highest SFC (47%) at 20°C. Crystal morphology and SFC profile at 20°C were comparable with CB. Rate of crystallization profile was comparable with CB at certain time duration. This fat blend (10%-30%) and CB was compatible with no eutecticity observed with SFC increased to 57% at 20°C. Chocolate bar from this fat (30%) with CB (70%) was able to be demoulded by 30 min. After one day stabilisation period, it produced snappability of 5032.71±85.91 g_f at 20°C. Palm fraction CBA with 91% PMF, 1% PKO, 5% POs IV 33 and 3% POs IV 14 and CB is the potential fat for chocolate bar.

Key Words: Cocoa butter alternative, palm mid fraction, palm stearin, mouldability

Starch Coating Enhances the Quality of Garden Egg Fruits During Low Temperature Storage

Jerry Ampofo-Asiama, Rosemond Dadzie

School of Biological Sciences, University of Cape Coast, Ghana

Abstract

Eggplant, a major fruit consumed in Africa, suffers from huge losses in quality after harvest. Among the available postharvest technologies that can be used to improve the quality of eggplants fruits is the application of edible coatings. Thus, the objective of this work was to investigate the effect of cassava starch coating on the quality of eggplant fruits during low temperature storage. Eggplants fruits were coated with 2% starch solution with or without 1% citrate pre-treatment, and the changes in quality of the fruits monitored during low temperature storage. Starch coating helped to reduce weight loss, while maintaining the colour and firmness of the fruits. Further improvements in quality were observed in fruits pre-treated with citric acid prior to coating. The physicochemical quality (total phenolic content, ascorbic acid and total antioxidant capacity) of the fruits were also enhanced by the coating. Based on the ability of the starch coating to improve the quality of eggplant fruits during low temperature storage, a response surface methodology (RSM) based on Box-Behnken design was used to optimize the coating conditions. The optimized coating conditions were a starch concentration of 4.99 % (w/v), citrate concentration of 2.98 % (w/v) and coating duration 10 min.

Key Words:

Morphological Characterization of Cotton Pests Belonging to Family Gelechiidae (*Pectinophora gossypiella*), Noctuidae (*Helicoverpa armigera* and *Spodoptera frugiperda*), Nolidae (*Earias vitella*), and Curculionidae (*Myloccerus undecimpustulatus undatus*) From Mianwali, Punjab

Kiaenat Nazir^{1,2,3*}, Muhammad Tayyib³, Muhammad Sheeraz Javed⁵, Zahida Nasreen¹, Irum Waheed¹, Safora Seemab¹, Ahmad Kamran Khan⁴, Uzma Batool^{2,3}

¹Department of Zoology, University of Mianwali, Mianwali, Pakistan

²Department of Zoology, University of Agriculture, Faisalabad, Pakistan

³Department of Entomology, University of Agriculture, Faisalabad, Pakistan

⁴Department of Plant Protection, Ghazi University, Dera Ghazi Khan, Pakistan

⁵Department of Agronomy, University of Agriculture, Faisalabad, Pakistan

Abstract

Cotton is a very important cash crop and a lot of foreign earning is added in the GDP of the country. Cotton has four cultivated species although the genus *Gossypium* contains more than 50 species. It is of great economic value for the country as well as in oil and lint production. The cotton crop is exposed to several predators and parasitoids. The reported chewing destructive pests were *Pectinophora gossypiella*, *Helicoverpa armigera*, *Spodoptera frugiperda*, *Earias vitella*, and *Myloccerus undecimpustulatus undatus*. In our studies, we have visited 15 fields of cotton in the district Mianwali during the year 2018-19. These fields were separated at ten km from each to avoid sampling biases. There was a difference in the frequency of insect occurrence in the visited fields. The pink bollworm was dominant in frequency among chewing insects. The specimens were collected by using entomological tools and brought to the taxonomy lab, University of Agriculture Faisalabad for identification. These identified species were described morphologically with photographic illustrations. The studied morphological aspects were head (antennae and mouthparts), thorax (wings and legs), and abdomen. The taxonomic keys were also provided based on these characters. The present study provides an effective way for pest management, and identification.

Key Words: Cotton crop, Pink bollworm, American bollworm, spotted bollworm, Fall armyworm, Cotton weevil, pests

Introduction

Cotton is a perennial shrub that belongs to the genus *Gossypium* having 50 species. Cotton is also known as white gold because of its industrial and commercial importance. The oil extracted from cotton seeds is called cotton oil and the residues are used in animal feed as a source of protein (Ashfaq *et al.*, 2011; Mahmood, 1999). Initially, it was cultivated for fiber production as a source of costume and yarn in the international trade market (Zahid and Hameed, 2003). Pakistan ranked 4th throughout the globe in cotton production accounts for 8.2 % value-added in agriculture and 2% of GDP (Naqvi *et al.*, 2017). However, there is a decline in yield over many past years due to the attack of insect pests at various vegetative and growth stages of the cotton crop. In the present study, the chewing pests are American bollworm, fall armyworm, pink bollworm, spotted bollworm, and cotton grey weevil. These pests undergo complete metamorphosis (holometabolous).

Pink bollworm (*Pectinophora gossypiella*) is placed in the family Gelechiidae having 4500 species in 500 genera, worldwide. It heavily infests using chewing mouthparts that are inserted into the opened cotton bolls, thus preventing normal opening. The damage to cotton seeds (2.8-61.9%), cotton boll (10.7– 59.2%), and oil content (2.1–47.1%) as reported in the studies of Prasad *et al.* (2018). American bollworm (*Helicoverpa armigera*) belongs to the family Noctuidae comprising 11772 species in 1089 genera (Zahiri *et al.*, 2011). It is multivoltine, polyphagous and adults have an excellent ability to fly generally active at night (Vennila *et al.*, 2007), larva is carnivorous and sometimes shows cannibalism. It damages the cotton bolls, squares, buds, and fruiting bodies. The *Helicoverpa* species are responsible for 60% reduction in crop yield.

Another member (*Spodoptera frugiperda*) of this family is also a polyphagous, sporadic, and serious lepidopteran pest of the cotton crop. It damages the cotton leaves and fruiting bodies. The first 3 instars feed on the leaves and the subsequent larval instars concealed in the auxiliary regions consume the cotton bolls (Cook *et al.*, 2004). Spotted bollworm is a member of the family Nolidae belongs to the genus *Earias* comprises 130 species, globally. *Earias vitella* heavily infests the cotton bolls and shoots and causes a 20% loss in yield. It has 6 to 8 generations and is active throughout the year. The cotton grey weevil belongs to the family Curculionidae and the genus *Myloccerus* comprises 336 species from Asia (O'Brien *et al.*, 2006). Adult boll weevil makes two types of

punctures in the plant, egg punctures, and feeding punctures. The eggs are laid in punctures made by the female and it is more abyssal than the feeding puncture. These punctures reduce the cotton yield (Parenica, 2006).

Gujar *et al.* (2000) reported that *Helicoverpa armigera* (American bollworm) was the basic pest of the cotton crop from the top leading countries. The top leading countries are India, China, Australia, Pakistan, and South-East Asia. A similar study was reported by Abbas *et al.* 2016. Ahmad and Arif (2009) studied *Earias vittella* from Pakistan. It was formerly identified as *Earias fabia*. It was the foremost pest from the order Lepidoptera that attack the cotton bolls. Mapuranga *et al.* (2015) reported four species of bollworms on the cotton crop of Zimbabwe. They recorded that *Helicoverpa armigera* (African bollworm), *Diparopsis castanea* (Red bollworm), *Earias insulana* (Spiny bollworms), and *Pectinophora gossypiella* (Pink bollworm) causing a significant reduction in cotton yield. Schmidt *et al.* (2018) provided the checklist for the superfamily Noctuoidea and reported the possible changes in it. Krinski and Godoy (2019) reported the American bollworm as a serious pest of crops from different countries. Shahina *et al.* (2014) findings support our results and provide a detailed investigation related to the potential of EPN in the management of cotton bollworms in Pakistan.

Considering these studies, the present study was planned to evaluate the various growth and reproductive phases of chewing pests of cotton crop morphologically in detail. This is the first comprehensive study cited from district Mianwali as there is no prior literature available on the morphology of cotton pests. This study provides an important aspect in identification and pest management.

Materials and Methods

The cotton cultivated sites in the district Mianwali was visited for the collection of specimens during the year 2018-19. The light traps and aerial net were used for this purpose. When the specimens were trapped these were placed in the poison jar immediately and were brought to the Taxonomy Lab, University of Agriculture Faisalabad. The adult bollworms were pinned at the right side of the thorax by PIN 16 while the cotton grey weevil was pinned at the right elytra. In the next step, the wings of the bollworm complex were situated on a thermopore sheet. After 1 day these were shifted to wooden boxes and labeled with technical name, collection place, and date. These preserved specimens were studied individually in detail. The morphology of the head, antennae, mouthparts, wings, legs, and abdomen was described. The keys were also constructed based on these characters following the studies of Passoa (2014). The microscopic illustrations were also given.

Results

A key to the chewing insect pests of cotton crop

1. Head is red-brown, eyes purple, antennae filiform having pecten-like hairs, forewings pointed towards the apex with a broader fringe, dark scales in the zone of medial cells, hindwings have concave outer margins *Pectinophora gossypiella*
Head is black, antennae without pecten, forewings greenish-grey, hind wings pale yellow with brown markings at distal end *Helicoverpa armigera*
2. Forewings spotted, brown grayish, markings at the distal end, hind wings white grayish *Spodoptera frugiperda*
Forewings have a green strip or band in the middle; extending from base to apex, hind wings off-white with brown fringe 3
3. Head is pale or light green, antennae filiform, the femur has three spines, pro and meso-femora are bidentate, meta-femur is tridentate *Earias vitelli*
Head is light yellow, yellow mark behind the eyes, antennae geniculate, elytra have irregular black dots; white-greyish, hind wings modified *Myllocerus undecimpustulatus undatus*

Pectinophora gossypiella

Head: *Pectinophora gossypiella* head is red-brown and it bears lustrous scales. The eyes are purple. Antennae are also known as sensors or feelers. The basal part of the antennae endures with firm and long hairs. These hairs are usually 5-6 and form a pecten-like structure. The labial palp is directed upward, long and curved. The basal part of the 2nd segment is condensed due to the presence of furrowed hairy brush and it is gradually uniformly tapering towards the apex. The 2nd segment is longer than the terminal segment (Fig. 1).

Thorax: The wing margins are distinct. The fore wings are pointed towards the apex with a broader fringe and elongated instead of widespread. These are ovoid, long, and brown. The basal part of the forewings bears dark scales in the zone of medial cells forming the clear spots. The hair-like scales originating from the center of the rear edge form a fringe. The fringe proceeds towards the apex and the wing ends with a sharp boundary (fringe) that is concealed by this fringe. The wingspan is 12-20mm. The hind wings have concave outer margins. They are pointed posteriorly and are wider than the forewings. The legs are brown-black and pale yellow bands on the legs in circular form (Fig. 1).

Abdomen: The abdomen is pale yellow dorsally and deep brown laterally. The female ovipositor is fragile. The male genitalia is wide at the base and tapers towards the end. The aedeagus has a hooked apex.

Material examined: Sikandrabad: 2, 9-ix-18. Piplan: 3, 18-ix-17. Wan bhachran: 4, 13-vii-18. Qamar mushani: 3, 17-vi-18.

Helicoverpa armigera

Head: Head is black, ocelli and compound eyes are present. The antennae are filiform (thread-like). The mouthparts are sucking type having long coiled proboscis (Fig. 1).

Thorax: The male forewings are greenish-grey in color. The female forewings are yellowish-brown in color. The black markings are present on them. The hind wings are pale-yellow, having brown bands at the rear margin. The wing venation in both species is distinct. The margins are also distinct. The legs are black or dark brown (Fig. 1).

Abdomen: The five abdominal segments are black or dark brown. The adults are 10-18 mm in length. The wings stretch about 28-38 mm.

Material examined: Qamar mushani: 2, 17-vi-18. Sikandrabad: 3, 9-ix-18. Harnoli: 4, 8-viii-18. Sher wala: 2, 15-vi-18.

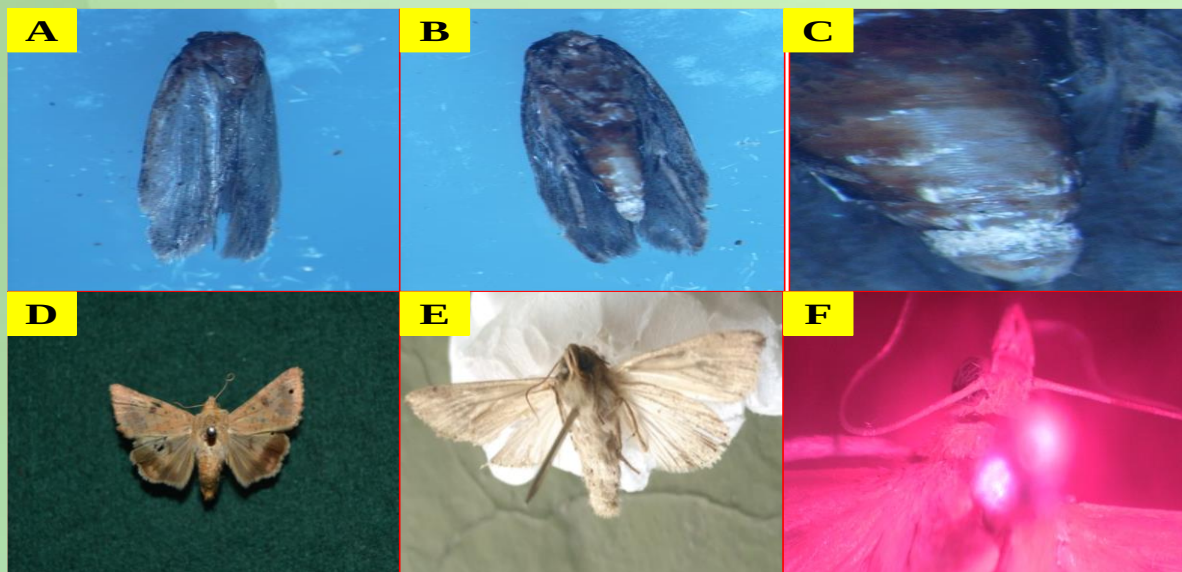


Fig. 1. Morphological characterization of *Pectinophora gossypiella* and *Helicoverpa armigera*; **A)** Dorsal view of *Pectinophora gossypiella*, **B)** Ventral view of *Pectinophora gossypiella*, **C)** Abdomen of *Pectinophora gossypiella*, **D)** Dorsal view of *Helicoverpa armigera*, **E)** Ventral view of *Helicoverpa armigera*, **F)** Head of *Helicoverpa armigera*

Spodoptera frugiperda

Head: The bulging eyes are present on the head. The antennae are filiform and mouthparts are chewing type with coiled proboscis.

Thorax: The male forewings are spotted and brown grayish. At the terminal end, distinct markings are present. The abaxial (dorsal) part has white marks near the tips. The female forewings are similar but with indefinite markings. At rest, the fore wings held over the abdomen. The hind wings are white-greyish. The legs are brown-grey with some black markings. The femur is covered with dense hairs at the ventral part. The tibia also has hairs with one or two spines (Fig. 2).

Abdomen: The wings held over the abdomen at rest. The short hairs are present throughout the whole but the last abdominal segment has abundant hairs. The abdominal segments gradually taper towards the last segment. The male species are 1.5 cm and the female species are 1.6 cm. The wingspan in males is 3.6 cm while in females is 3.7 cm (Fig. 2).

Material examined: Kundiya: 3, 9-x-18. Pai Khail: 3, 8-viii-18. Piplan: 2, 18-ix-18. Chakrala: 2, 10-ix-18.

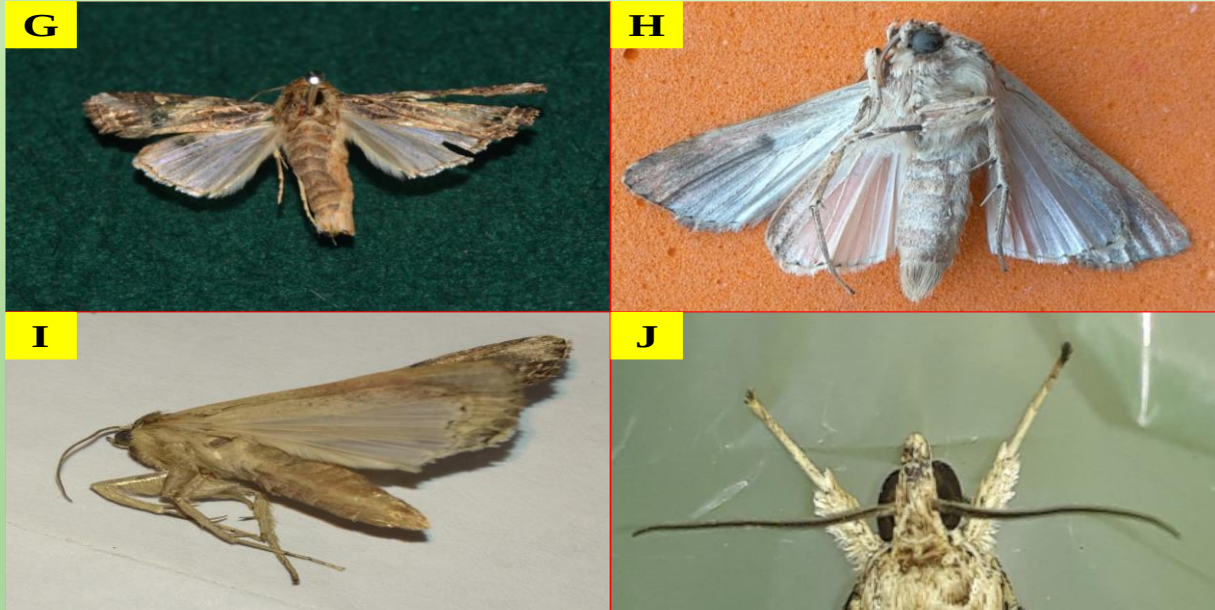


Fig. 2. Morphological characterization of *Spodoptera frugiperda*; **G)** Dorsal view of *Spodoptera frugiperda*, **H)** Ventral view of *Spodoptera frugiperda*, **I)** Lateral view of *Spodoptera frugiperda*, **J)** Head of *Spodoptera frugiperda*

Earias vitella

Head: The head is pale and light green and not visible from the dorsal view. The compound eyes are present. The antennae are filiform and mouthparts are piercing and sucking type (Fig. 3).

Thorax: The thorax is green in color. The forewing has a brown or green band in the middle. This stripe extends from the base to the terminal margin. The inner third portion of the forewing is light green and slightly pink. The hindwings are off-white having a brown fringe along the periphery. The legs are 5 segmented. The femur has 3 spines. The hairs are present from the ventral view.

Abdomen: The abdomen is whitish and dorsally olive green. The adults are 12 mm in length. The wings extend from 18-22 mm.

Material examined: Chakrala: 3, 10-ix-18. Piplan: 3, 18-ix-18. Musa wali: 4, 17-vii-18. Sher wala: 2, 15-vi-18.

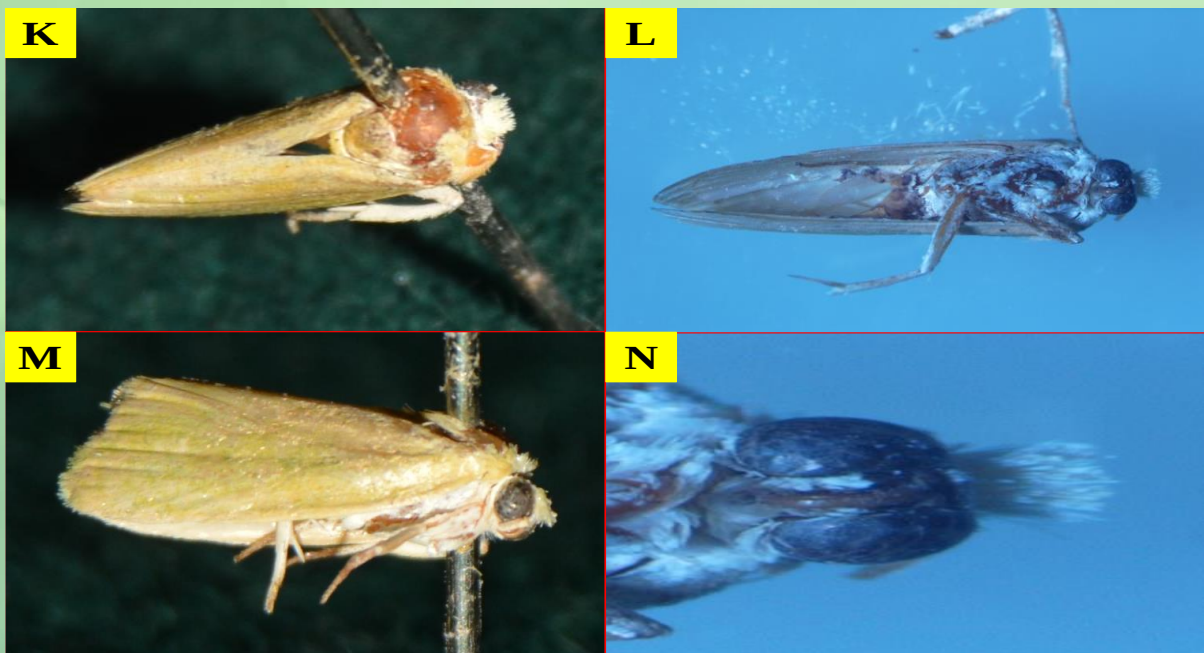


Fig. 3. Morphological characterization of *Earias vitella*; **K)** Dorsal view of *Earias vitella*, **L)** Ventral view of *Earias vitella*, **M)** Lateral view of *Earias vitella*, **N)** Head of *Earias vitella*

Mylocerus undecimpustulatus undatus

Head: The head is light yellow and distinct from the thorax. The eyes are clear from the dorsal view. From the lateral side, the frons is wider than the base of the rostrum. There is a yellow-orange mark beneath the eyes. The antennae are elbow shape and clubbed. It has 11 segments. The club is 3 segmented. The mouthparts are chewing type (Fig. 4).

Thorax: The humerus is wider than the pro-thoracic segment. The forewings are elytra having irregular black dots that give an asymmetrical appearance. These are white-gray. The femur is toothed. The femora of pro-leg and meso-leg are bi-dentate. The femora of meta-leg are tri-dentate.

Abdomen: The abdomen is oval towards the terminal segment. Its diameter is more than the thorax. It is covered by the elytra that are why least exposed portion of the body. The abdomen of the female is broader than the male. The adults are 7 mm in length. The females are more in length than males. This length is 1 to 2 mm (Fig. 4).

Material examined: Wan Bhachran: 5, 13-vii-18. Harnoli: 4, 19-ix-18. Pai khail: 3, 8-viii-18. Kalabagh: 3, 13-viii-18.

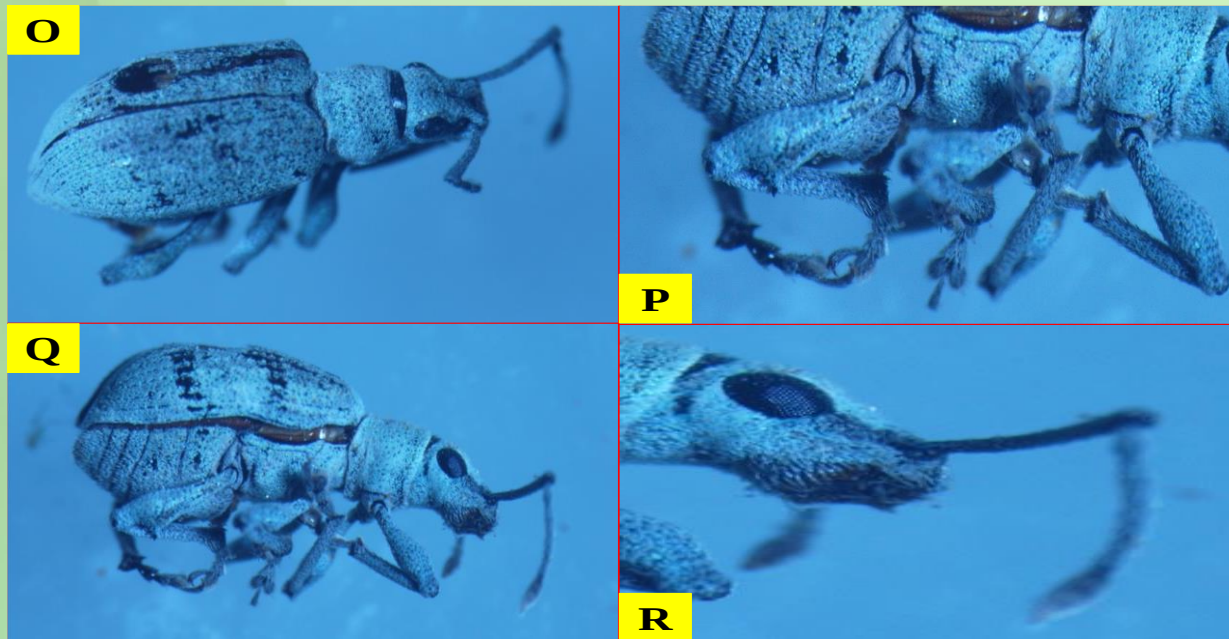


Fig. 4. Morphological characterization on *Mylocerus undecimpustulatus undatus*; **O)** Dorsal view of *Mylocerus undecimpustulatus undatus*, **P)** Ventral view of *Mylocerus undecimpustulatus undatus*, **Q)** Lateral view of *Mylocerus undecimpustulatus undatus*, **R)** Head of *Mylocerus undecimpustulatus undatus*

Discussion

Saunders first described *Pectinophora gossypiella* (Saunders) commonly known as pink bollworm in 1843 (Ingram, 2004) from cotton crops of India as *Depressaria gossypiella*. It was positioned in many genera from a taxonomic point of view but the complete synonymy described by Common in 1958. Pink bollworm is a key pest that causes a huge reduction in yield. This serious pest attacked the cotton crop throughout the season even the yield losses were seen in Bt cotton varieties. This resulted in increased demand of management costs in cotton cultivated areas of Maharashtra, Gujarat, Telangana, Andhra Pradesh, Karnataka, and Gujarat (China Babu *et al.*, 2017). Zinzuvadiya *et al.* (2017) conducted a study at Navsari Agricultural University on the biology and morphology of pink bollworm. The larvae were reared in the laboratory and conditions were set at room temperature of $28.34 \pm 3.15^\circ\text{C}$ and relative humidity of 40.00 ± 7.20 percentage. China Babu *et al.* (2017) conducted a study on the pink bollworm from different localities including Andhra Pradesh, Gujarat, Karnataka, Maharashtra, and Telangana. They recorded the pink bollworm as the trivial pest of the cotton crop. It badly affects the cotton crop; hence it is regarded as the major pest of the cotton crop from the genus *Pectinophora*. But, all these studies didn't provided the taxonomic keys based on morphological characters. The current study describes all these aspects of morphology.

Liu *et al.* (2004) conducted a study in china on different host plants of American bollworm. The findings revealed the life table history on cotton, tomato, tobacco, corn, hot pepper, and bean. It is a polyphagous and intense pest recorded from China, Australia, Pakistan, and India. Ahola and Silvonen (2005) described the mouthparts of American bollworm in northern Europe but failed to provide a taxonomic key. However, in the present study along with the morphological description, the taxonomic keys were also prepared. Al-abbadi (2001) described the life

table of American bollworm (*Helicoverpa armigera*). He conducted a detailed study on life stages, maturation period, reproductive ability, and egg-laying capacity. In addition, longevity was also studied and egg-laying capacity was compared with the reproduction. Passoa (2004) provided the taxonomic key of Heliothinae larvae with important pioneer; accentuate morphology, host, and origin. The key includes species that are usually intercepted and potentially harmful pests that may be intercepted due to the wide range of distribution of the host. When our current state of acquaintance does not permit species-level identification, it is critical to use host and origin to provide the best recognition. This information is helpful to pest risk measurement and identification agencies. Pogue (2000) reported 31 species in the genus *Spodoptera*. The 7 species were recorded from the Afro-tropical region. Other regions of Africa like west and Central Africa comprise 6 species. This genus heavily infested cotton crops. The egg morphology of American bollworm described by Bhatt and Patel (2001) and CABI (2018), larval morphology illustrated by Yamasaki et al. (2009), and study similar to present research performed by Brambila in 2009a provided data about the adults.

Goergen et al. (2016) in their study described the origin of fall armyworm from the tropical United States to Argentina and the Caribbean. Kalleshwaraswamy et al. (2018) conducted a study in Karnataka to describe the life table of fall armyworm. This study explained the fecundity rate, larval and pupal period, and life history in both species (male and female). Another study of UF/IFAS Extension (2017) explained the biology of *spodoptera frugiperda*; demonstrating a dome-shaped egg, 0.4mm in diameter, and an average of 1500-2000 eggs are laid by the female. Pannuti et al. (2015) studied the larval morphology and its feeding behavior on various vegetative phases of the plant. Schmidt et al. (2018) provided the checklist for the superfamily Noctuoidea and reported the possible changes in it. A brief review of the taxonomic position and terminologies was prepared from North America and north Mexico. The ultimate update was given in 2015 and almost sixty-four alterations were illustrated.

Roskov et al. (2014) conducted a study on the genus *Earias* and 112 species were recorded. This fauna was placed in the global catalog of life. Ahmad and Arif (2009) studied *Earias vittella* from Pakistan, formerly identified as *Earias fabia*. It was the foremost pest from the order Lepidoptera that attack the cotton bolls. As a result of its intensive activity on the crop, it was causing a loss of more than 50 percent. This loss was reaching the threshold level and important to control it immediately. Generally, the buds, sprouts, and even flowers of cotton crop were also influenced. The larvae incorporated into the green cotton bolls and heavily destroyed them. Due to the heavy infestation, it was recorded as a critical pest of cotton. Mapuranga et al. (2015) reported four species of bollworms on the cotton crop of Zimbabwe. They recorded that *Helicoverpa armigera* (African bollworm), *Diparopsis castanea* (Red bollworm), *Earias insulana* (Spiny bollworms), and *Pectinophora gossypiella* (Pink bollworm) causing a huge reduction in cotton yield.

Concerning this, a study performed by O'Brien et al. (2006) explained that the shoulder of the grey weevil elytron is wider than the prothorax and is angled. Neal (2013) described females lay an egg in organic soil and feeds on grown-up leaves, after hatching the larvae feeds on roots and then metamorphoses into a pupa. Later, it takes about 2 months to emerge into an adult weevil. In our study, cotton boll weevil is another important pest of the cotton crop which causes heavy losses not only to crop but also affecting the economy of the country. It was described morphologically in detail and the taxonomic keys were also prepared considering the fact that there are no recent studies about the morphology and identification of this pest.

Conclusion

The present study was conducted in different cotton cultivated areas of district Mianwali in the year 2018-19. This research covers the morphological characterization of Pink bollworm, American bollworm, spotted bollworm, fall armyworm, and Cotton grey weevil. The photographic illustration of the described specimens along with the taxonomic key is also given. The collected specimens were identified with the help of available taxonomic keys and available literature up to the species level. This study provides an important aspect about the pest management in cotton crops and provides estimation about control strategies of these devastating pests at every life stage. Moreover, it is the first comprehensive study that describes cotton chewing insect pests in detail, as no prior literature is available on this from Mianwali, Punjab, Pakistan.

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Fortification of a Lebanese Dairy Product (Labneh) with Vitamin D

Malak Abou Shahine¹, Jana Choubassi¹, Sanaa Khaled¹, Sami El Khatib¹

¹Department of Food Sciences, School of Arts & Sciences, Lebanese International University, Bekaa, Lebanon

Abstract

Vitamin D, also known as sunshine hormone, is the most prevalent deficient vitamin. Vitamin D deficiency is increasing and becoming a major problem in the Middle East and Lebanon especially during Covid-19 pandemic. Vitamin D deficiency can cause fatigue, bone pain, muscle weakness, depression, as well as Cohn's disease, celiac disease and other problems that may complicate this deficiency.

The aims of this research were to test consumer's knowledge in the Bekaa community on vitamin D functions and its importance to the human body, their awareness of the presence of food fortified with vitamin D, their willingness to try a fortified product, detecting the feasibility of fortifying a dairy product (labneh) with vitamin D and testing the acceptability of consuming fortified Labneh.

The results showed a considerable basic knowledge in the community on vitamin D and its deficiency and an overall acceptance of fortified products. Samples of Labneh were prepared and fortified with three different doses, 42 IU, 63 IU and 84 IU of vitamin D and then a group of 20 panelists assessed sensory attributes of the fortified Labneh samples.

Results showed that adding 42 IU of vitamin D into the Labneh affected its firmness, cohesiveness, wetness and sour taste by decreasing the liking score by panelists. Adding a higher dose, 63 IU affected compactness, white color, firmness, cohesiveness and wetness of Labneh but did not affect its sour taste. Compactness increased whereas other attributes liking scores decreased.

Moreover, adding the maximum allowed dose 84 IU affected the compactness, white color, firmness, cohesiveness and wetness of Labneh as well as its sour taste. Also, compactness increased whereas other attributes liking scores decreased. Overall acceptability of the three additions was encouraging to recommend a fortified new product with vitamin D.

Key Words: Vitamin D, Deficiency, Food Fortification, Labneh, Dairy Products

Depending on Sex Head Morphology in Cage Birds

Demirel Ergün¹, Atilla Taşkın¹

¹Department of Animal Science, Faculty of Agriculture, Kirsehir Ahi Evran University, 40100 Kirsehir, Turkey

Abstract

The widespread desire for urbanization is one of the important reasons why we move away from nature. Although this distance affected the longing for nature within us, it could not end it. This feeling inside us has caused us to carry various natural elements to our new living spaces. Cage birds are the most important living elements among them. The fact that they are easy to care for, colorful and attractive, that some of them have the ability to imitate sounds and sounds, and they eliminate the feeling of loneliness in their environment, have caused the interest and demand for them to increase day by day. Meeting the increasing demand has caused an increase in their production and trade. This situation has once again revealed the value of the knowing characteristics such as gender, age in order to plan the production of cage birds and resolve disputes in their trade. In this study, it is aimed to determine the morphological differences in the head parts to be used in determining the sex of these birds traded in Turkey. As a result, in this study; It was seen that the sex-related differences were different between the species and the morphological structures in the head region were used to determine the sex. It was concluded that the cere and color of budgerigars (*Melopsittacus undulatus*), the color of the cheek feathers of Indian nightingales (*Taeniopygia guttata*), the shape of the eye of canaries (*Serinus canaria*), have an effect on determining sex.

Key Words: Sex, Cage Birds, Head morphology.

Kafes Kuşlarında Cinsiyete Bağlı Baş Morfolojisi Özet

Yaygın kentleşme arzusu, doğadan uzaklaşmamızın önemli sebeplerinden biridir. Bu uzaklaşmadan, içimizde var olan özlem duygusu etkilense de bitmemiştir. İçimizdeki bu duygu yeni yaşam alanlarımıza çeşitli doğal unsurları taşımamıza neden olmuştur. Bunlar arasında kafes kuşları en önemli canlı ve doğal unsurlardandır. Bakımların kolay oluşu, renkli ve çekici oluşları, bazılarının sesleri taklit yeteneklerinin olması ve bulundukları ortamlarda yalnızlık hissini yok etmeleri, her geçen gün bunlara olan ilginin, talebin artmasına neden olmuştur. Artan talebin karşılanması üretimlerinin ve ticaretlerinin de artmasına sebep olmuştur. Bu durum kafes kuşlarının üretimlerinin planlanması ve ticaretlerinde anlaşmazlıkların giderilmesi için cinsiyet, yaş gibi özelliklerin bilinmesinin kıymetini bir kez daha ortaya koymuştur. Bu çalışmada Türkiye’de ticareti konu olan bu kuşların cinsiyetinin belirlenmesinde kullanılacak baş kısımlarındaki morfolojik farklılıkların tespiti amaçlanmıştır. Sonuç olarak yaptığımız çalışmada; cinsiyete bağlı farklılıkların türler arasında farklı olduğu ve baş bölgesinde bulunan morfolojik yapılardan muhabbet kuşlarında (*Melopsittacus undulatus*), cere ve renginin, Zebra ispinozu (*Hint bülbülleri*) (*Taeniopygia guttata*), yanak bölgesinde bulunan tüy renginin, kanaryalarda (*Serinus canaria*) ise gözün şekilsel yapısının cinsiyetin belirlenmesinde kullanılabileceği sonucuna varılmıştır.

Anahtar Kelimeler: Cinsiyet, Kafes Kuşları, Başın morfolojisi

Sex Determination in Chukar Partridges (*Alectoris chukar*)

Demirel Ergün¹, Atilla Taşkın¹

¹Department of Animal Science, Faculty of Agriculture, Kirsehir Ahi Evran University, 40100 Kirsehir, Turkey

Abstract

In poultry, knowing the sex provides a great advantage in breeding and production. It also prevents the occurrence the sex-related disputes during the trade of birds bred for hobby purposes. Monomorphism in poultry makes it difficult to determine sex. Because in monomorphic birds, sex has little effect on the formation of the physical structure, and the male and female are very similar to each other. Chukar partridges (*Alectoris chukar*) with folkloric value, which are breeding as hunting, hobby and intensively, are monomorphic. Therefore, it is difficult and important to know the sex in Chukar partridges (*A. chukar*). For this purpose, House and Ornamental Animals Sales Centers operating in Kırşehir and licensed by the Provincial Directorate of Agriculture and Forestry were visited to determine the methods used for sex determination in chukar partridges traded for hobby purposes in Kırşehir. As a result of technical visits and examinations; It has been determined that the sex determination method based on the detection of the spurs on the metatarsus (*Calcar ungius metatarsalis*) and the sex determination method based on the head structure are most commonly used in the determination the sex in chukar partridges. In addition, it was determined that the method using features such as live weight, anatomical structure of the head, voice and temperament was used to support this situation.

Key Words: Sex distinction, chukar partridge, metatarsal spur (*Calcar ungius metatarsalis*)

Kımalı Kekliklerinde Cinsiyetin Belirlenmesi (*Alectoris chukar*)

Özet

Kanatlıda cinsiyetin bilinmesi yetiştiricilikte ve üretimde büyük avantaj sağlar. Ayrıca hobi amaçlı yetiştirilen kuşların ticareti sırasında cinsiyete bağlı anlaşmazlıkların oluşmasını engeller. Kanatlılardaki monomorfizm cinsiyetin belirlenmesini zorlaştırmaktadır. Çünkü monomorfik kuşlarda cinsiyetin fiziksel yapının şekillenmesinde etkisi azdır ve erkek ve dişi birbirlerine çok benzerler. Folklorik değere sahip, avcılık, hobi ve entansif olarak yetiştiriciliği yapılan Kımalı keklikler (*Alectoris chukar*) monomorfiktirler. Bu yüzden Kımalı kekliklerde (*A. chukar*) cinsiyetin bilinmesi zor ve önemlidir. Bu amaçla, Kırşehirde hobi amaçlı ticareti yapılan kımalı kekliklerde cinsiyet tespitinde kullanılan yöntemlerin belirlenmesi için Kırşehir’de faaliyet gösteren ve İl Tarım Orman Müdürlüğünce ruhsatlı Ev ve Süs Hayvanları Satış Yerleri ziyaret edildi. Yapılan teknik ziyaretler ve incelemeler sonucunda; Kımalı kekliklerde cinsiyetin tespitinde en yaygın olarak metatarsuslar üzerindeki mahmuzların (*Calcar Ungius Metatarsalis*) tespitine dayalı cinsiyet tespiti ile kafadaki morfolojik özelliklere bakılarak yapılan cinsiyet tespiti yönteminin kullanıldığı, canlı ağırlık, ses ve mizaç gibi özelliklere bakılarak yapılan cinsiyet tespiti yönteminin ise iki yöntemi desteklemek için kullanıldığı tespit edilmiştir.

Anahtar Kelimeler: Cinsiyet ayrımı, kımalı keklik, metatarsal mahmuz (*Calcar ungius metatarsalis*)

Giriş

Kımalı keklik (*A. chukar*), sülüngiller (Phasianidae) familyasında yer alan benzer potansiyele sahip bir kuş türüdür. Kalın gövdeli, kısa kuyrukludurlar. Yetişkinlerin ortalama ağırlıkları 500-650 gramdır. Vücudu örten tüyler genel olarak kahverengi, ancak göğüs gri ve karın kısımları kahverengimsi sarı renktedir. Yüz, beyaz ve göğsün ortasına kadar inen siyah bir gerdanlıkla çevrilidir. Gaga ve bacaklar kırmızı renktedir. Sıcağa ve soğuğa dayanıklıdır. Doğal yaşam alanları dağlık, kayalık, taşlık, cılız bitki örtüsüne sahip ve yarı çöl sayılabilecek bölgelerdir. Ömürleri yaklaşık 15-20 yıldır. Kuluçka süresi 24 gündür. İnce tüylü bir örtü ile yumurtadan çıkar yavrular ebeveyn bakımına ihtiyaç duymazlar ve 12 saat içinde yürüyüp koşabilirler. Fakat ilk haftalar uçamazlar. Yumurtadan çıkan civcivler 32-34 haftalık olduklarında cinsel olgunluğa ulaşırlar (Kırıkçı ve Çetin, 1999; Özek, 2001).

Sevilen ve folklorik değeri olan bir kuş türüdür. Gelişimleri yavaş ve yemden yararlanma oranları (FCR) düşüktür. Bu sebeple ticari üretimleri ekonomik değildir. Fakat etlerinin çok lezzetli oluşu azda olsa entansif üretilmelerini sağlamaktadır (Çetin ve Kırıkçı, 2000). Entansif üretim daha çok, bilinçsiz avlanma ve diğer sebeplerden dolayı doğal hayatta azalan sayılarının korunması ile av turizmi, kene gibi parazitlerle mücadelede ve hobi amaçlı olarak yapılmaktadır (Christensen, 1996).

Kımalı keklikler (*A. chukar*) monomorfik kuşlardır, cinsiyet tayini fiziksel görünüşlerine bakılarak yapmak zordur. Çünkü erkek ve dişiler arasında cinsiyeti açıkça ifade edecek fiziksel fark bulunmaz. Monomorfik kuşlarda cinsiyet belirlemede; anüs vent cinsiyet tespiti, laparoskopik cerrahi yöntemi, steroid cinsiyet belirleme testi ve kromozomal cinsiyet testi gibi yöntemler kullanılır (Dubiec ve Zagalska-Neubauer, 2006). Fakat dikkatli incelendiğinde canlı ağırlık, kafanın anatomik yapısı, metatarsuslar üzerindeki mahmuzlar (*Calcar ungius metatarsalis*), ses ve mizaç gibi fiziksel farklılıkların kuşların cinsiyeti hakkında fikir sahibi olmamızı sağlar. Son yıllarda kanatlı üretimindeki alternatif materyal arayışı (Taskin ve ark., 2020a; Taskin ve ark., 2020b), hobi, av turizmi ve özel avlak sahalarının oluşturulması gibi faktörlerin artması kımalı keklik (*A. chukar*), gibi benzer potansiyele sahip türlere olan ilgiyi, talebi ve üretimi artırmıştır. Artan üretim ve ticaret kımalı kekliklerde (*A. chukar*), cinsiyetin belirlenmesinin önemini bir kez daha ortaya çıkarmıştır. Bu çalışmada, Kırşehir ilinde hobi amaçlı ticareti yapılan kımalı kekliklerin (*A. chukar*) cinsiyet tayininde, hangi yöntemlerin kullanıldığının tespiti amaçlanmıştır. Bu sayede keklik yetiştiriciliğine, ticaret kaynaklı anlaşmazlıkların giderilmesine ve akademik literatüre katkı sağlayacağı düşünülmektedir.

Materyal ve Yöntem

Bu araştırmanın materyalini Kırşehir ilinde faaliyet gösteren Tarım ve Orman Bakanlığından ruhsatlı ev ve süs hayvanları satış yerlerinde ki kımalı keklikler oluşturmaktadır. Araştırma evreleri olarak öncelikle literatür bilgileri toplandı. Daha sonra ziyaret edilecek satış yerleri belirlendi. Belirlenen bu yerlere bir plan doğrultusunda ziyaretler gerçekleştirildi. Satıcıların kımalı keklik (*A. chukar*) cinsiyetini tespitte kullandıkları yöntemler ve teknikler konusunda bilgiler alındı. Çalışmada kullanılacak fotoğraflar çekildi. Çekilen fotoğraflar bilgisayar ortamına aktarıldı. Gerekli değerlendirmeler yapıldıktan sonra fotoğrafların bir kısmı çalışmada kullanılmak üzere ayrıldı.

Bulgular ve Tartışma

Birçok kuş türü gibi kımalı keklikler (*A. chukar*)’de, cinsel olarak monomorfik kabul edilirler. Bu türlerde cinsiyetin belirlenmesi zordur. Kımalı keklik gibi monomorfik kuşlarda cinsiyet tespit işleminde, gelişmiş yöntemler ve genetik yöntemler kullanılmaktadır. Kımalı kekliklerde cinsiyetin belirlenmesinde gelişmiş yöntemlerden anüs vent cinsiyet tespit yöntemi, laparoskopik cerrahi yöntemi, steroid cinsiyet belirleme yöntemi ve kromozomal cinsiyet belirleme yöntemleri kullanılır. Kımalı kekliklerde (*A. chukar*) cinsiyetin belirlenmesi amacıyla kullanılan bu yöntemlerin doğruluk oranının yüksek olması avantajının yanında, uygulamasının zor, uzman kişilerce yapılması, çeşitli aletlere ihtiyaç duyulması ve kuşların bu uygulamadan olumsuz etkilenmesi gibi dezavantajları vardır.

Kımalı kekliklerde en çok ve en yaygın kullanılan yöntem anüs vent cinsiyet tespiti yöntemidir. Bu yöntemde ergin kuşların kloakasına bastırılarak kloakalarının çıkması sağlanır. Kloakanın merkezinde konik-sivri görüntü kuşun erkek, iki küçük nodül şeklinde ve kloakın yan kısımlarına kaymış olarak görünmesi kuşun dişi olduğunun işaret eder (Woodard ve ark., 1986).

Geleneksel yöntemlerde ise daha çok cinsiyete göre farklılık gösteren morfolojik, fiziksel ve mizaç özellikleri kullanılır. Bu yöntemlerin doğruluk oranı düşüktür. Ayrıca bu yöntemlerin sonuçları beslenme, yaş ve çevre gibi değişkenlerden etkilenir. Uygulanışları kolay ve ucuzdur. Saha şartlarında uygulanabilir ve kuşlar üzerinde olumsuz etkileri yoktur. Kımalı kekliklerin cinsiyetinin belirlenmesinde geleneksel yöntemlerden canlı ağırlık, kafanın anatomik yapısı, metatarsuslar üzerindeki mahmuzlar (*Calcar ungius metatarsalis*), ses ve mizaç gibi fiziksel farklılıklara dayalı yöntemler yaygın olarak kullanılmaktadır.

Bu çalışmada; Kırşehir’de ev ve süs hayvanları satış yerlerinde kımalı kekliklerin cinsiyetin geleneksel yöntemler kullanılarak belirlendiği tespit edildi.

Bu yöntemler:

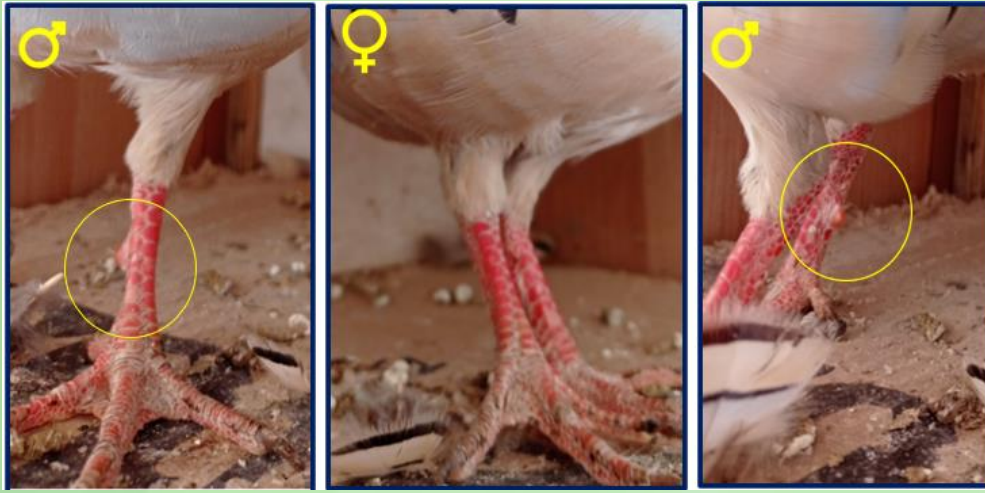
- Metatarsuslar üzerindeki mahmuzlar (*Calcar ungius metatarsalis*) varlığına dayalı yöntem,
- Kafadaki farklılıklara dayalı yöntem,
- Canlı ağırlık, ses ve mizaç gibi fiziksel özelliklere bakılarak yapılan yöntemlerdir.

Mahmuzların (*Calcar Ungius Metatarsalis*) Varlığına Dayalı Yöntem: Kırşehir’de en yaygın olarak kullanılan yöntemdir. Metatarsus üzerindeki mahmuzların (*Calcar ungius metatarsalis*), tespiti prensibine dayanır. Kanatlıların çoğunda ibik, gaga ve pençe gibi epidermoidal oluşumlar mevcuttur. Bu oluşumlar bazı türlerde cinsiyetin belirlenmesinde önemli rol oynar. Kekliklerdeki metatarsuslar üzerindeki mahmuzlar (*Calcar ungius metatarsalis*) bu oluşumlardandır ve cinsiyetin belirlenmesinde önemli (epidermoidal/deri oluşumu) rol oynar (König ve ark., 2016) (şekil 1). Metatarsuslar üzerindeki mahmuzlar (*Calcar ungius metatarsalis*) kımalı kekliklerde daha çok erkeklerde şekillenir. Bu yapının varlığı kuşun erkek olduğuna işaret eder. Doğruluk oranı yüksektir, kolay, ucuz ve sahada uygulanabilir olması gibi avantajlarının yanında mahmuzların 4-6 aydan sonra oluşmaya başlaması nedeniyle erken yaşlarda kullanıma olanağının olmaması, çok ender olmakla beraber mahmuz

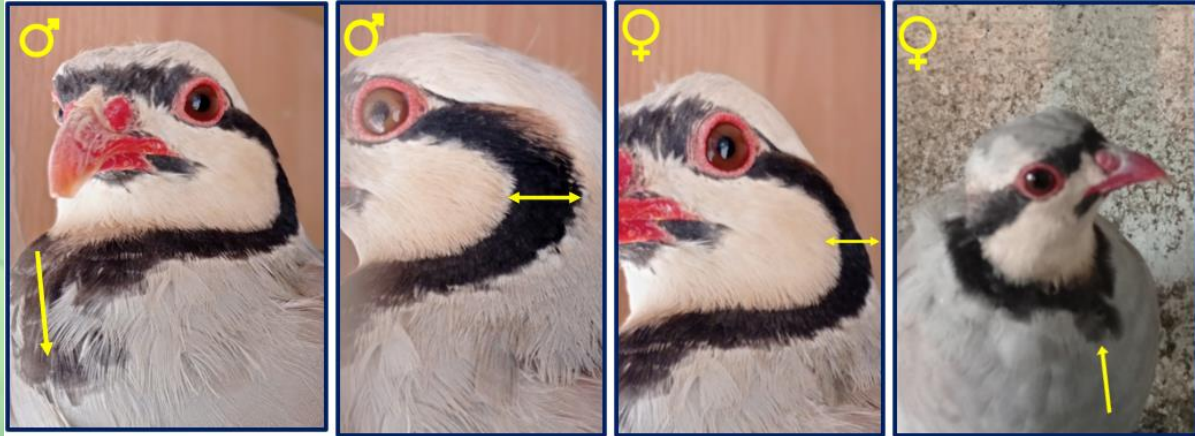
oluşumunun dişilerde de şekillenmesi, bazen de erkeklerde şekillenmemesi gibi dezavantajları vardır (Özek, 2001; Çetin ve Kırıkçı, 2000).

Kafadaki Farklılıklara Dayalı Yöntemi: İkinci sırada kullanılan yöntemdir. Kınalı kekliklerde (*A. chukar*) cinsiyete bağlı baş kısmındaki morfolojik farklılıkların tespiti prensibine dayanır. Kınalı kekliklerin baş kısmında bulunan morfolojik yapılar dikkatli incelendiğinde cinsiyete bağlı farklılıkların olduğu görülebilir. Ayrıca kınalı kekliklerde kafanın anatomik büyüklüğü, tüy ve deseni bize cinsiyeti hakkında bilgi verebilir. Aynı yaştaki erkeklerin kafa yapısı dişilerden daha büyüktür. Kafayı saran ve yüzü çevreleyen boyun halkası renk olarak erkeklerde daha koyu, kalın ve göğüse doğru daha iniktir (Şekil 2). Dişilerde ise daha dar, soluk ve yüze yakındır. Bu yöntemde yaş faktörü önemli olup yaş farklılıklarının dikkate alınması önemlidir.

Canlı Ağırlık, Ses ve Mizaç Gibi Özelliklere Bakılarak Yapılan Yöntemler: Bu yöntemin daha çok diğer iki yöntemi desteklemek için kullanıldığı tespit edildi. Kınalı kekliklerde (*A. chukar*) erkekler dişilerden daha büyüktür. Erkekler tok sesli ve hırçın yapıda, dişiler ise daha uysal tiz seslidir. Ayrıca ergen dişilerin yuva kurma eğilimi gösterme alışkanlıkları çok önemli bir farklılıktır.



Şekil 1. Kınalı kekliklerde calcar ungius metatarsalis



Şekil 2. Kınalı kekliklerin cinsiyete bağlı baş kısmındaki farklılıklar

Sonuç

Keklik gibi aynı anda özgür ve tutsak olarak yaşayan kuşlar üzerinde yapılan çalışmalar çok değerlidir. Çünkü bu çalışmalar özgür yaşayan kuşlar hakkında da bilgi sahibi olmamıza olanak sağlar. Bu çalışmalardan elde edilen bilgiler nesli tükenme tehlikesinde olan türlerin korunması ve diğer türlere uyarlanması açısından da önemlidir. Bu araştırmada; Kırşehir’de ev ve süs hayvanları satış yerlerinde kınalı kekliklerin (*A. chukar*) cinsiyetinin belirlenmesinde geleneksel yöntemlerden sırasıyla; Mahmuzların (*Calcar ungius metatarsalis*) varlığına dayalı yöntemin, kafadaki farklılıklara dayalı yöntemin ve canlı ağırlık, ses ve mizaç gibi özelliklere bakılarak yapılan yöntemlerin kullanıldığı tespit edildi. Ayrıca bu yöntemlerin kolay, ucuz, saha şartlarında uygulanabilir olduğu ve uygulamadan kuşların etkilenmediği görüldü. Fakat bu yöntemlerin erken yaştaki kuşların cinsiyetinin

belirlenmesinde kullanma olanaklarının sınırlı ve yetersiz olduğu, cinsiyet tespiti işleminin tecrübeli ve uzman kişilerce yapılabileceği kanaatine varılmıştır.

Araştırma sonucuna göre Kınalı kekliklerin (*A. chukar*) ülke ekonomisine katkısı da göz önüne alınarak

- Erken dönemlerde tespitinin yapılabilirliğinin araştırılması
- Üretim ve yetiştiriciliğini yapan kişilerin eğitim almalarının sağlanması
- Kuşlarda cinsiyet tayini yöntemleri dersinin zootekni ders müfredatında yer alması
- Keklik yetiştiriciliği dersinin bazı fakültelerde seçmeli ders olarak müfredata eklenmesi önerilmektedir

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Authentication of fruit juices by portable vibrational spectroscopy units combined with chemometrics

Ahmed Menevşeoğlu¹

¹Department of Food Engineering, Faculty of Engineering and Natural Sciences, Gumushane University, Gumushane, Turkey

Abstract

Fruit juice adulteration is a growing concern worldwide. Fruit juices such as orange, pomegranate, mango, etc. are a target for economically motivated adulteration due to their high commodity value. Some of fruit juices contain high concentrations of healthy compounds such as anthocyanins which plays an important role in reducing cardiovascular diseases. Therefore, the high demand for some certain fruit juices is due to their health-related benefits. Cheaper juices are the adulterants in expensive juices due to the similar color and taste profiles. A rapid method to detect fruit juice adulteration is in need as they are relatively more expensive than cheaper ones such as apple and cherry juices. Various chemical methods have been used to authenticate fruit juices; however, traditional methods such gas chromatography, high performance liquid chromatography, and mass-spectroscopy are requiring high-cost instrumentation and maintenance, and well-trained personnel to operate the instrumentation, and also being time consuming makes them less appealing as a technique to authenticate the juices. Vibrational spectroscopy techniques are easy to operate, non-invasive, and rapid for real-time assessments as well as cheaper alternatives to traditional methods. With the development of technology, handheld and portable FT-NIR, FT-MIR, and Raman spectrometers are available in the market. Portable vibrational spectrometers can be used for the authentication of fruit juices. These units provide sensitive, high throughput, and rapid information of the juices and their possible adulteration. Vibrational spectroscopy techniques show great potential for real time surveillance to detect fruit juice adulteration.

Key Words: Raman, FT-MIR, FT-NIR, adulteration, authentication, fruit juices

Determination of ACC Deaminase Enzyme Production and Nitrogen Fixation Characteristics of Endophytic Bacteria

Dilek Özcan Yardım¹, Ceylan Pınar Uçar², Bilgin Taşkın¹, Şilan Atbaş¹, Ahmet Akköprü²

¹Van Yüzüncü Yıl University, Faculty of Agriculture, Department of Agricultural Biotechnology

²Van Yüzüncü Yıl University, Faculty of Agriculture, Department of Plant Protection

Abstract

Endophytic bacteria can contribute to plant growth and development indirectly or directly by living in the inner tissues of the plant. The activity of 1-amino-cyclopropane-1-carboxylic acid (ACC) deaminase (ACC-d) enzyme, which provides fixation of free nitrogen in the air and reduction of ethylene hormone by these bacteria, is one of the factors that positively affect plant growth. Since nitrogen fixation and determination of ACC-d production are based on nitrogen requirement; it is aimed to determine the nitrogen fixation and ACC-d enzyme production properties simultaneously with a single method, as a fast and economical test. For this purpose, endophytic bacteria isolated from wild and cultivated Poaceae family from Van Lake Basin were scanned for these characteristics. The isolates were incubated in nitrogen-free DF minimal medium containing 6 mg/L ACC and without it, in 3 recurrence at 28°C at 200 rpm for 48 hours. ACC-d production and nitrogen fixation ability were determined in the study. In addition, the nitrogen fixation abilities of the isolates were tested in standard N-Free medium (Döbereiner, 1970). It was observed that all bacteria grown in liquid DF minimal nitrogen-free medium gave a positive reaction in terms of nitrogen fixation in N-Free solid medium. This method, 104 endophyte bacteria were screened reliably and quickly. ACC-d ability was determined in 13% of the isolates, and the ability to fixation N in 55%. As a result, the reliability of the method was confirmed and it was seen that it could be used in large-scale studies.

Keywords: ACC Deaminase, Nitrogen fixation, Endophyte bacteria, Poaceae

Endofit Bakterilerin ACC Deaminaz Enzimini Üretme ve Azot Fiksasyonu Özelliklerinin Belirlenmesi

Özet

Endofit bakteriler, bitkinin iç dokularında yaşayarak dolaylı veya doğrudan bitki büyümesine ve gelişimine katkı sağlayabilir. Bu bakteriler tarafından havadaki serbest azotun fiksasyonu ve stres altında üretilen etilen hormonunun azalmasını sağlayan 1-amino-siklopropan-1-karboksilik (ACC) deaminaz (ACC-d) enziminin aktivitesi bitki gelişimini olumlu yönde etkileyen faktörlerdendir. Azot fiksasyonu ve ACC-d üretiminin tespit edilmesi azot ihtiyacı temeline dayandığı için; azotu fikse etme ve ACC-d enzimi üretim özelliklerinin tek yöntemle aynı anda, hızlı ve ekonomik bir testle belirlenmesi amaçlanmıştır. Bu amaçla Van Gölü Havzası'ndan yabani ve kültür buğdaygiller (Poaceae) familyasına ait bitkilerden izole edilen endofit bakteriler bu özellikleri önerilen yöntemle taranmıştır. İzolatlar 6mg/L ACC ihtiva eden ve etmeyen azotsuz DF minimal besiyerinde 3'er tekerrür olarak 28°C' de 200 rpm hızda 48 saat inkübe edilmiştir. Çalışmada ACC-d üretimi ve azot fikse etme yeteneği aynı testle belirlenmiştir. Ayrıca testin sınanması için izolatların azot fiksasyon yetenekleri standart N-Free besiyerinde (Döbereiner, 1970) denenmiştir. Sıvı DF minimal azotsuz besi ortamda gelişen bakterilerin tamamı N-Free katı besiyerinde amonyum oluşumunu sağlayarak azot fiksasyonunun gerçekleştirdiği gözlenmiştir. Söz konusu yöntem ile 104 endofit bakteri güvenilir ve hızlı bir şekilde taranmıştır. İzolatların %13'ünde ACC-d yeteneği, % 55'inde ise N fikse etme yeteneği belirlenmiştir. Sonuç olarak yöntemin güvenilirliği doğrulanmış ve geniş çaplı çalışmalarda kullanılabileceği görülmüştür.

Anahtar Kelimeler: ACC Deaminaz, Azot fiksasyonu, Endofit bakteri, Buğdaygiller

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The Functionality of Bioactive Peptides Generated from Food Proteins via Enzymatic Hydrolysis

Fikriye Alev Akçay¹, Ayşe Avcı¹, Mohammed L. Hamk^{1,2}

¹Department of Food Engineering, Faculty of Engineering, Sakarya University, Sakarya, Turkey

²Food Industries Department, Technical College of Applied Science, Sulaimani Polytechnic University, Halabja, Iraq

Abstract

Bioactive peptides (BAP) are shorter peptides with a significant interest due to their unique biological and functional properties on human health (Fitzgerald and Murray, 2006). The release of BAP from the primary structure of animal and plant proteins can be actualized through different methods such as enzymatic hydrolysis, chemical synthesis, or recombinant DNA techniques (Olempska-Beer et al., 2006). Enzymatic hydrolysis is one of the most reliable and efficient methods based on proteolytic enzymes' cleavage of peptide bonds in proteins. Peptides can be liberated during digestion in the gastrointestinal tract, in food processing/ripening/fermentation (in vivo), and by using proteolytic enzymes derived from organisms including animals, plants, or microorganisms (in vitro) (Korhonen and Pihlanto, 2003). Bioactive peptides obtained by in vitro hydrolysis have a great deal of attention, especially in food and medicine applications, due to their functionality such as antimicrobial, antioxidant, antihypertension, metal binding, and opioid effects (Dávalos et al., 2004; So et al., 1998). Various proteinaceous substrates both from plants and animals can be used for BAP generation. The type of BAP depends on the protein source and the proteolytic enzyme (Daliri et al., 2017; Zarei et al., 2012). The current review discusses the functional properties of the BAP derived from food proteins by enzymatic hydrolysis.

Key Words: Bioactive peptide, Enzyme, Hydrolysis, Antimicrobial activity

Investigation of Efficacy of Some Washing Solutions in Removal of Pesticide Residues in Lettuce

Tarık Balkan¹, Özlem Yılmaz¹

¹Department of Plant Protection, Faculty of Agriculture, Tokat Gaziosmanpasa University, Tokat / Turkey.

Abstract

Pesticides are widely used in agricultural production to prevent or control pests, diseases, weeds, and other plant pathogens in an effort to reduce or eliminate yield losses and maintain high product quality. However, more frequent use of pesticides in agriculture field causes environmental pollution as well as serious health problems. It's not to easy remove residue of the pesticides that are commonly used in growing and producing fruits and vegetables prior to their consumption. This study aimed to investigate the effectiveness of 13 different washing solutions cold water (20°C), hot water (40°C), lemon juice, filtered mint water, filtered rice water, carbonated water, baking soda water, grape vinegar (4% acetic acid), grape vinegar (6% acetic acid), grape vinegar (8% acetic acid), rice vinegar, 50% grape vinegar+water and NaCl+grape vinegar) for the reduction of sulfoxaflor, boscalid, pyraclostrobin, pyrimethanil, fluopyram, deltamethrin and fluopcolide residues from lettuces. Pesticides were sprayed on lettuce in a greenhouse and the reduction rate of pesticide residues on each vegetable by washing was tested. The pesticides residues in lettuce samples were extracted by the QuEChERS technique, analyzed by LC-MS/MS. Processing factors (PFs) and reduction rates were calculated for each washing treatment. The processing factor of washing treatments was calculated as the ratio of residue concentration of processed lettuce (mg/kg) to residue concentration of unprocessed lettuce (mg/kg). PF of less than 1 (PF<1) indicates reduced pesticide concentration. Results showed that the PFs for every pesticide were less than 1, which indicated that the washing solutions could obviously reduce the pesticide residues that are present in lettuce. The amount of pesticide decreased by 61.0-76.3% on average with washing processes. The highest reduction (sulfoxaflor, boscalid, pyraclostrobin, pyrimethanil, fluopyram, deltamethrin and fluopcolide) with washing solution was in the application of rice vinegar. The results prevailed that to ensure the consumption of pesticide-free lettuce, the most efficient washing method is to immerse the lettuce in rice vinegar and for filtered rice water for ten minutes.

Key Words: LC-MS/MS, Pesticide residue, Reduction, QuEChERS, Food Safety, Lettuce

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Functional Properties of Different Parts of *Salvia officinalis* (Sage) Plant: A Comparative Study

Fikriye Alev Akçay¹, Isabel S. Carvalho², Ayşe Avcı¹

¹Department of Food Engineering, Faculty of Engineering, Sakarya University, Sakarya, Turkey

²Department of Biological Sciences and Bioengineering, Faculty of Science and Technology, University of Algarve, Faro, Portugal

Abstract

Salvia officinalis (known as "sage" or "common sage") is an aromatic plant that is a member of the mint family. Its origin is the Mediterranean region, but it can be cultivated in many areas of the world. Sage is mainly known for its healing attribute and is consumed for medicinal and culinary purposes. In this study, Sage was analyzed for the exploration of its functional and chemical properties. For this purpose, the plant was collected before their blooming period in June from the field in Sintra, Lisbon, Portugal. Freshly collected plants were dried, and the leaves and stems were manually separated, then milled into powder and sieved. To determine the phenolic and antioxidant properties of the plant, extraction was carried out using different methods such as extraction buffer or ethanol. The plant's chemical composition was investigated as total protein content with the Bradford method by using bovine serum albumin (BSA) as a standard. Results showed that the leaf and stem extracts' total phenolic compounds (TPC) were 42.8 and 10.8 mg GAE/g DW. Leaf extract exhibited an enormous DPPH scavenging power up to 93.9%, while stem extract was 10.6% at the exact concentration (1 g/L sample), which is attributed to the TPC amount of the leafy section. Also, the protein content of the leaf and stem extracts was determined as 57 and 36.6 mg BSA/g DW, respectively.

Key Words: Sage, Antioxidant activity, Total phenolic compounds

Biosynthesis and Characterization of Titanium Dioxide Nanoparticles Using Cell-Free Supernatant of *Acinetobacter* sp. MDA1

Esin Yılmaz^{1,2}, Ayşe Avcı¹, Fikriye Alev Akçay¹

¹Department of Food Engineering, Faculty of Engineering, Sakarya University, Sakarya, Turkey

²Institute of Nanotechnology, Gebze Technical University, Kocaeli, Turkey

Abstract

Biosynthesis of nanoparticles using bacteria is regarded as a green approach because of its eco-friendly and safe nature. In this study, titanium dioxide nanoparticles (TiO₂NPs) were synthesized by using the cell-free supernatant of *Acinetobacter* sp. MDA1 which was obtained after 24 h growth in nutrient broth. The effects of reaction conditions including pH (6-10), temperature (30-40°C), TiO₂ concentration (3.75-20.0 mM), and reaction time (0-144 hours) on the synthesis of NPs were investigated. The formation of TiO₂NPs have been determined by scanning the absorbance spectra of the samples between 300-700 nm using a UV-VIS spectrophotometer. A sharper peak at 341 nm was the indication of TiO₂NPs formation. According to the spectrophotometric measurements, optimal conditions have been determined in the medium containing 15 mM TiO₂ at pH 8 and 33°C in 144 hours. Furthermore, the effects of production conditions on the size of NPs were determined by the field emission scanning electron microscopy, which revealed that the increase in temperature caused an increase in the size of NPs. In addition, it is determined that pH also affects the size of NPs and aggregation occurs at pH 10. X-ray diffractometer demonstrated that the NPs possess a rutile phase with a spherical shape. The NPs also showed antioxidant activity.

Key Words: *Acinetobacter*, Biosynthesis, Titanium dioxide nanoparticle

Economic assessment of Optimum canola planting technique in sugarcane

Abdul Khaliq^{1*}, Hafiz basheer Ahmad¹, Zaheer Sikandar¹, Muhammad Shafique¹, Mubashra Yasin¹,
Rashad ul Sher²

¹Sugarcane Research Institute, Faisalabad

²Agronomic Research station, Farooq Abad

Abstract

Intercropping was originally adopted under rainfall conditions as an insurance against total crop failure. However, at present the objective of intercropping, a form of multiple cropping, is higher productivity per unit area and then stability in productivity along with judicious utilization of land, labor and inputs resources. The main principal behind intercrop selection is to choose such crops having variation in crop duration and peak growth period of both crops do not coincide. Here intercrop should be quick maturing and completes its life cycle before the start of main crop. A research experiment was carried out during the crop season 2019-20 at Sugarcane Research Institute, Faisalabad, Pakistan, to assess the economics and priftability of various planting techniques of canola as intercrop in autumn sugarcane. The canola was inter cropped in sugarcane in one line and two lines at 2.5 ft. and 4.0 ft. apart rows in of autumn season sugarcane. The experiment was laid out in RCBD with 3 repeats having plot size of 10mx 8.4m. All other agronomic practices were kept normal. It is obvious from the data that the sugarcane 4 ft. apart sown with 2 lines of canola on each ridge gave the maximum net income of Rs. 345210 with BCR of 1.93.

Key Words: Intercrop, maincrop, canola, planting techniques, Benefit cost Ratio

Phenotypic Characterization And Body Indices Of Nigerian Heterogenous Rabbit Population Under Backyard Systems Of Production

Moshood Abiola Popoola

Federal College of Animal Health and Production Technology, Ibadan, Nigeria

Abstract

Composite rabbits are highly heterozygous and adapted to backyard systems in the tropics. In Nigeria, stocks of rabbits raised are mostly products of indiscriminate mating between local breeds and exotic meat type commercial rabbits or from crosses among exotic rabbit breeds. Characterization of livestock species are essential for identification and improvement of breeding programs for such species as well as for conservation purposes. Phenotypic characterization and body indices of Nigerian heterogeneous rabbit population were evaluated in this study. Sixteen basic morphological traits were taken on 200 Nigerian heterogeneous rabbit population. The measurements were used to estimate the production indices of these rabbits. The aim was to achieve a preliminary assessment of type and function from production indices produced from combinations of different morphometric scores. The result showed significant ($p < 0.05$) differences between sexes in body weight, body length, thoracic circumference and abdominal circumference of heterogenous rabbit population. However, there was no significant ($p > 0.05$) difference between sexes in rump width, leg length, head length, head width, girth height, wither height, rump height, thoracic depth, chest width, thoracic width, trunk length, ear length and ear width of the rabbit. Structural indices indicated that Nigerian heterogenous rabbit population are brachycephalic (short-headed) having cephalic index values greater than 81.1%. ,longiline (long-bodied), breviline and sublongiline type (which indicates the relative capacity of the animal format) and the rabbits possess rectangular body shape. Conclusively, This study may help in identifying a commercial niche and contribute to *in situ* conservation of the Nigerian heterogenous rabbit population.

Keywords: Body measurements, body indices, characterization, heterogenous, rabbit

Training Needs Of Dairy Cattle Farmers In Oyo State, Nigeria

***Popoola M.A., Adebisi G.L., Amao A.A and Owoade S.A.**

Federal College of Animal Health and Production Technology, Ibadan, Nigeria

Abstract

Training needs assessment is one of the crucial steps towards identifying the area of farmers' interests. An assessment of needs and using them as the base for planning the strategy is important for the success of any development intervention. This study was conducted to assess training needs among dairy cattle farmers in Oyo state, Nigeria. Two stage sampling technique was adopted for this study and 123 farmers were selected as respondents for the study. Data were collected on socio-economic characteristics of the respondents, their dairy cattle production enterprises as well as their training needs in dairy cattle production. Information obtained were used to estimate training need index of the farmers. Result revealed that majority of farmers perceived training needs in breeding as most important. The result further shows 51.1% of the training needs of dairy cattle production among respondents was explained by their cattle production enterprises. In conclusion, breeding, feeding and healthcare were perceived as the most needed training by the farmers in the study area. Age, sex, marital status, religion, education level, source of flock flow, purpose of production and breeds of cattle had direct effects on training needs of dairy cattle production among respondent. Thus, there is need for establishment of famers' training Institute and/or organizing various training programs specifically for dairy cattle production, this will help identify holistic needs dairy farmers.

Keywords: Dairy cattle, index, needs assessment, training,

Classification and Ideal Standards of the Manisa's Classic Honcheria (Oriental Frill) Piegons

Murat Türkeş^{1*}, Serkan Gündüz²

¹Boğaziçi Üniversitesi İklim Değişikliği ve Politikaları Uygulama ve Araştırma Merkezi, Bebek, İstanbul,

²Isparta Uygulamalı Bilimler Üniversitesi, Fen Bilimleri Enstitüsü, Tarım Makineleri ve Teknolojileri Mühendisliği Anabilim Dalı, Isparta,

Abstract

The aim of this study is to introduce historical/cultural and scientific aspects, and ideal standards of the Turkish classical Honcheria (Hünkâri) pigeons, and to classify them by considering their various basic biological, morphological and some behavioural characteristics, all of which were not studied before in Turkey at this level and detail. The classical Honcheria pigeon of Manisa (old-fashioned oriental frill pigeon) is one of the well-known prominent races of fancy and exhibition pigeons in Turkey. The classical Honcheria pigeon is a small to medium sized bred with very beautiful and unique appearance. These pigeons have an evident breast frill and peak crest; their beak is short and thick. Two most common and popular varieties of this bred, among others, are Blondinettes and Satinettes. The Satinettes are tail marked varieties with colour bars or laces on their wings and point/coin spots or laces on their tails, while the Blondinettes are whole-coloured varieties, which also possess white bars or lacing on the shields and point/coin spots or lacing on their tails as in the satinettes. The white spots or lacing pattern on the tails of these pigeons are important features particularly in the standard of the 'Satinettes' and 'Blondinettes.' Some varieties of the blondinettes may have the one- and multi-coloured lacing extending over most of the body, which is named Sümbüllü and Süslü (may be fancy) respectively in Turkish. The pigeon of the Sultans, in other words the Honcheria, should be acknowledged as an important cultural biodiversity heritage of Turkey. Fortunately, mainly with respect to the historical/cultural existence and geographical distribution of these pigeons, today Honcheria pigeons have been still found mostly at its old native districts in Turkey consisting of the Manisa and İzmir district, along with in its large surroundings including relatively some new localities such as Balıkesir, Bursa and Çanakkale.

Keywords: Fancy pigeons, Anatolian owls, Oriental Turbit pigeons, Aegyptische/Miseria or Tunisian pigeons, Blondinette and Satinette frill pigeons.

Klasik Manisa Hünkâri Güvercinlerinin Sınıflandırılması ve İdeal Standartları

Öz

Bu çalışmanın amacı, klasik Türk Hünkâri güvercinlerinin tarihsel/kültürel ve bilimsel özelliklerini ve ideal standartlarını ortaya koymak ve onları çeşitli temel biyolojik, morfolojik ve davranışsal karakterlerini dikkate alarak sınıflandırmaktır. Burada açıklanan bu amacın hiçbir ögesi, daha önce Türkiye'de bu ayrıntı ve düzeyde çalışılmamıştır. Klasik Manisa Hünkârisi güvercini (eski tip oryantal güllü/fırfırlı güvercin), Türkiye'nin iyi bilinen önemli süs ve gösteri güvercini ırklarından biridir. Klasik Hünkâri güvercini, çok güzel ve eşsiz görünümlü küçük-orta boyutlu bir ırktır. Bu güvercinler belirgin bir göğüs güllü/fırfırına ve başında tepeye sahiptir; gagaları kısa ve kalındır. Başka çeşitleri olmakla birlikte, vücut işlemeli (blondinet) ve satinet (kanat işlemeli) Hünkâri, bu ırkın en yaygın ve popüler varyeteleridir. Kanat işlemeli Hünkâri, kuyruk pareleri nokta ya da para işaretli ya da işlemeli, kanatları ise renkli çavuşlu (şeritli) ya da işlemeli bir Hünkâri varyetesidir. Vücut işlemeliler ise, gövdesinin her yeri renkli ve satinet'ler gibi yine kuyruk pareleri nokta ya da para işaretli ya da işlemeli, kanatları ise renkli çavuşlu (şeritli) ya da işlemeli bir Hünkâri varyetesidir. Bu kuşların kuyruklarındaki beyaz noktalar (pareler) ya da işleme deseni, özellikle kanat işlemeli ve vücut işlemeli Hünkâri'nin standardındaki önemli özelliklerdir. Vücudun üstünde tek renkli ve çok renkli işlemenin bulunduğu blondinetlerin bazı çeşitleri sırasıyla Sümbüllü ve Süslü olarak adlandırılır. Sultanların güvercini, başka sözlerle Hünkâri, Türkiye'nin önemli bir kültürel biyoçeşitlilik mirası olarak kabul edilmelidir. Şanslıyız ki, günümüzde Hünkâri güvercinleri, asıl olarak bu güvercinlerin tarihsel/kültürel varlığı ve coğrafi dağılışı açısından Türkiye'deki Manisa ve İzmir yörelerini içeren çoğunlukla eski yerleri ile Balıkesir, Bursa, Çanakkale gibi görece daha yeni yerleri içeren geniş bir coğrafyada hala bulunmaktadır.

Anahtar Sözcükler: Süs güvercinleri, Anadolu bangoları, Oryantal Türbit güvercinleri, Mısırlı ya da Tunus güvercinleri, Vücut işlemeli ve Kanat İşlemeli güllü güvercinler.

The Effects of Some Essential Oils on Methicilin Resistant *Staphylococcus aureus*

Ali Soyuçok¹

¹Dairy Products and Technologies Application and Research Center, Burdur Mehmet Akif Ersoy University, Burdur, Turkey

Abstract

Microbial contamination in food and medicine is a situation that closely concerns human health. The high antibiotic resistance of the microorganisms causing the contamination makes it difficult to eliminate the contamination. Deficiencies such as incorrect use of antibiotics or lack of new antibiotics have caused microorganisms to acquire multiple antibiotic resistance. Methicillin-resistant *S. aureus* (MRSA) is one of the microorganisms with high antibiotic resistance. The antibiotic resistance mechanisms and biofilm production ability of MRSA has made it more resistant to the environment. In this study, disc diffusion method was used to determine the antimicrobial activities of *Heracleum platytaenium* and *Lavandula* spp. essential oils against MRSA, and the results were compared with commercial antibiotics. In addition, the effect of *Heracleum platytaenium* and *Lavandula* spp. essential oils on the biofilm produced by MRSA was also investigated. In our study, it was determined that *Heracleum platytaenium* and *Lavandula* spp. essential oils have antimicrobial activity against MRSA ($p<0.05$). It was found that *Heracleum platytaenium* and *Lavandula* spp. essential oils have antibiofilm activity against MRSA. It has been found that *Heracleum platytaenium* and *Lavandula* spp essential oils can be alternative natural sources compared to commercial antibiotics in controlling infections from MRSA.

Key Words: Essential oil, *Heracleum platytaenium*, *Lavandula* spp, *S. aureus*, antimicrobial activity

Bazı Esansiyel Yağların Metisiline Dirençli *Staphylococcus aureus* Üzerine Etkileri

Özet

Gıda ve tıp alanlarında mikrobiyal kontaminasyon insan sağlığını yakından ilgilendiren bir durumdur. Kontaminasyona neden olan mikroorganizmaların yüksek antibiyotik direnci sahip olması kontaminasyonun ortadan kaldırılmasını güçleştirmektedir. Yanlış antibiyotik kullanımı veya yeni antibiyotiklerin bulunmaması gibi durumlar mikroorganizmaların çoklu antibiyotik direnci kazanmasına neden olmuştur. Yüksek antibiyotik direncine sahip mikroorganizmaların başında metisiline dirençli *S. aureus* (MRSA) gelmektedir. MRSA'nın sahip olduğu antibiyotik direnç mekanizmaları ve biyofilm üretim kabiliyeti kendisini çevreye karşı daha dirençli hale getirmiştir. Bu çalışmada *Heracleum platytaenium* ve *Lavandula* spp. esansiyel yağlarının MRSA'ya karşı antimikrobiyal aktivitelerinin belirlenmesinde disk difüzyon yöntemi kullanılmış olup sonuçlar ticari antibiyotikler ile kıyaslanmıştır. Ayrıca *Heracleum platytaenium* ve *Lavandula* spp. esansiyel yağının MRSA tarafından üretilen biyofilm üzerine etkisi de araştırılmıştır. Çalışmamız, *Heracleum platytaenium* ve *Lavandula* spp. esansiyel yağlarının MRSA'ya karşı bir antimikrobiyal aktiviteye sahip olduğunu ortaya koymuştur ($p<0.05$). *Heracleum platytaenium* ve *Lavandula* spp. esansiyel yağlarının antibiyofil aktiviteye sahip olduğu bulunmuştur. MRSA kaynaklı enfeksiyonların kontrol edilmesinde ticari antibiyotiklere kıyasla *Heracleum platytaenium* ve *Lavandula* spp. esansiyel yağlarının alternatif doğal kaynaklar olabileceği bulunmuştur.

Anahtar Kelimeler: Esansiyel yağ, *Heracleum platytaenium*, *Lavandula* spp, *S. aureus*, antimikrobiyal aktivite

Potential implementation of amino acid conjugates as novel micronutrient fertilizers

Emre Aksoy

Dept. of Biological Sciences, Middle East Technical University, Ankara, Turkey

Abstract

Essential micronutrients are required in many vital processes in plants. Proper plant development and yield are strongly affected by micronutrient availability in the soil. Micronutrient deficiencies decline the crop yield and, in turn, cause extensive revenue losses in the world. Fertilizer expenses are among the top cost items for any agricultural production system. Therefore, the development of novel fertilizers is at the forefront to decrease the agriculture cost. Recent studies have demonstrated the conjugation of different amino acids with micronutrients, especially in the divalent form. Among them, negatively charged amino acids stand out with their chemical properties to complex with iron, zinc, magnesium, and manganese, etc. in aqueous solutions. Some of these amino acids were shown to correct the micronutrient deficiencies in plants meanwhile their usage in the biofortification of crops is increasing in the last few years. This review will focus specifically on the physical structures of amino acids conjugated with micronutrients and the potential of their utilization as ground-breaking fertilizers in the correction of mineral deficiencies in plants.

Key Words: *amino acid, fertilizer, micronutrient, mineral deficiencies, plant development*

Organic Field Crops Production Factors

Sancar Bulut¹ Mehmet Arslan²

¹Department of Plant and Animal Production, Safiye Cikrikcioglu Vocational School, Kayseri University, 38280, Talas-Kayseri, Turkey

²Erciyes University, Agricultural Faculty, Dept. of Agric. Biotechnology, 38039-Kayseri, Turkey

Abstract

Agriculture is one of the most important sectors in terms of human, animal and environmental health. The human-made contamination of our agricultural lands and water resources increasingly jeopardizes healthy and safe food production. Organic farming provides the opportunity to protect natural resources and sustainability in agriculture. Organic farming systems make sustainability depending on the recovery of natural resources destroyed by traditional agricultural practices. Field crops are grown on a large scale for consumption purposes. Knowing which production factor changes the productivity of crops under organic production conditions and which factors are very important can create an opportunity to prevent yield losses in organic production. In this way, in the production of organic field crops, labor, plant materials (organic seeds, tubers and seedlings), soil, fertilizers (farm manure, green manure, microbial fertilizers and commercial organic fertilizers), crop rotation, plant protection (disease, pest and weed control), irrigation, harvesting and storage are examined one by one and their relations with productivity are evaluated together. It is not impossible for us to turn the low yield, which is the biggest disadvantage in organic agriculture, into an advantage by paying attention to the production factors of field crops.

Key Words: Organic agriculture, organic field crops, production factors

Organik Tarla Bitkileri Üretim Faktörleri

Özet

Tarım insan, hayvan ve çevre sağlığı açısından en önemli sektörlerin başında gelir. Tarım topraklarımızın ve su kaynaklarımızın insan eliyle kirlenmesi, sağlıklı ve güvenli gıda üretimini giderek tehlikeye atmaktadır. Organik tarım, doğal kaynakların korunmasına ve tarımda sürdürülebilirliğe fırsat verir. Organik tarım sistemleri geleneksel tarım uygulamalarıyla tahrip olan doğal kaynakların yeniden kazanılmasına ve toprak verimliliğinin artırılmasına bağlı olarak tarımda sürdürülebilirliği kalıcı hale getirir. Tarla bitkileri ise insan beslenmesinin temelini oluşturan bitki gruplarını içerisine alan en geniş yelpazeye sahip bitki grubudur. Bu bitkilerin organik üretim şartlarında hangi üretim faktörüne bağlı olarak verimliliğinin değiştiği ve hangi faktörlerin çok önemli olduğunun bilinmesi organik üretimdeki kayıpların önüne geçmede fırsat yaratabilir. Bu sayede organik tarla bitkileri üretiminde işgücü, üretim materyali (organik tohum, yumru ve fide), toprak, gübreleme (çiftlik gübresi, yeşil gübre, mikrobiyal gübreler ve ticari organik gübreler), ekim nöbeti, bitki koruma (hastalık, zararlı ve yabancı ot mücadelesi), sulama, hasat ve depolama gibi üretim faktörleri tek tek irdelenerek verimlilikle ilişkileri birlikte değerlendirilmiş olur. Organik tarımda en büyük dezavantaj olarak karşımıza çıkan düşük verimi, tarla bitkileri üretim faktörlerine dikkat ederek avantaja çevirmemiz hiç te imkânsız değildir.

Anahtar Kelimeler: Organik tarım, organik tarla bitkileri, üretim faktörleri

Introduction

Field crops are grown on a large scale for consumption purposes. Knowing which production factor changes the productivity of crops under organic production conditions and which factors are very important can create an opportunity to prevent yield losses in organic production. In this way, in the production of organic field crops, labor, plant materials (organic seeds, tubers and seedlings), soil, fertilizers (farm manure, green manure, microbial fertilizers and commercial organic fertilizers), crop rotation, plant protection (disease, pest and weed control), irrigation, harvesting and storage are examined one by one and their relations with productivity are evaluated together.

Labor Force

Labor costs vary according to the enterprise, the type of production and labor. Organic production is a labor-intensive when compared to production systems containing extensive mechanization. Many techniques used in organic agriculture (mixed planting, cultural weed control, composting, etc.) require high labor. Organic production with a high labor requirement will create additional employment opportunities for the rural population

in regions where the labor is cheap (Scialabba and Hatam, 2002). In addition, the diversity in organic production can create additional job opportunities and ensure that the workforce is used in a balanced and profitable manner throughout the season (Anonymous, 2006; Anonymous, 2010 Turhan, 2005). Labor availability and cost in Turkey vary according to regions and seasons. In rural areas and regions where industry and service sectors are not concentrated, organic production emerges as an important opportunity in terms of making use of the workforce. With an alternation based on diversity, the workforce can be used in a balanced way in organic production. In the production of organic field crops, besides market research, labor costs should also be taken into account and relatively advantageous production can be prioritized. In cases where labor costs are high, the production of cereals, legumes and industrial plants, where mechanization is already used, can be seen as an advantageous production system in this respect (Akkaya, 2018; Bulut, 2011a).

Production Materials (Organic seeds, Tubers and Seedlings)

According to the relevant regulation, organic production materials are obtained from organic seeds, grown in organic production areas having suitable soil and climatic conditions in which no synthetic plant nutrition, growth agents, hormones and pesticides are used and only permitted soil improving materials are allowed during the growing seasons (Anonymous, 2010; Taşbaşı et al., 2003; Yenice et al., 2004). The production materials used in organic agriculture must also be produced organically (Duman, 2015; Aydın Eryılmaz et al. 2019). Organic seed and production material production in Turkey is still in the development stage. Turkey has the capacity to meet the needs of domestic production and to become the organic seed production center of the EU and the region, with good planning and accurate decisions.

Soil

The ideal soil used in organic farming is the soil with an intact biological and mineralogical structure and texture, with a pH value between 5.5 and 7 (Taşbaşı et al., 2003). In cases where the soil structure is improper, permitted soil improvers are used (Soyergin, 2003; Anonymous, 2010). Before starting organic crop production, it is decided whether production measures such as terracing, contour and strip-like planting, the use of soil moisture protective materials and mulching, shading with pruned branches or legumes, ditching and silt trapping methods are needed (Aksoy, 2006; Soyergin, 2003; Taşbaşı et al., 2003). Pollution caused by fertilizers and pesticides applied in traditional agriculture can prevent the transition to organic agriculture. Contamination with cadmium and other heavy materials resulting from long-term fertilizer application, for example, can hinder organic production (Kirimhan, 2005). Soil analyzes should be done before starting organic agriculture in areas where long-term intensive agriculture has been applied in order to prevent wasted costs and efforts (Kirimhan, 2005). Tillage is carried out in a way that will ensure the protection and improvement of soil fertility, reduce erosion, prevent soil compaction, protect flora and fauna in the soil, and avoid over tillage (Kirişçi and Korucu, 2001; Aykas et al. 2005; Kırmızıhan, 2005; Yılmaz and Dengiz, 2021). Soil tillage tools such as harrows, cultivators, and disc harrows, which do not cultivate the soil deeply, are used (Aykas et al. 2005).

Fertilizing

In the production of organic field crops, soil and plant analyzes should be done with appropriate methods, and the productivity characteristics of the production area should be determined and a fertilization program should be prepared for the crops. The nutrient demand of the crop and the amount of nutrients in the available form in the soil should be evaluated together, and the amount of nutrients to be determined should be given to the soil by an appropriate method, taking into account the plant development period. With the "Regulation on the Principles and Implementation of Organic Agriculture" published in the Official Gazette No. 25841, "Manure and soil improvers" allowed to be used in the cultivation of organic crops are: farm manure, dried farm and dewatered poultry manure, liquid feces of animals, worm and insect compost, guano, products of animal origin and by-products (blood meal, nail meal, horn meal, bone meal, fish meal, meat meal, feather and hair meal, wool, fur, hair and dairy products), vegetable origin products and by-products (green manure, straw, leaves and other vegetable residues, oilseed meal, cocoa pods, discarded malt, etc.), composted or fermented household waste, composted or fermented vegetable material mix, cultivated mushroom production residues, seaweed and seaweed materials, sawdust and wood chips, composted bark, tree ash, peat, clays (perlite, vermiculite, etc.), soft rock a phosphate, aluminum calcium phosphate, basic slag, raw potassium salts (kainite, silvinit, etc.), magnesium, potassium sulfate which may contain salt, stillage and stillage extract, calcium carbonate of natural origin (chalk, marl, ground limestone, phosphate chalk), magnesium and calcium carbonate of natural origin (magnesium chalk, magnesium limestone), magnesium sulfate, calcium chloride solution, calcium sulfate (gypsum), industrial lime from sugar production, elemental sulfur, sodium chloride, ground rock, trace elements and microbial fertilizers (Rhizobium, Azotobacter, Azospirillum, Clostridium etc.) bacteria, blue-green algae, mycorrhizae, which provide nitrogen by living in common with plants or living freely in the soil (Anonymous, 2010).

In the cultivation of organic field crops, nitrogen is mainly supplied by legumes and green fertilization, which are included in the crop rotation. Other elements can be replaced by the decomposition of soil minerals and by

precipitation. However, since all of the lost nutrients cannot be supplied with these inputs, the use of appropriate fertilizers and soil improvers is needed (Soyergin, 2003; Anonymous, 2010). While this need is supplied in a short time with inorganic fertilizers containing nutrients in high proportions and easily soluble in traditional agriculture, in organic agriculture, more nutrients can be supplied with organic fertilizers at lower rates, the effects of which are slower but longer lasting.

Farm Manure

Farm manure consists of solid and liquid feces of cattle and sheeps and bedding laid under the animals in barns. Farm manure contains nitrogen, phosphorus, potassium, calcium, sulfur and many other nutrients, but these elements in the structure of organic compounds become available to plants after the organic matter is broken down by microorganisms and enzymes. Therefore, the effect of farmyard manure on plant growth is slower but longer lasting than mineral fertilizers. In a related study, it was determined that 19360 kg/ha of cattle manure applied to rapeseed increased the grain yield of wheat planted after rapeseed by 61% compared to the control treatment without fertilizer (Wen et al., 2003). In another study conducted in Erzurum, higher results were obtained from organic fertilizer sources, including farm manure, in terms of both yield and quality (Ozturk et al. 2012; Bulut et al. 2013). Since the fertilizers of animal originating from extensive livestock, organically grown or not grown for commercial purposes can be used in organic agriculture, it is necessary to plan plant and animal production together in enterprises and to support organic livestock production.

The nutrient content of the farm manure is affected by the type and age of the animal, the nutritional value of the feed, the amount and quality of the bedding, the solid feces/urine ratio and the storage technique of the manure. According to the animal species, the nutrient contents of farm manures are in decreasing order; poultry > sheep > horse > cattle manure. As the bedding ratio in the manure increases, the amount of nutrients decreases, while the ratio of solid feces and phosphorus, urine ratio and the amount of nitrogen and potassium increase. When manure is left in small, loose heaps in the open field, it is washed away and its nutritional value is significantly reduced. Fresh application of farm manure to the soil; it causes temporary nitrogen deficiency in the soil, unidirectional reproduction of microorganisms, transfer of weed seeds and disease factors to the soil. In order to obtain the expected benefit from farm manure, it must be kept in the manure as a compacted heap for 2-3 months and mineralized (decay) as a result of the activities of microorganisms. Manure piles should not deteriorate, contain enough moisture and be affected by external conditions as little as possible (Ceylan, 1994; Kalkanci 2014).

Application time, form and amount of farm manure varies according to soil characteristics, plant species and environmental conditions. In order to minimize losses by washing, the application should be done in autumn and winter in heavy (clay) soils, and with planting in light (sandy) soils. The fertilizer should be distributed homogeneously on the field surface and mixed into the soil by applying immediately. The amount of fertilizer to be given should be at least 10 ton/ha. Generally, it is appropriate to repeat 20-40 tons/ha of farm manure every 2-3 years. More farm manure is given to soils poor in organic matter, heavy rainy areas and hoe crops. On the other hand, although the demand for farm manure is not high, it is known that it increases the plant parameters such as hectoliter (Bulut et al. 2013).

Green Manure

It is known that green manures make important contributions to soil quality and plant health, especially in the crop rotation system. Green manure should not be applied in arid and semi-arid regions, since the expected benefit from green manure can be obtained under conditions of sufficient moisture and decay.

Plants to be used for this purpose: It should be compatible with local conditions and primarily leguminous, it should have a fast growth and short growing period, it should produce abundant vegetative parts and it should be able to grow in poor soils. Legumes such as bean, vetch, peas, soybeans and one-year clover and clover as green manure plants; oats, barley and rye or mixtures of legumes + wheat grains (vetch + oats) can be used. The green manure plant should be applied to the soil at the beginning of flowering and 2-4 weeks before planting of the main plant (Karakurt, 2009; Aslan et al. 2013; Torun et al. 2019). The C:N ratio of the plant is important, and as this ratio increases, the time required for the plant to rot in the soil becomes longer. When the mixing process is done in the very early period, the amount of organic matter supplied to the soil decreases, and when it is done in the very late period, the amount of nitrogen supplied to the soil decreases.

Microbial Fertilizers

Microorganisms, which take an active role in chemical changes in the soil, are important elements of productivity. Those that fix atmospheric nitrogen, decompose organic residues, suppress soil pathogens, increase nutrient availability, destroy the effect of toxic compounds, and produce organic molecules such as hormones that promote plant growth are called beneficial microorganisms (Tecimen and Sevgi, 2009). With organic farming practices, the use of these microorganisms, which increase soil fertility and contribute to plant development.

Nitrogen-fixing microorganisms convert gaseous nitrogen (N_2) in soil air into nitrogenous compounds (NH_4 and NO_3) that plant roots can use. This event, called biological nitrogen fixation. It is carried out by two groups of

microorganisms that fix nitrogen by living freely in the soil (non-symbiotic) and by living in symbiosis with a plant (symbiotic). Non-symbiotic nitrogen fixers are Azotobacter, Anabaena-Azolla, Azospirillum, Bacillus, Chromatium, Clostridium, Desulfovibrio, Pseudomonas, Rhodospirillum etc. bacteria and blue-green algae, and they can multiply in the soil without the need for another living thing (Azizoglu et al. 2012). Azotobacters, which are very effective in N₂ fixation by making the best use of carbon, can provide 300-350 kg/ha N per year, and blue-green algae, which are important for paddy fields, can provide 100-300 kg/ha N (Soyergin, 2003). In field studies, it was determined that inoculation with Bacillus increased the root yield of sugar beet by 13% (Çakmakçı et al., 2001), and inoculation with Azospirillum increased the grain yield in wheat and barley by 15-18% (Ozturk et al., 2003).

Symbiotic nitrogen fixation takes place with Rhizobium bacteria, which co-live in the roots of leguminous plants. The amount of nitrogen fixed by Rhizobium bacteria depends on host plant, soil moisture, organic matter and nitrogen content, pH, P and K availability. For legumes to fix nitrogen, bacteria of that species must be present in the soil, otherwise the bacteria must be inoculated into the seed or field. Kantar et al. (2003) found that inoculation with Rhizobium increased the grain yield of chickpea by 17-23%. In addition, it has been determined that double and triple mixtures of phosphorus solvent and nitrogen fixing bacteria in wheat and barley increase both grain yield and quality and efficiency parameters, especially nitrogen uptake and use (Bulut, 2013a; Bulut, 2013b).

In organic farming, ground crude phosphate is the main form of phosphorus fertilizer. Its low solubility and low rate of release limit the plants' ability to meet their needs from this source. However, mycorrhiza and phosphorus-dissolving bacteria increase the use of phosphorus from crude phosphate. During the active plant development period, fungal species that live in symbiosis with the plant in the cortex tissue of the roots and are called mycorrhiza provide the plant to be better fed with nutrients such as nitrogen, potassium, iron, especially phosphorus, zinc and copper, while the plant also meets the carbon requirement of the fungus (Soyergin, 2003).

Crop Rotation

The main purpose of the crop rotation is to protect the crops from diseases, pests and weeds and to ensure the continuity of soil fertility. With a well-planned crop rotation in the production of organic field crops, control of diseases, pests and weeds becomes easier, the organic matter and nitrogen content of the soil increases, erosion decreases, the utilization of nutrients in the soil becomes more balanced, the risks that may arise in the crop production are reduced and the workforce is better utilized. In a crop rotation system for these purposes; a legume forage crop provides nitrogen to the soil and a grass cover crop increases the humus content of the soil, and a row crop eases the weed control (Aslan et al. 2013). Although the application of crop rotation may not solve all of the problems in organic agriculture, it plays an important role in maintaining soil fertility. While creating crop rotation systems in organic farming, the following points should be considered (Algan and Duman, 1998):

- Plants with high nitrogen consumption (sugar beet, potato, cotton, corn, rapeseed) and plants with nitrogen storage properties (clover, vetch, broad bean, pea),
- Deep rooted plants (clover, sugar beet, cotton) and shallow rooted plants (barley, onion),
- Plants with high water consumption (clover, corn, rice, cotton, sugar beet) and plants with less water consumption (barley, wheat, onions, peas),
- Plants with slow growth (cotton, onion, tomato) and plants with fast growth (corn, soybean, sorghum, vetch),
- Plants with high residues (forage legumes, cereals) and plants with low residues (potatoes, sugar beets, onions) should be grown one after the other.
- Deep rooted and more robust varieties should be preferred, and deep root formation should be stimulated with early planting.
- In the period between the two main crops, short season crop cultivation should be done and attention should be given for green manure plants.

Plant Protection

Since chemical pesticides are prohibited in organic farming, biological control, biotechnical methods and integrated control techniques that deal with all these control methods as a whole are recommended. Integrated control can be defined as "a pest management system that uses all appropriate control methods and techniques in harmony, taking into account the population dynamics and environmental relations of the pest species, and keeps the populations of pests below the economic damage level". It is reported that a good crop rotation combined with an appropriate fertilization management in organic field crop cultivation is successful in controlling diseases and pests (Özçelik, 2003). In the control of diseases and pests, attention is given to the following (Anonymous, 2006; Taşbaşlı et al., 2003);

- Selection of disease-resistant species and cultivars,
- Cultural practices and rotation program,
- Appropriate tillage methods,
- Cultural, biological and biotechnical control methods,
- Weed control by hand or hoeing method,

- Integrated methods of pests and disease

In organic field crops farming, weeds can be controlled by cultural measures, mechanical control, use of resistant varieties, allelopathy, biological control methods, use of cover crops and mixed cultivation techniques. Success depends on the appropriate method to be determined according to the production area and the field crop to be grown, or the integration of more than one method (Aksoy, 2003).

Cultural measures are to use clean seeds, to ensure that the agricultural tools and machinaries to be used are clean, to use mature farm manure, to prevent weed seeds from being carried to the field with irrigation water, to grow varieties with high competitiveness, to include row crops in rotation, to prepare a good seed bed and to plant at the appropriate planting time. It can be destroyed by tools, pulled by hand, frequently cut and left under water. The use of sunflower, chickpea and broad bean varieties resistant to parasitic broomrape had higher yields (Aksoy, 2003). Some plant species can produce chemicals with a phytotoxic effect that inhibit the growth of other species (allelopathy). It has been determined that cherry radish, which is planted before cotton and then mixed into the soil, prevents the emergence of Johnson grass, an important weed of cotton. By using some insects, parasitic plants, bacteria and fungi, undesirable plants can be biologically controlled in culture areas (Aksoy, 2003).

Irrigation, Harvest and Storage

According to the current regulation, industrial and city wastewater and drainage water obtained from the drainage system cannot be used in organic production. The irrigation water used should not cause environmental pollution and irrigation should not cause deterioration and erosion in the soil structure. A water plan is prepared according to the amount of water that the plant will consume during the vegetation period. A water level measuring device is placed on the land, and irrigation water is measured and used according to the plan. A drainage system should be established in soils with poor drainage, low permeability, heavy clay and loamy soils. Irrigation cannot be done with the drainage water obtained from the drainage system. If there is a suspicion of pollution in the water resources to be used in organic agriculture, necessary tests and analyzes should be carried out. The irrigation method recommended in organic agriculture is generally pressurized irrigation (drip or mini sprinklers). It is recommended to use mulches to control weeds. Water pads are a combination of drip irrigation and mulching technique, and it is an irrigation method that can be used successfully for irrigation of all row crops in organic farming. The method is an easy-to-apply method with high irrigation efficiency, weed and erosion control, no surface flow and deep infiltration losses (Real, 2009).

It is essential that the techniques and tools used in the harvesting of organic products must not create any ecological problem and pollution. In the manual harvests, necessary hygiene measures must be taken by pickers and collected materials. In machine harvesting, the harvester is cleaned of all residues, and the parts that will come into contact with the product are washed if possible. Organic containers are used in the harvest of organic crops (Anonymous, 2010; Taşbaşı et al., 2003). In addition, it is recommended that the harvest moisture of the grain should be 13-14% to prevent cracking and shrinking the seed.

Moldy and shriveled grains must be removed before the field crops are put into storage. Grains should be placed in clean containers in clean storage to ensure uniform grain temperature (Anonymous, 2010; Bulut, 2011b).

Conclusion and Future Trends

Today, environmental factors and unhealthy food consumption are factors for cancer increase and the emergence of problems that adversely affect human health, especially for infant development. In order to develop organic agriculture in Turkey, implementation of support policies, research-development and extension studies for the initiation and dissemination of organic farming in the places where ecologically more suitable for organic farming, the transition period may be shorter and easier. It is great important that organic crop farming can contribute to rural development socially and economically. Turkey has suitable organic farming conditions since it has suitable climate, soil, water resources, product diversity and high work force and population in agriculture. In terms of organic farming, it is predicted that employment will increase with organic agriculture and contribute to rural development. Due to the prohibition of synthetic pesticides in the pest control method in organic farming, almost all of the biological and mechanical applications are cultural. The widespread use and necessity of cultural measures, biological control and mechanical control practices in organic agriculture is an important indicator of the contribution to sustainable agriculture. Within the framework of Turkey's EU membership perspective, the main objectives are to improve income distribution, fight poverty, activate regional development dynamics and increase the contribution of agriculture.

In this respect, care must be taken to suspend organic crop production materials, increase the investment potential to be made, and create opportunities that provide information flow for the organic producers. Despite the increasing export of organic farm products of Turkey, its share in the world organic production and food market is very low. The organic products and produced foods, especially in North American and European countries, cannot meet the increased demand. Therefore, these markets potential offer a good opportunity for developing countries such as Turkey whose ecology and infrastructures are suitable for organic farming and organic product export. Increasing and diversifying organic production is one of the issues that should be emphasized. For accepting the organic

farming in Turkey, issues such as market guarantee, purchase support, input subsidy, income support, credit facilities and premium price application should be given. Supporting domestic market companies, increase consumer education and awareness, lowering the prices of organic products and establishing new organic markets will contribute to the expansion of the organic markets.

As a result, organic agriculture is a great opportunity for Turkey to become an organic farming base in the future. Informing consumers on every issue and creating consumer awareness are of great importance for development of organic farming. Currently all legislation and legal regulations for organic farming in Turkey are in line with the European Union. By using this legal support, Turkey's goal in the short term should be the development and expansion of the domestic organic market. For the adoption and dissemination of organic agriculture, organic agriculture should be encouraged through pilot projects in the areas whose ecology is suitable for organic farming, through relevant public and private institutions.

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The effect of camu camu (*Myrciaria dubia*) powder on lipid oxidation and microbiological properties of ground beef

Nazik Meziyet Dilek^{1*}, Kübra Ünal², Ali Samet Babaoğlu³, Mustafa Karakaya⁴

¹Nutrition and Dietetics, Akşehir Kadir Yallagöz School of Health, Selçuk University, Konya, Turkey, meziyettemel@hotmail.com, ORCID No: 0000-0003-2506-2067

²Department of Food Engineering, Agriculture Faculty, Selçuk University, Konya, Turkey, ulusoy_kubra@hotmail.com, ORCID No: 0000-0001-9005-6160

³Department of Food Engineering, Agriculture Faculty, Selçuk University, Konya, Turkey, asmtbb@gmail.com, ORCID No: 0000-0003-4643-7454

⁴Department of Food Engineering, Agriculture Faculty, Selçuk University, Konya, Turkey, karakayam@hotmail.com, ORCID No: 0000-0002-6436-3658

Abstract

This study aims to evaluate the effects of camu camu powder on the physicochemical meat parameters and the growth of *Enterobacteriaceae*, *Pseudomonas*, total mesophilic aerobic bacteria (TMAB) and psychrotrophic bacteria in ground beef. Batches of ground beef were mixed with 0.0%, 5% and 10% camu camu powder and stored at 4 °C for seven days. pH, TBA number, color and microbiological analyses were carried out on days 1 and 7. Camu camu powder decreased pH in ground beef from 5.93 to 4.77. The TBA number of control group (%0.0 camu camu powder) was 4.53 mg MDA·kg⁻¹ while the addition of camu camu powder significantly reduced the TBA number to 0.50 and 0.47 mg MDA·kg⁻¹, respectively (p<0.05). However, increasing the ratio of camu camu powder used did not make a significant difference (p>0.05). Camu camu powder addition changed the color properties of the samples. *a** value decreased (from 15.78 to 8.22) and *b** value increased (from 8.95 to 15.53), while *L** was not affected statistically (p>0.05). Increasing rates of camu camu powder usage have significantly (p<0.05) reduced *Enterobacteriaceae*, *Pseudomonas*, TMAB and psychrotrophic bacteria in ground beef. During the storage period, no significant differences in ground beef pH and *L** values of between camu camu powder added and control samples were observed (p>0.05).

Key Words: camu camu powder, antioxidant, antimicrobial, natural, ground beef

Introduction

Meat and meat products are one of the most important food resources in terms of providing a healthy and balanced diet and meeting the protein requirements of the increasing world population. However, the shelf life of meat containing high protein, fat, essential amino acid, and mineral value is shortened due to microbial growth and oxidation. Ground meat is especially sensitive to quality deterioration because of the increased water content after cell disruption. The minced process promote the oxidative processes resulting in the formation of undesirable substances (Ahmad, Gokulakrishnan, Giriprasad, & Yattoo, 2015; Tamkutè et al., 2021).

The usage of antioxidant is known to be one of the alternative methods for the control of oxidation in meat and meat products. Natural compounds have been used to formulate products to promote health and food safety (Tiwari et al., 2009). Therefore consumers are concerned about using of synthetic additives and generally prefer natural products.

Myrciaria dubia is one of the popular fruit from the Amazon region. This fruit is a member of *Myrtaceae* family, its pulp is a reddish color and has received more attention due to the high nutritional and functional properties. Researches have indicated that it is a good source of flavonols, polyphenols, anthocyanins, ascorbic acid, gallic acid etc. (da Silva, Cadavez, Lorenzo, Figueiredo, & Gonzales-Barron, 2021; Fidelis et al., 2020; Fracassetti, Costa, Moulay, & Tomás-Barberán, 2013). *Myrciaria dubia* products such as whole fruits, pulp, juice have been begun to use all over the world. Therefore, it is also reported that *Myrciaria dubia* powder also have exhibit antioxidant capacity, antimicrobial property and higher polyphenol contents (Kaneshima, Myoda, Toeda, Fujimori, & Nishizawa, 2017). From this point of view, it can be considered as a natural antioxidant for meat and meat products.

The present research aimed to evaluate the effects of *Myrciaria dubia* powders on some quality properties such as pH, TBA, color, and microbiological of ground meat.

Materials and Methods

Materials

Ground beef samples were obtained from a local marketplace in Konya, while camu-camu powder was purchased from The LifeCo Industry (Istanbul, Turkey).

Preparation of ground beef patty samples

Ground beef samples with camu camu powder were prepared by adding three concentrations (0.0%, 5% and 10%). Prepared beef patties were stored in a refrigerator at 4 °C for 7 days and the pH, TBA number, color and microbiological analyses were performed at 1 and 7 days of storage.

Determination of pH value

The pH value was measured via pH meter according to method given by Lambooi, Potgieter, Britz, Nortje, and Pieterse (1999).

Determination of TBA number

The lipid oxidation of ground beef samples was determined by measuring TBA number on the 1 and 7 days of the storage period and results were given as mg malonaldehyde (MA) / kg of sample.

Determination of color parameters

L^* (lightness), a^* (redness) and b^* (yellowness) parameters of samples were determined using a colorimeter (Minolta CR 300, Osaka, Japan). Color measurement was made perpendicular to the sample surface at four different locations per sample, and mean values from each sample were analyzed.

Determination of microbiological quality

Enterobacteriaceae, *Pseudomonas*, total mesophilic aerobic bacteria (TMAB) and psychrotrophic bacteria in ground beef samples were determined according to (Gokalp, Kaya, Zorba, & Tulek, 1999). The microbiological counts were expressed as log₁₀ colony-forming units per gram of ground beef sample (log₁₀ CFU/g).

Statistical analysis

The pH, L^* , a^* , b^* , TBA number and microbiological counts, underwent an analysis of variance and Tukey Multiple Comparison Test to determine potential differences camu camu powder levels at a significance probability level of 0.05. All statistical analyses were carried out using the MINITAB release 18.0 program (Snedecor & Cochran, 1980).

Results and Discussion**Physicochemical Characterization of Ground Beef Containing Camu-Camu Powder**

Table 1 presents the physicochemical parameters of the ground beef samples subjected to camu camu powder treatments. Camu camu powder addition was significantly ($p < 0.05$) affected the pH value of samples. Increased camu camu powder concentrations caused the decline in pH values from 5.93 (0.0%) to 4.77 (10%). But during storage period, there was no significant effect ($p > 0.05$) on the pH value. Contrary to the results obtained in our study, Guedes-Oliveira et al. (2018) stated that the addition of 100 ppm of camu-camu peel and seed extracts led to increases in pH values from 6.01 to 6.16 in ground-lamb meat. Similarly, another study reported that pH values increased from 5.47 to 5.66 when camu camu powder is added to ground beef (da Silva et al., 2021).

Camu-camu powder addition on the ground beef samples significantly declined ($p < 0.05$) TBA number from 4.53 mg malonaldehyde (MA)/Kg for control group to 0.50 mg malonaldehyde (MA)/kg and 0.47 mg malonaldehyde (MA)/kg for group of 5% and 10% camu camu powder including, respectively. It was determined that interactions between usage of camu camu powder and storage have significant effects for TBA number ($p < 0.05$). At the same time a 7-day storage period increased TBA number of samples about 1.11 times (Table 1).

Guedes-Oliveira et al. (2018) also reported that camu-camu extracts affected ($p < 0.05$) lipid oxidation values in chilled ground lamb meat treated with camu-camu peel and seed extracts and stored at 4 °C for 9 days under a normal atmosphere. In this study, control group presented 0.108 mg MDA/kg while treat groups presented 0.079 and 0.068 mg MDA/kg for peel and seed extracts respectively. da Silva et al. (2021) stated that the TBA number of ground beef samples decreased from 0.573 (mg MDA/kg) to 0.207 (mg MDA/kg) when the amount of camu camu powder used is increased from 0% to 5%. It was concluded that the camu-camu powder promoted the oxidative stability of foods, which may be associated with phenolic compounds present in camu-camu fruits.

Camu camu powder addition level significantly affected ($p < 0.05$) the color properties of the samples. As the increase of camu camu powder addition level, it was observed that a^* value decreased (from 15.78 to 8.22) and b^* value increased (from 8.95 to 15.53), while L^* was not affected statistically ($p > 0.05$). On the other hand, significant effects during the storage period were observed only for a^* and b^* value (Table 1). Similarly, Guedes-Oliveira et al. (2018) reported that no significant effects on L^* values in ground-lamb meat included camu-camu peel and seed extracts. Additionally, da Silva et al. (2021) noted that L^* did not differ between the initial and final storage days, with a mean value of 44.75, during the storage period, and concerning camu camu powder concentrations versus time. One study concluded that camu-camu powder resulted in a^* reductions from 14.45 to 13.44 and b^* increments from 17.41 to 21.25 in ground beef (da Silva et al., 2021). These findings are similar with our study. In addition another study concluded that camu-camu peel and seed extracts led to decrease of a^* value, from 16.29 and 13.33 to 10.19 in vacuum-packed ground lamb meat, but in this study, reductions in b^* values were also observed, from 16.29 to 11.25 and 13.33 to 10.19 for peel and seed camu-camu extracts, respectively (Guedes-Oliveira et al., 2018).

Table 1. Physicochemical parameters determined in ground beef containing different levels of camu-camu powder

Treatments	n	pH	TBA	L*	a*	b*
Camu camu powder ratio (A)						
Control	4	5.93±0.04 ^a	4.53±2.28 ^a	42.28±1.00	15.78±1.75 ^a	8.95±0.88 ^c
Camu camu (%5)	4	5.13±0.00 ^b	0.50±0.03 ^b	41.34±0.66	8.85±0.29 ^b	13.18±0.35 ^b
Camu camu (%10)	4	4.77±0.02 ^c	0.47±0.02 ^b	41.05±0.39	8.22±0.28 ^c	15.53±0.38 ^a
Significance		*	*	ns	**	**
Storage period (B)						
Day 1	6	5.28±0.54	1.18±1.08 ^b	41.77±0.94	10.60±2.87 ^b	12.96±2.75 ^a
Day 7	6	5.27±0.52	2.49±3.12 ^a	41.34±0.78	11.30±4.64 ^a	12.14±3.24 ^b
Significance		ns	*	ns	*	*
Interaction significance (AxB)		ns	*	ns	*	*

Mean ±standard deviation, Values with different superscripts indicate significant differences (p < 0.05), *p<0.05; **p<0.01; ns: not significant

Microbiological Quality of Ground Beef Containing Camu-Camu Powder

Table 2 and Figure 1 shows the effects of camu camu powder on microbiological counts of the ground beef samples. Both amount of camu camu powder addition and storage period had a significant effect on total mesophylic aerobic bacteria (TMAB), psychrotrophic bacteria, *Enterobacteriaceae* and *Pseudomonas* counts (p < 0.05) in ground beef stored at 4 °C for seven days (Table 2 and Fig. 1). The addition of camu-camu powder led to reductions in TMAB, psychrotrophic bacteria, *Enterobacteriaceae* and *Pseudomonas* counts from 7.32 (log CFU/g) to 5.64 (log CFU/g), from 7.22 (log CFU/g) to 5.65 (log CFU/g), from 5.46 (log CFU/g) to 1.23 (log CFU/g) and from 6.70 (log CFU/g) to 2.39 (log CFU/g), respectively. Similarly, in literature, many studies reported that camu camu fruit, pulp, peel, seed, extract or powder displayed antimicrobial activity against several microorganisms (Camere-Colarossi et al., 2016; de Azevêdo, Fujita, de Oliveira, Genovese, & Correia, 2014; Kaneshima et al., 2017).

Table 2. Microbiological counts of ground beef samples containing different levels of camu-camu powder

Treatment	n	TMAB**	Psychrotrophic bacteria***	Enterobacteriaceae***	Pseudomonas***
Camu camu powder ratio (A)					
Control (0%)	4	7.32±1.62 ^a	7.22±2.01 ^a	5.46±0.43 ^a	6.70±1.46 ^a
Camu camu (5%)	4	6.35±1.85 ^b	6.06±2.31 ^b	1.95±1.10 ^b	3.40±0.21 ^b
Camu camu (10%)	4	5.64±2.57 ^c	5.65±2.85 ^c	1.23±0.47 ^c	2.39±0.49 ^c
Significance		*	*	*	*
Storage period (B)					
Day 1	6	4.70±1.15 ^b	4.23±1.03 ^b	2.38±2.14 ^b	3.54±1.57 ^b
Day 7	6	8.17±0.44 ^a	8.38±0.45 ^a	3.38±1.99 ^a	4.79±2.48 ^a
Significance		*	*	*	*
Interaction significance (AxB)		*	*	*	*

Mean ±standard deviation, Values with different superscripts indicate significant differences (p < 0.05), *p<0.05; **p<0.01; ns: not significant; *** (log CFU/g)

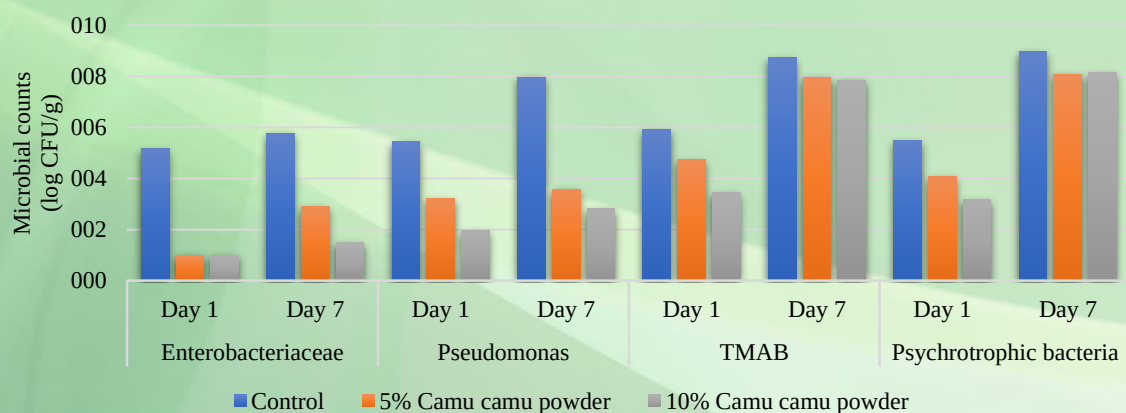


Fig. 1. Microbiological quality of ground beefs containing different camu-camu powder

Conclusions

Camu camu powder addition affected the a^* and b^* values of ground beef samples. However, camu camu powder significantly reduced the lipid oxidation and microbial counts of ground beef samples. These results showed that camu camu powder could be used as a promising natural antioxidant and antimicrobial agent in ground beef instead of synthetic additives. On the other hand, as a result of the literature review, it was concluded that more studies are needed in this area.

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Determination of Antioxidant Capacities of Mistletoe (*Viscum album ssp. austriacum*) Leaf and Bud Extracts Collected from Yellow Pine (*Pinus sylvestris* L.)

Fatma Ergün

Faculty of Health Sciences, Kırşehir Ahi Evran University, Kırşehir, Türkiye

Abstract

In this study, it was determined that total phenolic and flavonoid substance amounts and antioxidant capacity of methanol extracts obtained from leaves (Y) and buds (T) of mistletoe (*V. album ssp. Austriacum*, çeküm) collected from Northeast Anatolian Yellow Pine forests (*Pinus sylvestris* L.). The amount of total phenolic substance was determined as 19.55 ± 4.68 mg GAE/g in Y and 16.88 ± 2.77 mg GAE/g in T, while amount of total flavonoid substance 17.56 ± 2.53 mg QE/g in Y and 17.17 ± 3.29 mg QE/g in T. IC₅₀ values were calculated as 476.26 ± 22.54 µg/mL in Y and 778.57 ± 25.61 µg/mL in T. In addition, the reducing antioxidant powers of Fe³⁺-Fe²⁺ were calculated as 303.00 ± 1.73 µg AAE/mL in Y and 307.01 ± 1.05 µg AAE/mL in T, equivalent to ascorbic acid. As a result, it was seen that mistletoe which is considered harmful for yellow pines, has antioxidant properties. It has been concluded that the evaluation of mistletoe collected during the struggle with mistletoe as a natural antioxidant source may contribute economically.

Key Words: *Viscum album ssp. austriacum*, Phenolic substance, Flavonoid substance, Antioxidant,

Sarıçamlardan (*Pinus sylvestris* L) Toplanan Ökse Otu (*Viscum album ssp. austriacum*) Yaprak ve Tomurcuk Ekstraktlarının Antioksidan Kapasitelerinin Belirlenmesi

Özet

Bu çalışmada, Kuzeydoğu Anadolu Sarıçam (*Pinus sylvestris* L.) ormanlarından toplanan ökse otu (*Viscum album ssp. austriacum*, çeküm) bitkisinin yaprak (Y) ve tomurcuklardan (T) elde edilen metanol ekstraktlarının toplam fenolik ve flavonoid madde miktarı ve antioksidan kapasiteleri belirlendi. Toplam fenolik madde miktarı Y’de $19,55 \pm 4,68$ mg GAE/g, ve T’de $16,88 \pm 2,77$ mg GAE/g olarak, toplam flavonoid madde miktarları Y’de $17,56 \pm 2,53$ mg KE/g ve T’de $17,17 \pm 3,29$ mg KE/g olarak tespit edildi. IC₅₀ değerleri ise Y’de $476,26 \pm 22,54$ µg/mL ve T’de $778,57 \pm 25,61$ µg/mL olarak hesaplandı. Ayrıca Fe³⁺-Fe²⁺ indirgeyici antioksidan güçleri askorbik aside eşdeğer olarak Y’de $303,00 \pm 1,73$ µg AAE/mL ve T’de ise $307,01 \pm 1,05$ µg AAE/mL olarak hesaplandı. Sonuç olarak sarıçamlar için zararlı olarak kabul edilen ökse otunun antioksidan özelliğine sahip olduğu görüldü. Zararlı ile mücadele sırasında toplanan ökse otlarının doğal antioksidan kaynağı olarak değerlendirilmesinin ekonomik olarak katkı sağlayabileceği kanaatine varılmıştır.

Anahtar Kelimeler: *Viscum. album ssp. austriacum*, Fenolik madde, Flavonoid madde, Antioksidan.

The Investigation of Some Contaminants in Nut Butters and Chocolates

Buket Er Demirhan, Burak Demirhan

Department of Pharmaceutical Basic Sciences, Faculty of Pharmacy, Gazi University, Ankara, Turkey

Abstract

Mycotoxins and microorganisms are major contaminants in some foodstuffs. It is important that foods are free of contaminants that can adversely affect the health of humans. In this study, a total of 80 peanut butter, hazelnut butter and chocolate samples were obtained from local markets in Ankara (Turkey). These foods were analyzed for 12 toxicological important mycotoxins such as aflatoxin B1 (AFB1), B2 (AFB2), G1 (AFG1), and G2 (AFG2); fumonisin B1 (FB1), B2 (FB2); ochratoxin A (OTA); sterigmatocystin (STE); deoxynivalenol (DON); zearalenone (ZON); T-2 toxin and HT-2 toxin by LC-MS/MS multi-mycotoxin method. In addition to these analyses, the presence of total aerobic mesophilic bacteria was investigated in the samples. The samples were analyzed microbiologically using standard procedures. Finally, the minimum and maximum levels of AFB1, AFB2, AFG1, FB2, OTA, STE, DON, ZON, T-2 toxin and HT-2 toxin levels of the samples were found to be not detected (nd)-27.37 µg/kg, nd-6.19 µg/kg, nd-0.40 µg/kg, nd-2.93 µg/kg, nd-37.26 µg/kg, nd-2.25 µg/kg, nd-42.09 µg/kg, nd-7.57 µg/kg, nd-2.54 µg/kg and nd-7.43 µg/kg, respectively. AFG2 and FB1 were not detected in any of the samples. The most frequently detected mycotoxins in analyzed samples were OTA (78.75%) and AFB1 (75%). Also, total aerobic mesophilic bacteria were isolated from 53.75% of samples.

Key Words: Hazelnut butter, Chocolate, Mycotoxin, Total aerobic mesophilic bacteria, LC-MS/MS

Sert Kabuklu Kuruyemiş Ezmeleri ve Çikolatalarda Bazı Kontaminantların İncelenmesi

Özet

Mikotoksinler ve mikroorganizmalar bazı gıda maddelerinde önemli kontaminantlardır. Gıdaların insan sağlığını olumsuz yönde etkileyebilecek kontaminantlar içermemesi önemlidir. Bu çalışmada, Ankara'daki (Türkiye) yerel marketlerden toplam 80 adet fıstık ezmesi, fındık ezmesi ve çikolata örneği toplanmıştır. Bu gıdalar, aflatoxin B1 (AFB1), B2 (AFB2), G1 (AFG1) ve G2 (AFG2), fumonisin B1 (FB1), B2 (FB2); okratoksin A (OTA); sterigmatocystin (STE); deoksinivalenol (DON); zearalenon (ZON); T-2 toksini ve HT-2 toksini gibi 12 toksikolojik olarak önemli mikotoksin açısından LC-MS/MS çoklu mikotoksin yöntemiyle analiz edilmiştir. Bu analizlere ek olarak örneklerde toplam aerobik mezofilik bakteri varlığı araştırılmıştır. Örnekler standart prosedürler kullanılarak mikrobiyolojik olarak analiz edilmiştir. Sonuç olarak, örneklerin AFB1, AFB2, AFG1, FB2, OTA, STE, DON, ZON, T-2 toksin ve HT-2 toksin düzeylerinin minimum ve maksimum seviyeleri sırasıyla tespit edilemedi (te)-27,37 µg/kg, te-6,19 µg/kg, te-0,40 µg/kg, te-2,93 µg/kg, te-37,26 µg/kg, te-2,25 µg/kg, te-42,09 µg/kg, te-7,57 µg/kg, te-2,54 µg/kg ve te-7,43 µg/kg olarak bulunmuştur. Örneklerin hiçbirinde AFG2 ve FB1 tespit edilmemiştir. Analizi yapılan örneklerde en sık saptanan mikotoksinler OTA (%78.75) ve AFB1 (%75)'dir. Ayrıca, örneklerin %53.75'inden toplam aerobik mezofilik bakteri izole edilmiştir.

Anahtar Kelimeler: Fındık ezmesi, Çikolata, Mikotoksin, Toplam aerobik mezofilik bakteri, LC-MS/MS



CRISPR/Cas9 mediated genome editing in crop plants

Abdulrezzak Memon

Department of Molecular Biology and Genetics, Faculty of Science and Letters, Usak University, Turkey

Abstract

Recently, most genomic research has focused on genome editing methods to develop new technologies that could be easy, reliable, and feasible to edit plant genomes for highly productive agriculture. Genome editing is based on alternating a specific target DNA sequence by adding, replacing, and removing DNA bases. This newest technology called CRISPR/Cas9 seems to be less time-consuming, more effective and used in many research areas of plant genetic research. This new genome editing CRISPR/Cas9 system (CRISPR being an acronym for clustered regularly interspaced short palindromic repeats, and Cas9 being an acronym for CRISPR associated protein) have many advantages in comparison with ZFNs and TALENs). CRISPR/Cas9 techniques have been extensively used for genome editing to many crop plant species; around 20 crop species are successfully worked out for trait improvements, for example, yield improvement, disease resistance, herbicide tolerance, and biotic and abiotic stress management. In this presentation I will overview recent advances in CRISPR/Cas genome editing research in detail. The main focus will be on the use of CRISPR/Cas9 technology in plant genome research.

Key Words: CRISPR, cas9, genome editing, Plants, ZFNs, TALENs

Effects of various palm-based oils on rheological and textural characteristics of cheese spread

Nur Haqim Ismail¹, Norazura Aila Mohd Hassim¹, Rafidah Abd Hamid¹, Saw Mei Huey¹, Noor Lida Habi Mat Dian¹ and Sivaruby Kanagaratnam¹

¹Product Development and Advisory Services, Malaysian Palm Oil Board, No. 6, Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia.

Abstract

In this work, cheese spreads containing palm oil (PO), palm mid fraction (PMF), palm kernel oil (PKO), and red palm olein (RPOo) and anhydrous milk fat (AMF) as the control were evaluated for the rheological and textural properties at 4°C and 25°C. PMF had the highest content of long chain saturated fatty acids. The main fatty acids of PO, PMF, and RPOo were palmitic acid (43.69 %, 42.68 % and 35.44 %, respectively) and oleic acid (39.02 %, 38.23 %, 40.99 % and 45.26 %, respectively). Palmitic acid was the dominant fatty acid discovered in AMF (37.92%) suggested that the palm-based fractions are suitable for milk fat substitution. Viscoelasticity was assessed using a controlled-stress rheometer using parallel-plate geometry. The textural characteristics of cheese spread were measured using the spreadability test. For all cheese spread, the linear viscoelastic range increased when the temperature decreased from 25 to 4°C. The effects of temperature on the linear viscosity range and on G' and G'' values in this region were greater for cheese spread made with PMF. Cheese spread made with PMF showed the highest firmness and spreadability among all samples. These results indicate that different types of fat affect the rheological and textural properties of cheese spread.

Key Words: Cream cheese, Palm oil, Fatty acid composition, Texture, Rheology

Investigation Of Some Chemical Values in Milk Produced in Small Farms

Halil Yalçın¹

¹Burdur Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology, Burdur, Turkey

Abstract

Milk and dairy products, which are one of the most important outputs of animal production, are important foodstuffs that must be taken from all age groups in a certain amount per day in order for individuals to maintain their lives in a healthy way. The access of the increasing population to chemically and microbiologically qualified milk depends on many factors such as animal health, diet, hygienic milking, processing and storage conditions. It is also important to know the nutritional values of milk, which is so necessary for our health. For this purpose, the fat, protein, lactose and non-fat dry matter content of 60 milk samples obtained from small-scale (2-10 head) dairy farms (Yeşilova-Burdur) were investigated with the Bentley Combi 150 (Chaska, USA) device. The lowest and highest values for parameters measured in the samples were determined as 2.16% and 5.35% for fat, 2.55% and 4.54% for protein, 3.99% and 4.97% for lactose, and 6.95% and 9.62% for non-fat dry matter, respectively. As a result of our study, the mean values of the parameters studied in the samples were found as 3.35 ± 0.54 (mean $\pm$ std) for fat, 3.21 ± 0.28 for protein, 4.64 ± 0.17 for lactose and 8.67 ± 0.47 for non-fat dry matter. On the other hand, it was determined that 5 samples (8.33%) did not comply with the Turkish Food Codex in terms of protein amount. Moreover, 2 samples (3.33%) did not comply with the Turkish Food Codex in terms of fat-free dry matter. When the average lactose value in milk was accepted as 4.6%, the mean values of lactose level in 20 samples (33.33%) were below this value. It is considered that animals from which milk with low values in terms of the examined parameters may have problems related to nutrition and health. It is recommended to increase the routine controls in order to prevent the deception of the consumer, the compliance of raw milk with the regulations and to make the milk subsidy correctly.

Key Words: Milk, Chemical Composition, Nutritional Value

Küçük İşletmelerde Üretilen Sütlerde Bazı Kimyasal Değerlerin İncelenmesi

Özet

Hayvansal üretimin en önemli çıktılarından biri olan süt ve süt ürünleri her yaş grubundan fertlerin hayatlarını sağlıklı sürdürebilmeleri için günde belirli miktarda alınması gereken önemli bir gıda maddeleridir. Her geçen gün artan nüfusun kimyasal ve mikrobiyolojik olarak nitelikli süte ulaşması hayvan sağlığı, beslenme şekli, hijyenik sağım, işleme şekli ve muhafaza şartları gibi birçok faktöre bağlıdır. Sağlığımız açısından bu denli gerekli olan süütün besleyici değerlerinin de bilinmesi önemlidir. Bu amaçla çalışmamızda küçük ölçekli (2-10 baş) süt işletmelerinden (Yeşilova-Burdur) sağlanan 60 adet süt örneğinin yağ, protein, laktoz ve yağsız kuru madde miktarı Bentley Combi 150 (Chaska, USA) cihazı ile araştırılmıştır. Örneklerdeki en düşük ve en yüksek parametre değerleri sırası ile yağ için %2.16 ve %5.35, protein için %2.55 ve %4.54, laktoz için %3.99 ve %4.97 ve yağsız kuru madde için %6.95 ve %9.62 olarak tespit edildi. Çalışmamız sonucunda örneklerdeki ortalama değerler yağ için 3.35 ± 0.54 (ort $\pm$ std), protein için 3.21 ± 0.28 , laktoz için 4.64 ± 0.17 ve yağsız kuru madde için 8.67 ± 0.47 olarak bulunmuştur. Ayrıca elde edilen değerler Türk Gıda Kodeksi (No: 2019/12) göre değerlendirildiğinde yağ miktarı açısından 16 örneğin (%26.66) tam yağlı, diğerlerinin ise (%73.34) yarım yağlı sınıfta yer aldığı tespit edilmiştir. Diğer taraftan, protein miktarı açısından 5 örneğin (%8.33), yağsız kuru madde bakımından ise 2 örneğin (%3.33) Türk Gıda Kodeksine uymadığı belirlenmiştir. Sütte ortalama laktoz değeri %4.6 kabul edildiğinde, 20 (% 33.33) örneğin bu değerin altında kaldığı tespit edilmiştir. İncelenen parametreler açısından düşük değerlere sahip sütlerin elde edildiği hayvanların beslenme ve sağlıkla ilgili sorunları olabileceği düşünülmektedir. Çiğ süütün yönetmeliklere uygunluğu ve tüketicinin aldatılmasının önüne geçilmesi ve süt desteklemelerinin doğru yapılabilmesi için rutin kontrollerin artırılması önerilmektedir.

Anahtar Kelimeler: Süt, Kimyasal Kompozisyon, Besin Değeri

Production And Characterization Of Breadfruit (*Artocarpus Altilis*) Bread Flour

Assogba Karl T. ^{1*}, Tchekessi C. K. Célestin¹, Tella Huguette¹, Sachi S.A. Pivot¹, Da Matha Raymond³, Bleoussi T. M. Roseline¹, Banon Jultesse¹, Djogbe Anayce¹, Azokpota Paulin² & Bokossa Yaou P. Innocent¹

¹ Food Health Safety Research Unit (URSSA), Microbiology and Food Technology Laboratory (LA.MI.T.A), Department of Plant Biology, Faculty of Sciences and Technologies (FAST), Abomey- Calavi University (UAC), 04BP 1107 Cotonou, Republic of Benin.

²Food Sciences Laboratory (LSA), Laboratory of Food Formulations and Molecular Biology (LAFAB); Department of Nutrition, Food Science and Technology, Faculty of Agricultural Sciences (FSA), University of Abomey-Calavi (UAC), 02 BP 2810 Cotonou, Republic of Benin.

³Faculty of Economic Sciences and Management (FASEG), University of Abomey-Calavi (UAC), 01 BP 3050 Cotonou; Republic of Benin.

Abstract

The breadfruit native to Indonesia is a plant available in Benin but endangered due to the limited data available on its use. The general objective of this work is to characterize the flour of breadfruit and its suitability for use in bread formulas. To achieve this, breadfruit flour was produced and the water, ash, protein and fiber contents were determined. The flours produced were used to make formulations first with wheat flour only and secondly with wheat flour and cassava flour. The flour mixtures developed were characterized and were used in the production of French-type bread. Physico-chemical analyzes carried out, it appears that the flour of the breadfruit contains on average 2.487% of proteins, 2.875% of ash, and 3.01% of fibers. Its water content is 3.18%. Of all the formulations made (10%, 15%, 20%, 25% and 30%) with the flour of the breadfruit and that of the wheat, only the formulation with 10% of the flour of the breadfruit gave a better bread and more appreciated by the panelists. In the formulations in which cassava flour and breadfruit flour are used in the same proportions, only bread with 10% of the cassava flour and breadfruit flour was little appreciated by the panelists. The formulation made with 10% of the breadfruit and wheat flour is the most suitable.

Keywords: Breadfruit fruit, flour, characterization, food formulations, Benin.

Introduction

Native to Polynesia and Indonesia, the breadfruit (*Artocarpus altilis*) has been introduced to Benin from the West Indies since the days of slavery (Zerega et al., 2004; Azokpota, 2012). The Departments of Ouémé and Plateau constitute the areas of high production (Azokpota, 2012). The fruit is abundantly available for a short period of time and is difficult to keep fresh over a long period (Roberts-Nkrumah, 2007). Numerous works carried out have revealed a post-harvest loss of the fruit of nearly 50% (Akouéhou, 2012; Azokpota, 2012). It is included in the list of underutilized foods (Knudsen et al., 2008). The name of breadfruit certainly comes from the fact that its transformation could give bread products. Indeed, the fruit would then have the ability to be used for bread-making (Agudo del pozo, 2014). Thus, attempts to add value to breadfruit through the manufacture of cakes of the "cake" type have been reported (Akouéhou, 2012; Azokpota, 2012), like many studies on the development of composite flours in which a part wheat flour is replaced by other starchy sources (Dendy et al., 1973; Berthelot, 1990; Defloor, 1995). Many varieties of maize, sorghum and tubers have been reported to be suitable for breadmaking (Abimbola et al., 2010). In Nigeria, the yam variety *Dioscorea rotundata*, which has a starch content of 20-25% and responds very favorably to milling has been used to produce flour in bread formulas (Attaie et al., 2009). In Cameroon, the flour from the cassava variety IRA 8006 is used for bread making with a dry matter content of 35% (Bangré, 2005). Once the bread flour is obtained, there are several methods of making bread and other good quality pastry products. As such, several derived products have been obtained from bread-making compound flours obtained from roots and tubers and from cereals. For example, English type sandwich breads made from sweet potato, cassava, sorghum and maize and French type breads, traditional donuts and pancakes made from maize, sorghum and cassava, as well as pastries were obtained from these compound flours (Feillet, 2000). In general, it has been found that a flour is said to be non-breadmaking when it does not contain gluten, this constituent which makes the dough "rise" (Gallagher et al., 2004). Compound flours (also known as substitution) come either from tubers or roots (cassava, yam, potato, sweet potato), or from legume protein concentrate (soybean, cowpea), or from cereals (maize, sorghum, etc.). These mixtures are suitable for making breads, cookies, pasta, various cakes (Guinet, 1992). It is therefore possible to obtain from breadfruit flour formulations derived from flours composed of cereals and / or roots and tubers with a small proportion of wheat flour for the manufacture of derived products such as cakes, , pancakes, English or French breads to a certain extent (ORSTOM, 1977). In Benin, as in most developing

countries, products derived from wheat flour occupy a very important place in human food. For example, bread, sweets, cakes and pasta are widely consumed (FAO, 2008). However, access to these products is becoming more and more difficult given their prices which keep increasing year after year. By way of illustration, the price of bread, which was 60 FCFA in 1996, rose in 2017 to 125 FCFA or even 150 FCFA in certain localities of the country (MAEP / MIC, 2008). The main cause for this continued increase in the price of these products is the local unavailability of wheat. As the wheat is not produced at home in Benin, it is imported. Suddenly, the slightest disturbance in world production and the simple increase in the price of oil has repercussions on the price of wheat flour. This is how the recent economic crises of 2008-2009 made the situation more alarming than ever. The cost of wheat flour being at US \$ 200 in 2007 had increased to US \$ 500 in 2008 (FAO, 2008). For this, research is therefore called upon in order to make other bread-making flours available to populations from food products grown in Benin. The general objective of the study is to enhance the breadfruit by using its flour in bread formulas.

Methodology

The material used consisted mainly of breadfruit, cassava roots and wheat flour. Breadfruit was purchased in the Communes of Dangbo and Avrankou. They were transported in jute bags by car and motorcycles. The fruits were spread out on the ground and were processed the next day. As for the cassava roots, they were bought in Houèdo in the commune of Abomey-Calavi. The transport was done in jute bags and by means of motorcycles. The sweet variety was the one used for this production. Processing of cassava roots took place on harvest day. Finally, as for the wheat flour, it had been bought in Akassato in the commune of Abomey-Calavi on the day of the production of the breads.

Production of breadfruit and cassava flour

The breadfruit flour was produced using the production technology described by Azokpota (2012). The different stages of this production are summarized in the diagram illustrated in figure 1. As for cassava flour, the production technology used is that developed by CORAF / WECARD (2011). Figure 2 illustrates the technological diagram of cassava flour production.

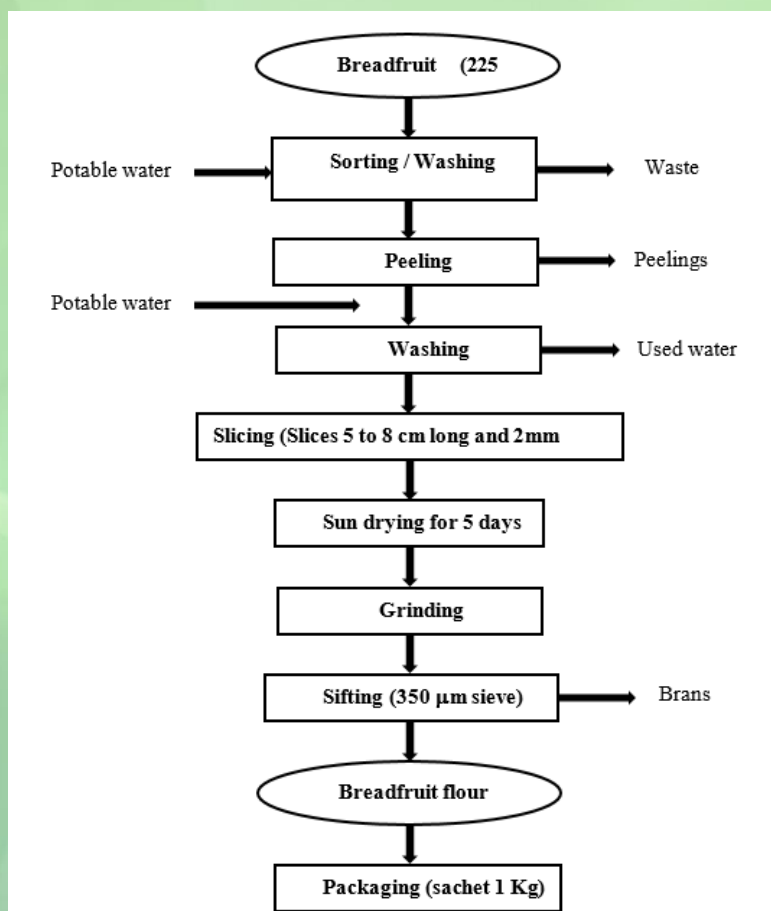


Figure 1. Technological diagram of breadfruit flour production

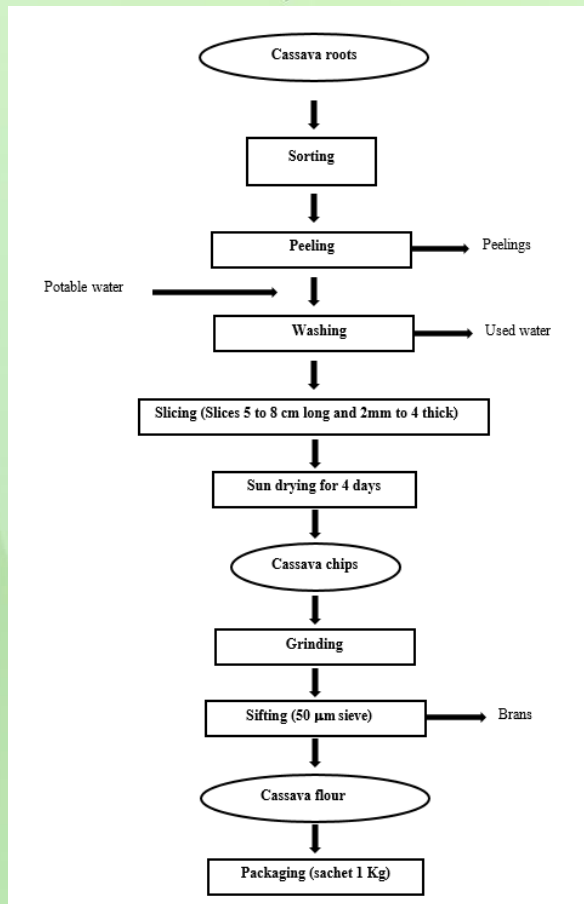


Figure 2 Technological diagram of cassava flour production

Formulation tests

The flours obtained were used for the formulations summarized in Tables 1 and 2. These formulations follow on from previous work on breadfruit flour by Azokpota (2012) and Nacitas (2012). Likewise, they were based on the standards and regulations of mixed breadmaking in Benin (Decree No. 2008-571).

Table 1. First series of formulation tests

Types of flour	Incorporation rate (%)				
Breadfruit flour	10	15	20	25	30
Wheat flour	90	85	80	75	70

Table 2. Second series of formulation tests

Types of flour	Incorporation rate (%)				
Breadfruit flour	10	15	20	25	30
Cassava flour	10	15	20	25	30
Wheat flour	80	70	60	50	40

Evaluation of the physico-chemical characteristics of flours

• Determination of the water content

The determination of the water content (TE) is carried out according to the AOAC method (1990).

• Determination of protein content

The total protein content is determined by the AOAC method (1990). It was calculated using the conversion factor 6.25 (AOAC 46-11A, 1990). The results expressed represented the average of three trials.

• Determination of ash content

The crude ash content of flour is determined according to the AOAC method (1990).

• Determination of the dietary fiber content

1g (W1) of the sample in a ground-neck Erlenmeyer flask then add 200 ml of 1.25% H₂SO₄ previously heated and slightly cooled (around 80-85 ° C) and a few drops of antifoam. Heat this mixture slowly to reflux, 30 min from the start of boiling, then filter under vacuum through a round filter paper placed in a Büchner. Rinse the filter

paper with 200 ml of 1.25% NaOH previously heated in a cooled Erlenmeyer flask (around 80-85 ° C). Heat this mixture slowly to reflux, 30 min from the start of boiling, then transfer all the insoluble matters into a target raw meal by filtering the contents of the Erlenmeyer flask using a vacuum pump. Rinse the contents of the target raw meal successively with boiling water then 1% HCl then with boiling water, then rinse twice with ethanol and then three times with acetone. Dry the target raw wines in an oven at 105 ° C for 1 hour, let them cool and weigh (W2). Incinerated in an oven at 550 ° C for 1 h then cooled and weighed (W3).

$$\% \text{ crude fiber} = W2 - W3 / W1$$

Bread production

The bread was produced according to the technological production diagram used in the Agro-technical center. This production diagram is illustrated in Figure 3.

Evaluation of the organoleptic characteristics of the breads produced

The breads produced were tasted by a panel made up of 30 tasters following a 5-level hedonic test (see appendix). Each loaf was assessed for color, swelling, taste, odor and overall acceptability at levels pleasant, somewhat pleasant, neither pleasant nor unpleasant, somewhat unpleasant and unpleasant. The tasters were chosen at random and trained for the occasion. The order in which the breads were presented to the tasters varied from person to person. The data after tasting was processed in software R. The database was established using an Excel spreadsheet.

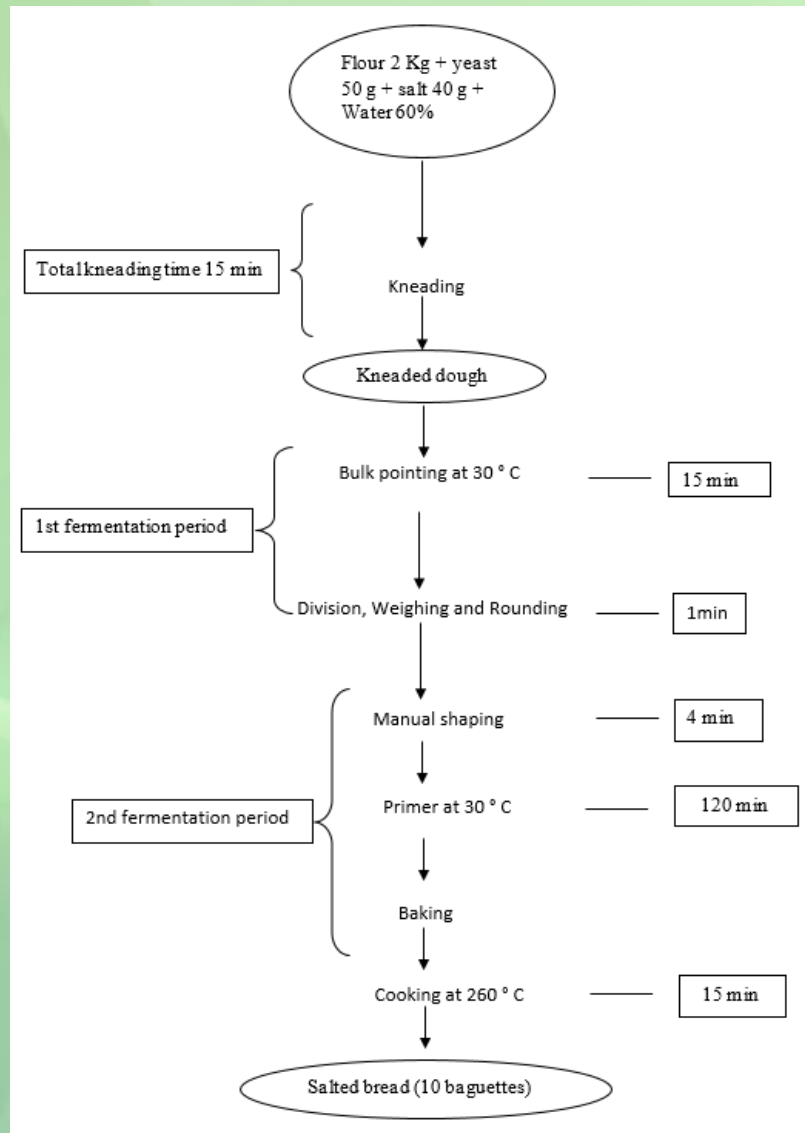


Figure 3. Technological diagram of salted bread production

Results

Breadfruit flour

Physicochemical characteristics of the flours produced

In Table 3, the physicochemical characteristics of cassava flour and breadfruit are presented.

Table 3. Physicochemical characteristics of cassava flour and breadfruit

	Protein content %	Ash content %	Moisture %	Fiber %	Particle size in μm
Breadfruit flour	2,487	2,8751	3,18	3,01	350
Cassava flour	0,964	1,3538	4,552	1,64	350

From the analysis of this table, it emerges that breadfruit flour is respectively more than 2 times richer in protein and ash than cassava flour. Likewise, it is almost twice as rich in fiber as that of cassava. On the other hand, cassava flour is almost 1.5 times wetter than that of breadfruit.

Bread production

The flours developed were used in the production of French breads. In the first substitution, the formulations obtained from 25% and 30% of the flour of the breadfruit added respectively to 75% and 70% of the wheat flour gave the kneading of hard, porous dough whose tenderness was lower than that obtained with 100% of the wheat flour. The breads made from these formulations could not be presented to the tasters because of their textures. Likewise, in the second substitution the pasta obtained from the mixture of 20%, 25% and 30% of the cassava flour and the same proportions of the breadfruit flour with respectively 60%, 50% and 40% of wheat flour gave hard dough with less extensibility than ordinary bread (100% wheat). Only the breads obtained from 10% (F1), 15% (F2) and 20% (F3) of the breadfruit flour with respectively 90%, 85% and 80% of the wheat flour gave after kneading dough having similar characteristics to ordinary bread dough in the first substitution. At the level of the second substitution, the breads obtained from the F4 and F5 flours had characteristics similar to those of ordinary bread.

Organoleptic characteristics of breads

The breads resulting from the F1, F2, F3, F4 and F5 flours were presented to the tasters to be appreciated on the basis of a tasting sheet. Analysis of the data from this tasting gives the following results. Figure 4 illustrates the overall acceptability of breads made from F1, F2, F3, F4 and F5 flours.

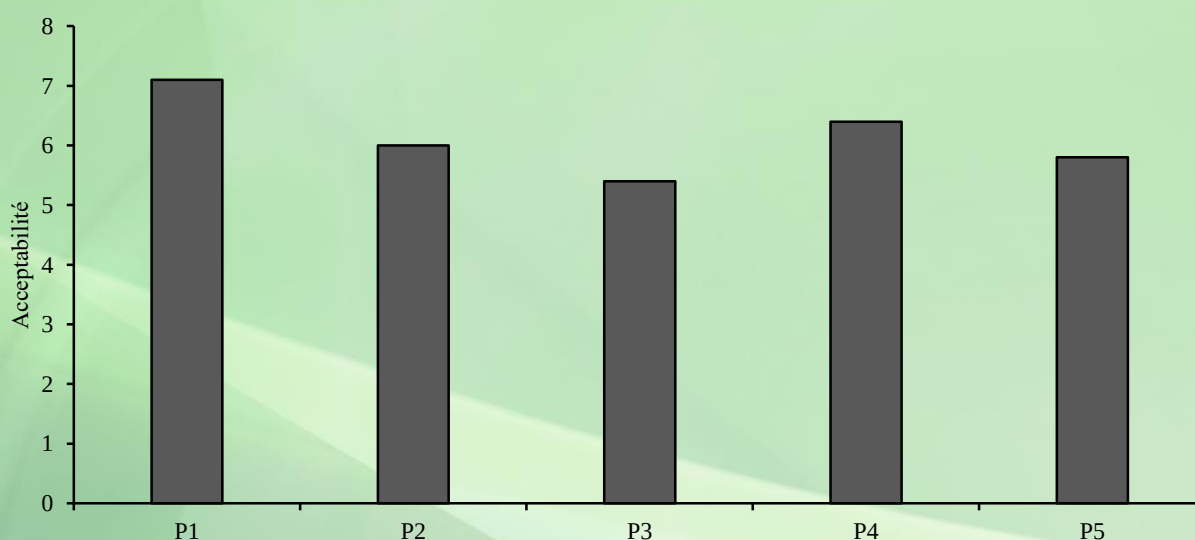


Figure 4. Overall acceptability of breads made from F1, F2, F3, F4 and F5 flours

The analysis in Figure 4 generally shows that P1 bread is the one most appreciated by tasters. P4 bread is second followed by P2, P5 and P3 breads respectively. The photo illustrates the images of breads P1, P2, P3, P4 and P5. The Principal Component Analysis (PCA) carried out on the tasting data and the correlation between these and the physicochemical characteristics of the flours from which the breads were derived gave the results presented in Table 4 and illustrated in Figure 5.



Photos: Images of breads P1, P2, P3, P4 and P5

Table 4. Correlations between principal components and variables

Variables	Component 1		Component 2	
	Cor	P-value	Cor	P-value
Fiber	0.97	0.005	-	-
Ash	0.92	0.025	-	-
Acceptability	-0.99	0.001	-	-
Swelling	-0.99	0.001	-	-
Taste	-	-	0.95	0.014
Moisture	-	-	-0.26	0.010
Color	0.86	0.001	-	-
Odor	-	-	0.74	0.001
Protein content	-	-	-0.83	0.001

From this table, it emerges that the two principal components are sufficient to guarantee the reliability of the results because they concentrate 95.75% of the information. The analysis of Figure 5 shows that the overall popular P1 bread with good swelling is obtained from a flour having low fiber and ash content. On the other hand, P3 bread with a high protein and fiber content does not have good swelling but a more appreciated color. P4 and P5 breads have a pleasant smell and taste and are made from a low protein flour. On the other hand, P2 bread made from flour rich in protein and with a high humidity rate has an odor and a taste that is not appreciated by tasters. The protein content can therefore be considered as a factor not only in the elasticity of the pasta but also in the taste and smell of the finished products (bread).

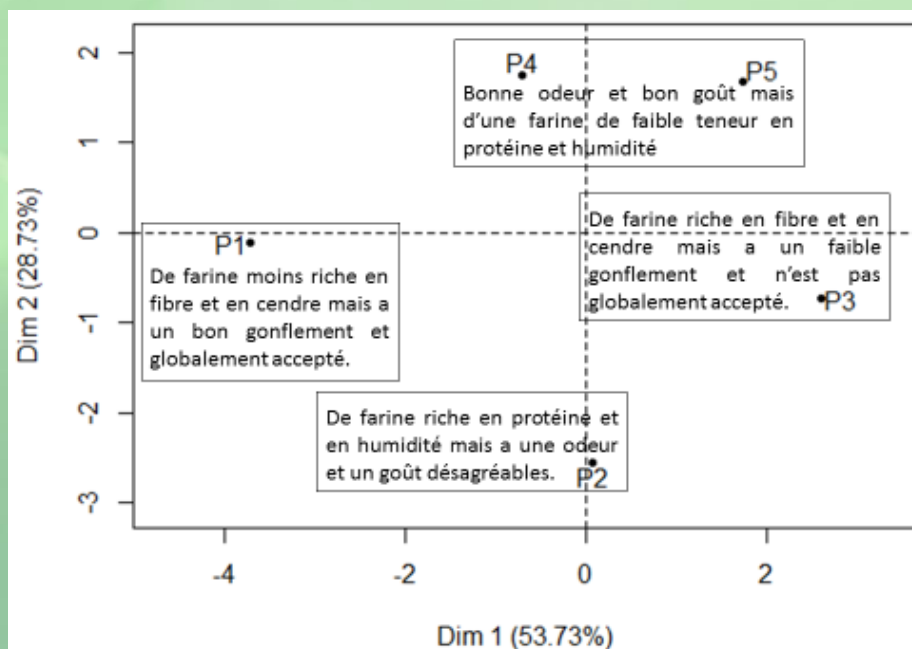


Figure 5. Characteristics of the flours used in the production of each bread

Discussion

The flours produced from the breadfruit have changed color. This change in color is due to the ripeness of the fruits. These results are close to those of (Azokpota, 2012) who also obtained a white flour and a gray one. He concluded that the color change is related to the stage of ripeness of the processed fruit. But this change in color may be related to the non-enzymatic browning that occurred during drying, because the fruits which had reached maturity and whose lamellae were well dried did not experience any change in color. Solar drying is therefore not suitable for transforming this fruit into flour. The work of Nacitas (2012) showed that pasta with the addition of 22 to 30% breadfruit flour was more porous. In this case, the fermentation cannot be prolonged because the gas production is low and / or the entrapment of the gases was less efficient. These works confirm the results previously found for the pasta obtained with 25% and 30% of the breadfruit flour. This observation can be explained by the low protein content of these flours because the gluten which is the fundamental element in the puffiness and the tenderness of the pasta is contained in the proteins. Bread flour intended for the production of French bread according to the International Standard (NI 4687, 2015) must have an ash content of between 0.60 and 0.62 and a fiber content of less than 1%. The values obtained for the F1 flour are slightly higher than the values fixed by the standard. But, of all the formulations, F1 flour is the one with a lower fiber and ash content. The work of Nacitas (2012) on breadfruit showed that the best formulation remains the one with an 11% addition of breadfruit flour. This confirms the appreciation of bread with 10% of the breadfruit flour by the tasters. The results obtained for P3 bread are similar to those of Nochera and Caldwell (1992) who had worked on breadfruit flour and concluded that the substitution of wheat flour at a rate of 20% by fruit flour bread is found acceptable in terms of color for breads as well as cookies. It emerges from this result that a flour having a high content of fiber and ash does not allow to have a well puffed bread but a bread of good color. In general, we find that as the flour content of breadfruit increases, the tenderness of the pasta decreases. This could be due to the low protein content of the breadfruit flour. Likewise, we find that the addition of cassava flour failed to correct this weakness. Indeed, cassava flour contains only 0.964% protein; which is much lower than the protein content of breadfruit. However, to correct this weakness, you need a flour with a higher protein content or an improver that could compensate for the protein deficit. The same observation was made by Olatunji and Akinrele (1978) after their work on the substitution of breadfruit flour by that of wheat and who reported that the amount of gluten as well as the pH decreased, with the consequence of decreasing of the development time of the dough. They also observed sagging of the dough. These same authors also noted that increasing the amount of breadfruit flour proportionally increased resistance to stretching and decreased stretchability of the dough. They explained their results by the fact that the gluten strands did not have enough strength and elasticity to withstand the large production of gas for good dough expansion; which caused the loaves to collapse. Their conclusion was that the bread is palatable and qualitatively acceptable for a 10% substitution rate of wheat flour by breadfruit flour.

Conclusion

The study carried out on breadfruit uncovered another form of valorization of the latter. Based on experience, breadfruit can be used for bread production. After incorporations into wheat flour in the proportions of 10%, 15%, 20%, 25% and 30% of the breadfruit flour, only one formulation remains the best, that with 10%. In a second substitution where cassava flour was added to the first substitution in the same proportions as that of breadfruit flour, only breads with 10% and 15% of each of the breadfruit and cassava flours gave bread similar to regular bread (100% wheat). These breads were little appreciated overall compared to bread with 10% of the breadfruit flour. This appreciation of the bread with 10% of the breadfruit flour is due to the swelling of this bread which is greater than the swelling of the other two which are more appreciated in relation to taste and smell.

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Evaluation of Potential Biocontrol Agents on *S. minor* Jagger

Raziye Koçak¹, Özden Salman², Nuh Boyraz³

¹Selçuk University, Çumra Vocational School, Animal and Plant Production Department, Konya, Turkey

^{2,3}Selçuk University, Faculty of Agriculture, Department of Plant Protection, Konya, Turkey

Abstract

This study was carried out to determine the antagonistic effects of 38 bacterial isolates isolated from the rhizospheric soil region of different plants against *S. minor* Jagger, which is one of the causative agents of white rot in sunflower. Approximately 37% of the bacteria tested in vitro suppressed mycelial growth of the pathogen at moderate or high levels. Bacteria that inhibit pathogens at a high level (80-100%) *in vitro* (*Pseudomonas chlororaphis* IDV5, *Bacillus amyloliquefaciens* IEB1, *Bacillus cereus* IPT3, *Stenotrophomonas* sp. IGL1, 2 unidentified bacterial isolates (IFG1 and IFG2)) were potted under climatic chamber conditions tested by work. According to our research results, all bacteria except *Pseudomonas chlororaphis* were 100% effective in pot experiments. In addition, although it is ineffective against *S. minor* *in vitro*, *Pseudomonas korenensis* (IFG4), which we have found to be successful *in vivo* conditions in different studies we have done before, was included in the trial and was found effective in this study as well. This result shows that some inhibitory properties of some rhizospheric bacteria, which play a role in suppressing the pathogen, appear when they come together with the plant. In conclusion, our study reveals that biological control is one of the alternatives to control soil pathogens in sunflower and can be used as a bioagent after investigating other properties of these antagonistic bacteria.

Key Words: *Sclerotinia minor*, Antagonist effect, Biocontrol, *Pseudomonas* sp., *Bacillus* sp.

Pesticide residues in food: A comparison study between Jordan and Hungary

Skandar Abu Gazlha¹, Riadh Ilahy² and József Kiss¹

¹Szent Istvan University, Faculty of Agricultural and Environmental Sciences

²University of Carthage, National Agricultural Research Institute of Tunisia, Laboratory of horticultural crops

Abstract

The presence of pesticides in fruits and vegetables is becoming a growing concern not only for consumer but also for growers, processors and competent authorities in the entire world. In Jordan, there are only four specialized laboratories which have the required infrastructure to accurately determine pesticide residues in agricultural products. The aim of this study was to investigate the presence of PPPs residues in nationally produced palm dates and olive oil for local consumption and exportation. Among the 283 pesticides analyzed, only 7 were detected in palm dates at concentrations ranging from detectable/quantifiable below the MRLs (4 µg/kg for carbendazim) to values above the MRLs attaining (508 µg/kg for carbendazim). Regarding olive oil, only 4 were detected at concentrations ranging from detectable below MRLs (20 µg/kg) for cypermethrin to higher than MRLs (260 µg/kg) for chlorpyrifos. The order of occurrence for PPPs in date samples was from the greatest to the lowest as follows: carbendazim (53.33%), hexythiazox (21.3%), spiromesifen (12%), thiacloprid and finazinan (2.6%), thiophanate-methyl (6.6%), and imidacloprid (1.3%) and was in olive oil as follows: chlorpyrifos (27.45%), cypermethrin (25.49%) and finally both oxyfluorfen and myclobutanil (3.92%). 84% of the date samples had pesticide residue lower than MRLs and only 16% had residue higher than MRLs. However, in olive oil samples, 49.01% had residue below the MRLs, 9.8% were above the MRLs and interestingly in 41.17% had no detected pesticide residues. The main part of the palm date tested samples (80.32%) were containing simple pesticide residue and (19.67%) exhibited double pesticide residue. However, in olive oil samples, only one of the reported pesticides was detected. Although the limited biological diversity (just one year samples), we suggest, the urgent implementation of programs designed to facilitate awareness about the health concerns from PPPs and programming a compulsory and periodical training sessions for specialized workers and traders in Jordan.

Keywords: Pesticide residues, date palm, olive oil, MRLs

Determination of Biocontrol Activities of *Bacillus* spp. and *Stenotrophomonas* sp. against *Macrophomina phaseolina* in Sunflower

Ozden Salman¹, Raziye Kocak², Nuh Boyraz¹

¹Department of Plant Protection, Faculty of Agriculture, Selcuk University, Konya, Turkey

²Çumra Vocational School, Selcuk University, Konya, Turkey

Abstract

Macrophomina phaseolina is a soil pathogen known as charcoal rot and can cause up to 90% yield loss in sunflower under suitable conditions. The serious damage caused by chemicals used in the control of soil-borne pathogens to the environment and health has become one of the most important concerns in agriculture. Therefore, in our study, it was aimed to determine the *in vitro* antagonistic effects of various bacterial species against *M. phaseolina*. A total of 38 bacterial strains *Malva sylvestris* (hibiscus), *Vicia sativa* (vetch), *Cicer arietinum* (chickpea), *Papaver rhoeas* (weasel), *Carlina marianum* (thistle), *Glebionis coronaria* (crown daisy) and *Vicia faba* collected from Urla district of İzmir were isolated from soil samples in the rhizosphere of plants. All bacterial strains exhibited antibiosis effect under *in vitro* conditions, but it was determined that 5 bacterial isolates among them showed a high inhibition zone and showed an average inhibition potential ranging between 55% and 74%. The most effective bacteria identified at species and genus level by Maldi biotyping (MALDI-TOF MS) were identified as *Bacillus amyloliquefaciens*, *Stenotrophomonas* sp. and *Bacillus cereus* (3 isolates), and these species showed that they can be important biocontrol agents in biological control against *M. phaseolina*.

Key Words: *M. phaseolina*¹, *Pgpr*², Antibiosis effect³, Sunflower⁴, Biocontrol⁵

Determination of the Antagonistic Effects of Some Rhizospheric Bacteria against *Macrophomina phaseolina* in vitro Conditions

Ozden Salman¹, Fatma Rana Bayram¹, Nuh Boyraz¹, Raziye Kocak²

¹Department of Plant Protection, Faculty of Agriculture, Selcuk University, Konya, Turkey

²Çumra Vocational School, Selcuk University, Konya, Turkey

Abstract

Macrophomina phaseolina (Tassi) Goid. which causes charcoal rot disease (Sin: *Rhizoctonia bataticola*) is a fungal disease that causes significant yield losses in many plants. In our study, it was aimed to determine the antagonistic effects of 39 bacteria isolated from sugar beet cultivation fields in Ilgın district of Konya province in 2019 against the pathogen *Macrophomina phaseolina* isolates isolated from sugar beet, beans and chickpeas. Approximately 31% of the bacteria used showed antibiosis effect against the pathogen. It was determined that *Lelliottia amnigena*, *Bacillus atrophaeus*, *B.pumilus* and *B. cereus* (7 isolates) species showed moderate or high effective against *Macrophomina phaseolina*. *Bacillus atrophaeus* (Pto15-1a coded isolate) showed the highest efficacy of 80%, 72.94% and 82.35%, respectively, against chickpea, bean and sugar beet isolates of the pathogen, while *Lelliottia amnigena* (Pto 14-1b) showed a moderate (57.78%) effect against the chickpea isolate of the pathogen. It was determined that *Lelliottia amnigena*, *Bacillus atrophaeus*, *B.pumilus* and *B. cereus* (7 isolates) species showed moderate or high activity against *Macrophomina phaseolina*. It was observed that of the seven *Bacillus cereus* isolates used in the experiment, three of them (Pto14-1a, Pto12-1b, Pto17-1b) had a high effect on the chickpea pathogen, two (Pto12-1b, Pto14-2b) on the bean pathogen, and one (Pto15-1b) on the sugar beet isolate. In the experiment, it was determined that the bacteria showed different antagonistic activity against different *Macrophomina phaseolina* isolates, while the high level of antibiosis effect of *Bacillus atrophaeus* against all pathogenic isolates showed that this bacterium could be used as a bioagent in future studies against the disease.

Key Words: *Macrophomina*1, Antibiosis2, *Bacillus*3, Bioagent4, Charcoal root5

Lebanese consumers' attitudes and perception towards Wild Edible Plants (WEP): a case study of *Salvia officinalis* (Sage)

Amin Nawal¹, khaled Sanaa¹, El Khatib Sami¹, krayem Maha¹

¹Department of Food and Science Technology, School of Arts and Sciences, Lebanese International University, Al Khyara, West bekaa, Lebanon

Abstract

Sage (*Salvia officinalis*) is one the most beneficial and popular wild edible plants in Lebanon. Despite of this, its consumption is limited mostly because it is not suitable for direct consumption or cooked. It is mainly used for the preparation of hot beverages. Thus, the aim of this study is to evaluate the Lebanese people knowledge about wild edible plants in general and more specifically about sage plant, its cultivation and health benefits, mode of consumption and their desire toward trying a new product containing sage. In order to reach our goal, an appropriate questionnaire is designed, followed by sensory analysis performed on olive oil fortified with sage. Questionnaire results show that out of 410 participants, 91% (373 participants) know and have informations about WEP. From these participants, 82% (306 participants) only know the sage plant. In addition, out of 306 participants, 78.4% do not know any product containing sage, yet 59.2% of them prefer the manufacturing of olive oil fortified with sage. Moreover, most of the participants (48.4%) are using sage for medical treatment. Finally, the olive oil fortified with sage was more preferred than the crude one as a result from the sensory analysis. In fact, sage with its health, medicinal, and financial benefits could be an important ingredient to be added for plenty of foods. Conclusively, more serious studies and researches should be done to increase the Lebanese interest and knowledge about sage in general, and olive oil fortified with sage specifically.

Key Words: *Salvia officinalis*, olive oil, questionnaire, sensory analysis, awareness

Nevşehir bagel and Nevşehir tahini-bagel

Nazik Meziyet Dilek¹, Mustafa Karakaya²

¹Nutrition and Dietetics, Akşehir Kadir Yallagöz School of Health, Selçuk University, Konya, Turkey, meziyettemel@hotmail.com, ORCID No: 0000-0003-2506-2067

²Department of Food Engineering, Agriculture Faculty, Selçuk University, Konya, Turkey, karakayam@hotmail.com, ORCID No: 0000-0002-6436-3658

Abstract

Nevşehir is an our province that is rich from the aspect of vegetable traditional foods. Nevşehir bagel, one of these traditional foods, is a product made in the locality Nevşehir and fondly consumed by local people. Nevşehir bagel, due to the fact that yeast used in fermenting its dough from chickpea is obtained by a specific method, it is different from the other sorts of bagels as flavor and taste. Nowadays, a number of masters producing this bagel in Nevşehir relatively decrease and it is reported that 2 to 3 masters are continuing to produce this bagel. In spite of this, Nevşehir bagel has a considerably important place in the locality, and it is often consumed by local people in breakfasts and taken as a gift while going out of the city or it is a palatal delight the people from Nevşehir in the other localities continuously demand. Unfortunately although it is a commonly consumed product in Nevşehir, it is our product that cannot go out of Nevşehir and is not most known. Nevşehir tahini –bagel is produced by adding tahini to the dough of Nevşehir bagel and is again our traditional product specific to Nevşehir. That yeast used in fermenting dough is obtained from chickpea provides idiosyncratic taste of Nevşehir tahini –bagel to form and also differs from the other tahini-bagel as form. Nevşehir tahini-bagel is also our traditional food forming a considerably important consumption habit in the region like Nevşehir tahini.

Key Words: *Nevşehir bagel, Nevşehir tahini – bagel, chickpea, traditional food*

Make-Up of Nevşehir Bagel

Necessary Materials: dried chickpea, flour, water.

For making Nevşehir bagel, firstly, chickpea is crushed and made into flour. Chickpea made into flour is put in bier bottle and is added hot water on it and held on the oven over 2-3 hours. It is reported by the masters making bagel that especially bier bottle has to be used for this process. When the bubbles begin to go out of bier bottle, this bubble is taken to use as yeast in the fermentation of bagel dough. Bagel dough is obtained by using the flour, water, and yeast. After dough is conditioned for about 30 minutes, it is taken onto a cloth and shaped by stretching. On pieces of dough are lined side by side and after holding in hot oven for 2 to 3 minutes, they are taken out. Later, again placing in the heated oven, they are cooked over 15-18 minutes until its top part is roasted.

Make Up of Nevşehir Tahini-Bagel

Necessary material: dried chick pea, flour, water, tahini, sugar

Dough of Nevşehir tahini-bagel is obtained by adding and kneading the tahini and sugar onto dough of Nevşehir bagel dough. After this dough is conditioned for 30 minutes, it is taken onto a cloth and roundly shaped by hand. Later, in similar to that of Nevşehir bagel, it is cooked in the preheated oven until both surfaces of it are roasted.

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Some Turkish Traditional Meat Products

Nazik Meziyet Dilek¹, Mustafa Karakaya²

¹Nutrition and Dietetics, Akşehir Kadir Yallagöz School of Health, Selçuk University, Konya, Turkey, meziyettemel@hotmail.com, ORCID No: 0000-0003-2506-2067

²Department of Food Engineering, Agriculture Faculty, Selçuk University, Konya, Turkey, karakayam@hotmail.com, ORCID No: 0000-0002-6436-3658

Abstract

Meat has a highly importance place in terms of nutrition. Besides that meat is a very important of protein resource, it is an indispensable part of human nutrition due to the fact that it is relatively rich in terms of vitamin and mineral. It is reported that red meat consumption in our country is very low compared to many countries. In the solution of this problem related to meat consumption, the consumption of traditional meat products can be considered as a good alternative. In this study, the information will be given about sucuk (a traditional fermented meat product), pastırma (a traditional dried meat product), kavurma (a traditional cooked meat product), doner kebab among our traditional meat products as well as our traditional sorts of köfte (a traditional meat products; meatball or patty) such as Tire köfte, Manisa köfte, Akçaabat köfte, Ödemiş köfte, Sivas köfte, İzmir köfte, Anchovy köfte, Milas köfte, Tekirdağ köfte, içli köfte, Salıhlı odun köfte, Keşan satır köfte, Akhisar köfte, Burdur şiş köfte, Kestirmeli köfte, taş köfte and sızgit that is our another traditional product.

Key Words: *Sucuk, pastırma, kavurma, doner kebab*

Sucuk

Sucuk is a product that is widely consumed in many countries from the Balkans to Middle Asia, especially in Armenia, Bulgaria and Turkey (Altun, 2014). Sucuk is generally defined as a Turkish fermented product obtained by filling the dough prepared from butchery animal meats in natural or synthetic casings and maturing for a certain period of time (Yılmaz and Velioğlu, 2007). Sucuk is the most widely produced meat product in our country, and there are many varieties such as fermented, semi-fermented, cooked sucuk, homemade sucuk, variante sucuk (Çelik and Yılmaz, 2010). The "variante sucuk", which has recently been developed specifically for our province of Kayseri, is also homemade and is prepared from 100% deboned beef, without intestines, by marinating it with herbs such as black pepper, coriander, poppy, pepper seeds, and cumin. It is stated that this product can be eaten raw, and it is generally consumed as an appetizer when cooked (Altun, 2014). Sucuk, produced in many different varieties, is produced by filling in undyed white fabrics called "mermerşahi" in our province of Tokat, and this special product is called "Tokat bez sucuğu" (Kaval et al., 2010). Bez sucuk, also known as çoban sucuğu, is produced by natural fermentation and has a unique flavor depending on the fabric casing, spice mix and drying method used (Çakmak, 2009).

Pastırma

Pastırma, which is known to date back about five thousand years, is a traditional Turkish meat product that is produced by drying and then using with fenugreek. In many countries in the world, there are meat products produced with production methods similar to pastırma and called by different names (Yılmaz et al., 2010). The most important raw meat products processed in pieces in our country is pastırma. Pastırma is defined as a traditional meat product obtained by removing and standardizing the meat extracted from certain parts of beef carcasses, followed by salting/curing with special methods, pressing, fenugreek and drying again (Tekinşen et al., 2000; Gökalp et al., 2010). Pastırma is divided into varieties according to the region where the muscle or muscle groups are taken from the carcass. Traditionally, 26 types of pastırma were produced from a single carcass, but it is known that this number has decreased as consumers prefer superior quality pastırma. Pastırma varieties currently being produced are kuşgözü pastırma, sırt pastırma, tütünlük pastırma, bohça (eğrice, bohçagözü) pastırma, şekerpare pastırma, kenar pastırma, mehle pastırma, dilme pastırma, omuz pastırma, kürek pastırma, kapak pastırma, döş pastırma, bez pastırma, bacak pastırma, etek pastırma, kavram pastırma, meme pastırma, kelle pastırma, arkabaş pastırma and antrekot pastırma (Çakıcı & Aksu, 2012).

Kavurma

Kavurma is a traditional meat product with a unique flavor obtained by chopping meats in different pieces and cooking them in meat fat (Turhan and Sağır, 2010). Kavurma, which is produced widely in various regions of our country, is cooked using similar cooking methods, usually from goat or beef meat in Adıyaman region, and then frozen roasts are turned into medium-sized tops upon request. The resulting tops roasts are kept in wicker baskets for preservation in the cold (Kurt and Kılınççeker, 2012).

Sızgıt

Sızgıt is a meat product that is traditionally produced and consumed in the winter months in many regions of Anatolia, especially in the provinces of Kayseri and Nevşehir, when modern preservation methods are not available. The difference between sızgıt, which is obtained by roasting small pieces of cubed meat in animal fat, from kavurma is that the fat tissues are melted after being chopped into cubes, salt is added after cooking for a while, roasting and the name “kırdak/kakırdak” that remains in the product during processing the fact that the given connective tissue particles provide a unique texture, structure and flavor to the final product, contains much less meat and much more fat than kavurma (Kaya et al., 2010).

Doner kebab

Doner kebab is an important traditional product of Turkish cuisine, which is called by various names such as “dona kebabs, doner kebabs, shawirma, gyros, souvlaki, donair” in different countries (Vazgeçer et al., 2004; Kılıç, 2003; Gönülalan et al., 2004; Kayışoğlu et al. et al., 2003; Acar, 1996). It is a traditional meat product that was prepared by Iskender Bey, who lived in Bursa, by purifying the lamb from nerves and bones and turning it around on a vertical metal rod. Sheep, lamb, beef, chicken and turkey meats are used in the making of doner kebab, and tail and shirt oils are used as fat. Leaf meat and fats prepared by shredding chicken and red meat are kept for 2 hours after being treated with a salt-spice mixture. Afterwards, it is dipped into the spice mixture and left for 3-6 hours, and it is strung on a doner kebab skewer and cooked by rotating in front of an electric or gas stove (Acar, 1996).

Types of Köfte

Köfte is one of our most consumed traditional meat products. In general, köfte is obtained by adding various spices and optionally bread and eggs to the ground meat, kneading it well and resting it. In addition to industrial production, it is also produced in optional formulations by consumers at home (Kundakçı and Ergönül, 2009). It is known that there are about 300 kinds of local köfte in Turkish cuisine. Although some of these are made the same, it is known that they are consumed with different local names. The most consumed types of köfte are Tire köfte, Manisa köfte, Akçaabat köfte, Ödemiş köfte, Sivas köfte, İzmir köfte, Anchovy köfte, Milas köfte, Tekirdağ köfte, içli köfte, Salihli odun köfte, Keşan satır köfte, Akhisar köfte, Burdur şiş köfte, Kestirmeli köfte and taş köfte.

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The use of continuous ultraviolet light on yoghurt (homogenized and cream on top) surface: The effects on lipid and protein oxidation during storage

Aygün Şanlı¹, Müge Urgu-Öztürk¹, Öyküsu Atılğan¹, Gamze Sonkaya¹, Fatma Özen-Özdemir¹, Yurdanur Akgül², Nurcan Koca^{1*}

¹Food Engineering Department, Faculty of Engineering, Ege University, Izmir, Turkey

²Chemistry Department, Faculty of Science, Ege University, Izmir, Turkey

Abstract

Ultraviolet light (UV-C) application, which is one of the non-thermal preservation methods, is used in the dairy industry to extend the shelf life of foods and protection. This preservation method can cause lipid and protein oxidation in dairy products rich in fat and protein. Yoghurt, a traditional dairy product is produced in our country with and without cream on top. This study aimed to determine the effects of UV-C light application on the lipid and protein oxidation of yoghurt (homogenized and cream on top) during the storage period. Peroxide Value and Thiobarbituric Acid (TBA) analysis were used to determine lipid oxidation, and carbonyl content and sulfhydryl groups analysis were used for protein oxidation. A continuous UV-C disinfection system (UV STR400, UV RND, İzmir, Turkey) specially designed for UV-C light application was used. Consumer sensory tests were performed in order to determine the doses to be applied to the yoghurt samples and it was decided to apply at 15 cm height and of 4, 1.6 and 0.2 m/min band speeds. The sample without UV-C light treatment was used as a control. Both peroxide and TBARS value significantly increased with the application of high UV-C light doses, as well as during the storage time. A statistically significant increase was determined in both samples in the carbonyl content depending on the application dose and during storage. There was no significant change in the sulfhydryl group during the storage period in the homogenized yoghurt while it increased in the yoghurt with cream on top. UV light application and storage time significantly change some the primary color parameters (L* and b* values), there was no significant change in a* value. As a result, it accelerated the oxidative changes (lipid and protein). Therefore, sensory and oxidative changes should be considered in the selection of light doses to be used before industrial use.

Key Words: UV-C light, Yoghurt, Protein Oxidation, Lipid Oxidation, Consumer Test.

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Study of Quality and Yield of Kohlrabi with Effect of Mulch Under Green House Conditions

Muhammad Abbas Khan¹, Arshad Mahmood Malik¹, Senay Ugur²

¹Institute of Hydroponics Agriculture PMAS Arid Agriculture university Rawalpindi, Pakistan.

²Faculty of Agricultural Sciences and Technologies, University of Niğde Ömer Halisdemir, Niğde, 51240, Turkey.

Abstract`

Kohlrabi (*Brassica oleracea* var. *gongylodes*) is an important nutritive as well as medicinal leafy vegetable crop grown mostly in the Eastern Anatolia region of Turkey. The current study was designed with the aim to investigate the quality and yield traits of kohlrabi in the presence of transitional greenhouse conditions. In the current experiment, four different cultivars of kohlrabi (Azur Star, Kordial F1, Kolibri F1, and Lech F1) were sown in the presence and absence of mulch in three replications by following two factorial split plot design. The organic fertilizer was mixed constantly each of the four blocks. The results showed that the application of mulch improved most of the morphological parameters (total weight, total diameter, estimated volume) of kohlrabi crop. Likewise, the blocks having mulch with also showed significant effect on most of the biochemical traits like total soluble solids, nitrate, antioxidant and fiber contents of different varieties of kohlrabi. It is concluded from this experiment that the use of organic conditions in the presence of mulches have the ability to improve both the quality and yield of the two cultivars (Azur Star and Kolibri F1) of kohlrabi.

Keywords: Kohlrabi, Organic production system, greenhouse, quality traits antioxidants, nitrate, fiber contents.

Evaluation of Photosynthetic Roles of Different Canopy Strata and Capitulum on Seed Yield and its Components of Spring Safflower (*Carthamus tinctorius* L.)

Shiva Sadighfard ¹, Bahman Pasban Eslam ², Reza Amirnia³, Esmaeil Zanghani⁴

¹Department of Field Crops, Faculty of Agriculture, Tokat Gaziosmanpasha University, Tokat, Turkey

² Crop and Horticulture Science Research Department, East Azarbaijan, Agricultural and Natural Resources Research and Education Center, ARREO, Tabriz, Iran.

³Department of Plant Production and Genetics, Faculty of Agriculture, Urmia University, Urmia, Iran

Abstract

The main source of seed filling result from photosynthesis of the green tissue closest to the seed sinks in the capitula. In order to evaluate the role of different leaf strata and capitula in seed yield and its components of Safflower genotypes, a field study was performed as a factorial experiment based on RCBD in 3 replicates in Eastern Azarbaijan Research Center for Agricultural and Natural Resources during 2008. Factors used in this experiment were: two Safflower genotypes including (Mahalli Esfahan and Goldasht) and defoliation in five levels: lower 1/3, middle 1/3, upper 1/3 defoliation of plant, capitulum covered with aluminum paper, and control (without defoliation). Our results showed that defoliation did not affect plant height, and number of heads per plant. But, there was a highly significant difference between genotypes in height and heads per plant. Number of heads per plant in Mahalli Esfahan genotypes was higher than Goldasht. Among the defoliation treatment levels in both the genotypes, the highest decrease in the seed yield compared to the control was observed in the upper 1/3 defoliation levels, where as the lowest decrease was observed in the lower 1/3 defoliation levels. Rate of seed yield reduction in Mahalli Esfahan was higher than Goldasht. The change in Goldasht seed yield was mostly due to changes in number of seed per plant and number of seed in head. Since the strata leaf area and net photosynthesis of Mahalli Esfahan was higher than Goldasht in all the strata, application of treatments led to higher seed yield reduction in Mahalli Esfahan compared to Goldasht. In addition, net photosynthesis, strata leaf area, and photosynthesis contribution of the upper strata compared to the lower ones were higher, and removal of the upper strata had the highest effect on seed yield through reduction in the total photosynthesis of the whole plant. Also, covering of the capitulum caused a significant decrease in the seed yield. So, apparently, head photosynthesis has a major contribution in Safflower seed yield.

Key Words: Strata, Defoliation, Seed yield, Net photosynthesis, Iran

Assessment of the phenolic and flavonoid content in certain artichoke (*Cynara scolymus* L.) cultivars grown in Northern Tunisia

Riadh Ilahy, Imen Tlili, Thouraya R'him, Kamel Arfaoui, Marcello Salvatore

Department of horticultural crops, National Agricultural Research Institute of Tunisia, University of Carthage, Tunis, Tunisia

Abstract

Artichoke (*Cynara scolymus* L.) is a worldwide popular horticultural crop. Interest in assessing bioactive compounds with potential health benefits in artichoke is increasing. Therefore, in this study, the variability in total phenolic and flavonoid contents of six artichoke cultivars, including five purple namely Brindisie, Opal, Conserto, Romanesco and Rouge de France as well as an ordinary white artichoke variety were investigated. The results showed significant differences in total phenolic and flavonoid contents between artichoke cultivars. Total phenolic content ranged from 17.31 mg GAE/ g DW in the white artichoke variety to 21.31 mg GAE/g DW in Romanesco. Flavonoid content ranged from 4.51 mg RE/g DW in white artichoke to 7.06 mg RE/g DW in Rouge de France. Therefore, the highest total phenolic content was shown by Romanesco. However, the highest flavonoid content was recorded for both Opal and Rouge de France. This study demonstrates the importance of genotypic variability in shaping the levels of total phenolic and flavonoid, emphasizing the need to evaluate artichoke biodiversity in order to improve its nutritional value and to contribute towards increasing the intake of antioxidants.

Key words: total phenolics, artichoke, flavonoids, quality, *Cynara scolymus* L.

Common Purslane: A Potential Source of Nutrition and Antioxidant

Muhammad Yasir Naeem ¹, Khawar Jabran¹

Department of Plant Production and Technologies, Faculty of Agricultural Sciences and Technologies, Nigde Omer Halisdemir University Nigde, 51240, Turkey

Abstract

Millions around the world continue to utilize herbs as a source of medicine easiness of availability and low cost. Among these herbs, one of the most common and emerging herbs is known as common purslane (*Portulaca oleracea* L.). Common purslane is a widespread weed mostly in summer crops. But also used as a green leafy vegetable with various names in many countries across the globe. This herb has a lot of potentials to be identified as a new crop as it is one of the best plant sources of vital nutrients like omega-3-fatty acids, antioxidants like α -tocopherol, β -carotene, ascorbic acid, and glutathione. Common purslane is found all over the world and is used as a potherb in many parts of Europe, Asia, and the Mediterranean. This plant contains mucilaginous compounds that have therapeutic use. As it is a rich source of a great variety of various amounts of biologically active components like α -tocopherol, β -carotene, ascorbic acid, and glutathione, potassium, magnesium, and calcium. It is also used in traditional remedies since ancient times. Today, in the modern era its therapeutic efficacy is evidenced from its usage in the treatment of burns, headaches, cardiac tonic, emollient, muscle relaxant, anti-inflammatory diuretic treatment and, liver, stomach, cough, shortness of breath, and arthritis. There has been little human study on the medicinal properties of this plant species. As a result, further research is needed to understand the chemicals found in it and their potential impact on human health. This review will cover a wide range of its medicinal value, antioxidant potential, pharmacological applications, and phytochemical components.

Keywords: common purslane, bioactive components, diseases, and medicinal value.



Intelligent Food Packaging as an Emerging Technology in Food Sector

Muhammad Yasir Naeem

Department of Plant Production and Technologies, Faculty of Agricultural Sciences and Technologies, Nigde Omer Halisdemir University Nigde, 51240, Turkey

Abstract

The lean toward maintainability, better quality, safety, and improved class degree are vital in every aspect of life science. Orderly, to satisfy these requirements, the job of food packaging cannot be ignored in any product of life cycle. Intelligent packaging is a newly developing technology in food areas. This new technology can observe permanently the quality of the food products and can also share information related to the products with the customers. Hence, the consumer's satisfaction can be enhanced while the wasting of food can be decreased. This review describes the various types of tools used in intelligent food packaging systems and also the concept and future aspects of this technology. Generally, this system can guarantee the safety and quality of food and food products in the food sector. The high cost and legal aspects like issues are the major problems in this new technology. However, the practical use of this technology is very limited but its capability and potential are well recognized.

Keywords: *Intelligent packaging, safety, quality, and food products.*

Performances of the Promising Narbon Vetch Genotypes in Central Anatolia Conditions

Onur İleri¹, Ali Koç¹

¹Department of Field Crops, Faculty of Agriculture, Eskisehir Osmangazi University, Eskisehir, TURKEY

Abstract

The research was carried out to determine the yield and forage quality characteristics of six lines (2277, 2380, 2391, 2461, 2466, 2467) and two cultivars (Bozdağ, Dikili) of narbon vetch (*Vicia narbonensis* L.) species under semi-arid Central Anatolia conditions. The highest fresh forage (18,93 t ha⁻¹) and dry matter yields (6,69 t ha⁻¹) were determined at Bozdağ cultivar. Plant height and crude protein (CP) contents did not show significant variation among the genotypes but the highest CP yield was recorded as 929,3 kg ha⁻¹ at Bozdağ cultivar. NDF and ADF contents showed significant variations among the genotypes. The line-2277 had the lowest NDF and ADF contents but the highest difference between NDF and ADF contents was determined at Bozdağ cultivar, which roughly indicates the higher digestibility. All results showed that Bozdağ cultivar has better yield performance in Central Anatolia conditions and line-2461 has also promising results for the region.

Key Words: Narbon vetch, Genotypes, Yield, Forage quality, Lines

Potansiyeli Yüksek Bazı Koca Fiğ Genotiplerinin İç Anadolu Koşullarındaki Performansları

Özet

Çalışma, koca fiğ'e ait 6 hat (2277, 2380, 2391, 2461, 2466, 2467) ve 2 çeşidin (Bozdağ, Dikili) İç Anadolu koşullarındaki verim ve yem kalitesi özelliklerinin belirlenmesi amacıyla yapılmıştır. En yüksek yeşil ot (1893 kg/da) ve kuru madde (669 kg/da) verimleri Bozdağ çeşidinden elde edilmiştir. Genotipler arasında bitki boyu ve ham protein (HP) içeriği bakımından önemli bir farklılık olmadığı görülmüş ancak en yüksek HP verimi 92,93 kg/da ile yine Bozdağ çeşidinde kaydedilmiştir. Genotiplerin NDF ve ADF içerikleri arasında önemli farklılıklar görülmüştür. 2277 numaralı hat en düşük NDF ve ADF içeriklerine sahip olurken Bozdağ çeşidinin NDF ve ADF içerikleri arasındaki farkın en yüksek olduğu görülmüştür. Bu durum genel hatlarıyla Bozdağ çeşidinin sindirilebilirliğinin daha yüksek olduğunu da ifade etmektedir. Elde edilen sonuçlara göre Bozdağ çeşidinin İç Anadolu koşullarındaki performansının çalışmadaki diğer genotiplere göre daha yüksek olduğu ve 2461 numaralı hattın da bölge için ıslah edilecek yeni koca fiğ çeşitleri çalışmaları için potansiyelinin yüksek olduğu ifade edilebilir.

Anahtar Kelimeler: Koca fiğ, Genotipler, Verim, Yem kalitesi, Hatlar

Introduction

In addition to providing good quality and quantity forage, legumes have a significant role in improving soil quality and some of their annual species (narbon vetch, Hungarian vetch, forage pea, etc.) can also be used as winter catch crop or second crop in cropping patterns of semi-arid conditions. Many researchers agreed that good quality forage shortage in Turkey could be alleviated by replacing annual legumes into fallow in the dry farming system in arid or semi-arid regions (Acikgoz, 2001; Erkovan et al., 2017; Ozyazici and Acikbas, 2019; Surmen et al., 2019). In the irrigated farming system of central Anatolia region, where are characterized by semiarid climatic condition, they could also be used as and the second crop after cereals (Dereli, 2015) or as winter catch crop (Sarıkaya, 2019). Therefore, determining suitable species is essential for aimed planting system.

Selecting species for an aimed planting pattern is important but it is essential to determine suitable cultivar for the species because there are serious variations among cultivars of every species concerning investigated characteristics (Cacan and Kokten, 2017; Turan and Sakman, 2019). Hence, developing new cultivars and testing their performance for the current environment has crucial importance.

In the central Anatolia region, where arid and semi-arid conditions prevail, precipitation received mostly from autumn to spring and summer months are generally hot and dry. Therefore, the plants, which are efficiently utilizing this period, have special importance. Narbon vetch is a typical cool-season legume and it is resistant to cold and capable of growth under cooler conditions, consequently reach the harvest stage earlier (Larbi and Nie, 2006). Since the plants complete their growing during the moisty period, they can be cultivated in both the rainfed and irrigated conditions of the region without irrigation and they could leave enough moisture in the soil for following crop or fallow.

Narbon vetch is quite proper for the limy soils of Anatolia due to its calcicole characteristics (Enneking and Maxted, 1995). The plant is mostly cultivated for its grain and straw (Fıncioğlu et al., 2012; Bouabid et al., 2018). It could produce satisfying hay under rainfed conditions. The studies conducted under dry conditions in Turkey gave prominent results (Yilmaz, 2008; Seydosoglu et al., 2014). The researchers reported that hay yield changed from 2,54 to 5,76 t ha⁻¹ among cultivars at the same location (Cakmak, 2002; Dereli, 2015) and 1,49 to 7,25 t ha⁻¹ for different locations (Seydosoglu et al., 2014; Cacan and Kokten, 2017). Narbon vetch hay is rich in crude protein content. The researchers reported that crude protein content of the plant hay changes between 13,68 and 21,40 % (Turk et al., 2007; Turan and Sakman, 2019). The researchers also reported 28,57 and 44,80 % NDF and 23,98 and 33,10 % ADF content for the plant hay (Turk et al., 2007; Turan and Sakman, 2019). Yield and chemical content results of narbon vetch hay changed depending on both environment and genotypes.

This research was carried out to determine the yield and forage quality characteristics of new narbon vetch lines. For this purpose, fresh forage, hay, and CP yields, plant height, CP, NDF, and ADF ratios were examined of 6 lines and 2 cultivars of narbon vetch in Central Anatolia rainfed conditions.

Material and Method

This research was carried out at the experimental fields of Eskisehir Osmangazi University, Faculty of Agriculture, in 2015. The region is in a semi-arid climatic zone, which receives annual total precipitation in the range of 350-500 mm annually. The experimental area has received 280,2 mm precipitation through the 9 months (experimental period), and the average temperature and humidity were 9,1 (°C) and 73,7 % respectively (Table 1). Soil samples were taken from a depth of 0-40 cm and analyzed in the laboratory of the Soil Science Department of the Faculty of Agriculture, Eskisehir Osmangazi University. According to the report, experimental soils were loamy, limy (8,4 %), non-saline (0,2 %), organic matter content was 1,68 % and ph level was 7,55. Available K₂O and Olsen P₂O₅ contents were 2480 and 50,7 kg ha⁻¹ respectively.

Table 1. Meteorological data of the Eskisehir province during the experiment period

Experimental Months	Precipitation (mm)	Temperature (°C)	Humidity (%)
September	3,1	20,9	63,3
October	34,0	13,1	77,1
November	8,2	7,9	74,3
December	1,1	-0,7	84,8
January	77,6	0,0	89,9
February	33,6	6,6	76,3
March	41,2	7,4	66,7
April	36,7	12,9	61,3
May	44,7	14,2	69,9
Tot./Ave.	280,2	9,1	73,7

Narbon vetch genotypes used in the experiment consisted of six lines (2277, 2380, 2391, 2461, 2466, 2467) and two cultivars (Bozdag and Dikili). Sowing was carried out on 17 September 2015 using 100 plants m⁻² density with a row spacing of 30 cm (Yilmaz, 2008) to the plots consisted of 6 rows with 6 meters long. Fertilizer was applied while sowing as 18 kg ha⁻¹ N and 46 kg ha⁻¹ P₂O₅ (Fıncioğlu et al., 2012). Weeds were removed regularly using a hand hoe and no irrigation was applied.

All plots were harvested on 13 May 2016, when the plants reached to pod filling stage (Turan and Sakman, 2019). Plant height was measured in every plot from randomly selected 10 individuals. Fresh forage yield was determined by harvesting 3 m of the middle-three rows and harvested plants were weighted and then dried at 60 °C until reached constant weight to determine fresh forage and dry matter yields, respectively. Dried samples were grounded in an experiment mill to pass through a 2 mm sieve and forage quality characteristics (CP, NDF, ADF) were analyzed using a forage-calibrated near infra-red spectroscopy (NIRS). CP yield was estimated by multiplying CP ratio and dry matter.

Statistical analyses were carried out in SAS 9,3 software considering Randomized Complete Block Design (SAS Institute, 2011), and the means were separated using Tukey Multiple Comparison Test.

Results and Discussion

Fresh forage yield showed significant variation ($P \leq 0,05$) among the genotypes. The highest fresh forage yield was obtained from Bozdag cultivar as 22,51 t ha⁻¹ but the lines-2391, 2461, 2466, 2467, and Dikili cultivar were statistically in the same group with Bozdag. The lines-2277 and 2380 had the lowest fresh forage yield, which was 16,88 and 16,99 t ha⁻¹ respectively (Table 2).

Dry matter yield of the genotypes significantly ($P \leq 0,05$) varied between 4,83 – 6,69 t ha⁻¹ and it was the highest at Bozdag cultivar while the line-2277 had the lowest dry matter yield. The lines-2277, 2380, and 2466 had lower

dry matter yields considering Bozdag cultivar. Except for these lines, the rest of the genotypes were statistically in the same group as Bozdag cultivar (Table 2).

The average plant height of the genotypes was 67,2 cm but the variation was not statistically significant among the genotypes. The crude protein content of the genotypes varied between 12,95 – 14,40 % but this variation was not statistically significant (Table 2).

CP yield showed a significant ($P \leq 0,05$) variation and the highest value was 744,7 kg ha⁻¹ which was estimated at Bozdag cultivar. All other genotypes except for lines-2277 and 2380, were statistically in the same group in terms of CP yield (Table 2). The values for lines-2277 and 2380 were lower than other genotypes, which were 639,1 and 664,0 kg ha⁻¹ respectively.

Table 2. Yield and forage quality characteristics of the genotypes

Genotypes	Fresh forage yield (t ha ⁻¹)	Dry Matter yield (t ha ⁻¹)	Plant height (cm)	CP (%)	CP yield (kg ha ⁻¹)	NDF (%)	ADF (%)
2277	16,88 ^b	4,83 ^b	68,9	13,26	639,1 ^b	29,51 ^C	15,45 ^D
2380	16,99 ^b	4,90 ^b	65,8	13,59	664,0 ^b	32,78 ^{AB}	17,62 ^{ABCD}
2391	18,29 ^{ab}	5,52 ^{ab}	67,9	12,95	715,4 ^{ab}	33,61 ^A	19,21 ^{AB}
2461	18,20 ^{ab}	5,59 ^{ab}	66,5	13,05	728,8 ^{ab}	30,48 ^{BC}	16,67 ^{BCD}
2466	18,97 ^{ab}	5,10 ^b	65,4	14,40	733,2 ^{ab}	32,66 ^{AB}	18,31 ^{ABC}
2467	18,19 ^{ab}	5,27 ^{ab}	64,8	13,53	706,5 ^{ab}	33,84 ^A	18,72 ^{ABC}
Bozdağ	22,51 ^a	6,69 ^a	68,1	13,90	929,3 ^a	31,52 ^{ABC}	16,26 ^{CD}
Dikili	21,44 ^{ab}	5,95 ^{ab}	70,1	14,16	840,8 ^{ab}	33,60 ^A	19,63 ^A
Mean	18,93	5,48	67,2	13,58	744,7	32,25	17,73
F value	3,689*	3,439*	0,938 ^{ns}	0,764 ^{ns}	3,693*	6,749**	6,460**

*, $P \leq 0,05$, ** $P \leq 0,01$, ns: non-significant

NDF and ADF content of the genotypes showed significant ($P \leq 0,01$) variations and their distributions were similar among the genotypes (Table 2). NDF values of lines-2467, 2391, and Dikili cultivar were the highest while lines-2461 and 2277 had the lowest, and ADF values of Dikili cultivar and line-2391 were higher than Bozdag cultivar and line-2277.

The fresh forage yield of cultivars (Bozdag and Dikili) was higher than the lines but the lines-2391, 2461, 2466, and 2467 statistically had no difference with the cultivars. This variance among the genotypes is due to their adaptation ability and genetic differences as long as they are cultivated in the same conditions. Researchers determined the fresh forage yield of narbon vetch could range between 9,66 – 28,81 t ha⁻¹ (Yilmaz, 2008; Turan and Sakman, 2019), which is similar to our findings.

Dry matter yields of all lines were statistically similar but lines-2277, 2380, and 2466 showed lower performance than Bozdag cultivar (Table 2). Even though these lines had statistically similar dry matter yield with the Dikili cultivar there was about a 1,0 t ha⁻¹ dry matter yield difference, which might be significant economically. Dry matter yield of narbon vetch generally ranged between 3,24 – 6,28 t ha in other studies (Yilmaz, 2008; Ozyazici and Acikbas, 2019). Besides, Basbag and Gul (2004) examined the forage characteristics of the lines 2380 and 2461 in southeast Anatolia conditions and determined the hay yield of the lines as 3,67 – 4,09 t ha⁻¹ respectively. Plant height of narbon vetch was indicated to have a positive correlation with yield (Yilmaz, 2008), and significant height differences were observed among genotypes by many researchers (Basbag and Gul, 2004; Seydosoglu et al., 2014; Cacan and Kokten, 2017) but genotypes used in our study had no significant differences in terms of plant height.

The CP content of narbon vetch was stated between 13,68 – 23,4 % in other studies (Turk et al., 2007; Dereli, 2015), which was averagely 13,58 % and there were not any significant differences among the genotypes in our study (Table 2). The genotypes examined in this study must be similar genetically to CP content. Turan and Sakman (2019) also reported similar results.

CP yield indicates quantitative information about the CP content, which could be used to compensate for the CP requirements of the animals. Except for line-2277 and 2380, the other lines used in this study had statistically similar CP yields. The CP yield of superior genotypes was ranged between 715,4 – 929,3 kg ha⁻¹. Turan and Sakman (2019) indicated a CP yield of narbon vetch genotypes between 556 – 813 kg ha⁻¹. The results of this study for lines were consistent with their findings but Bozdag and Dikili cultivars had higher values (929,3 and 840,8 kg ha⁻¹ respectively) than the findings of Turan and Sakman (2019).

NDF and ADF contents indicate the structural carbohydrates of the plants and provide general information for the digestibility of the forage (Moore and Coleman, 2001). The results of the other researches showed that NDF and ADF contents of the narbon vetch could vary between 28,57 – 44,80 % and 23,98 – 33,10 % respectively (Turk et al., 2007; Turan and Sakman, 2019) but the results of this study were lower than the reported results in the studies. Indeed, legume forages generally have lower NDF and ADF contents (Kir et al., 2018) but they increase as the plant maturation advanced (Collins and Fritz, 2003). Therefore, this difference might be attributed to harvesting

stage differences in addition to ecological differences. In addition, it was observed that line-2277 had the lowest values for both NDF and ADF contents (Table 2). The rest of the lines had similar values with the cultivars except line-2461, which had lower NDF and ADF values than Dikili cultivar only. Bozdag had similar NDF content with Dikili but ADF content was lower and this roughly indicated the higher digestibility for Bozdag than Dikili.

Conclusion

Autumn-sown narbon vetch could produce high-quality hay in the areas of Central Anatolia, where irrigation is not possible and Bozdag cultivar was quite suit for hay production for the region. Besides, it was determined that this cultivar has also the highest second crop forage performance among the other narbon vetch cultivars in the region (Dereli, 2015). The investigated lines generally showed good forage performances but virus damage was observed morphologically at lines-2391 and 2466 (personal observation), which may cause significant losses in yield and forage quality. Despite their quite low ADF contents, lines-2277 and 2380 had lower yields, which is an important parameter that affects the preference of the growers. The lines-2461 and 2467 both had promising yield values but the forage quality of line-2461 was higher and therefore, this line might be considered primarily for the new cultivar breeding studies for the region. However, lines should be tested in different years, especially in the non-irrigated areas.

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Optimization Of Sunflower Oil Bleaching By Ultrasonic Processing

Sedef Aydın¹, Halime Pehlivanoglu², Gülcan Özkan¹

¹Suleyman Demirel University, Faculty of Engineering, Department of Food Engineering, Isparta, TURKEY

²Tekirdag Namik Kemal University, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology, Tekirdag, TURKEY

Abstract

In this study, an ultrasonic assisted bleaching method for sunflower oil under different conditions was optimized by monitoring the reduction of oil-containing colorants and the result of this study was compared with conventional bleaching method. Ultrasonic power (60-100P), ultrasonic time (5-20 min) and amount of clay (0,5-2 g) was used as process condition parameters, and color values (yellowness, redness, A_{446}), free fatty acids, peroxide value, conjugate dienes and trienes were also chosen as responses. Redness and yellowness color removal rate of conventional bleaching method were reduced 12.65% and 66.60% compared to neutralized sunflower oil, respectively. The ultrasound method provided yellow and red color reduction in 17.45% and 68.40% compared to the neutralized sunflower oil, respectively. Also, the rate of color removal was increased by the raise of ultrasound power and time. The peroxide value (PV) of the sunflower oil after ultrasonic bleaching was reduced compare to both control and neutralized sunflower oil. In conclusion, ultrasonic process could reduce redness, yellowness values and PV but increase color removal ratio. Hence, application of ultrasonic technology in the oil extraction compared to the traditional method has several benefits such as declined processing time and less energy consumption.

Key Words: Sunflower oil, bleaching, ultrasound assisted bleaching, ultrasonic process, conventional method, optimization

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Bioactive Components Of Avocado And Its Health Effects

Lale Gumüştepe¹, Ebru Aydın¹, Gülcan Özkan¹

¹Gıda Mühendisliği Bölümü, Mühendislik Fakültesi, Süleyman Demirel Üniversitesi, Isparta, Türkiye

Abstract

Avocados belong to the *Plantae* kingdom, the Lauraceae family, the order Laurales, the genus *Persea*, and the species *P. americana*. It is a plant-derived food which is implicated in various health-promoting and disease preventive effects. Therefore it is considered a superfood. Avocado fruit pulp and peel, leaves and seeds are rich in both nutritive, such as vitamins, dietary fibers, and mineral and bioactive compounds, polyphenols, carotenoids, tocopherols and sterols. While carotenoids and tocopherols are mostly found in the fruit pulp, polyphenols are widely present in the fruit pulp and peel, seeds and leaves. Avocado fruit's seed (16%) and peel (11%) are consisted of 21-30% of the fruit as a solid waste except in some varieties. The rich bioactive compounds of avocado exhibited important biological activities in in vitro and in vivo studies, suggesting possible prevention against several diseases such as hypoglycemic, antihypertensive, antioxidant, obesity, hyperlipidemic, antimicrobial, antiprotozoal and antimycobacterial activity etc. Therefore its effect on diseases has become a subject of interest in the literature. It was reported that the seed, peel and leaf of the fruit, especially from the avocado waste, have larvicidal, antifungal, antimicrobial, antioxidant, antiprotozoal, antidiabetic, antihypertensive, hypercholesterolemic and antimycobacterial activities such as stopping/slowing down many diseases. In this review, avocado tree; the bioactive components of the fruit pulp and peel, leaves and seeds and the effects of these components on health will be examined.

Key Words: Avocado, Bioactive components, Metabolic syndrome, By-products.

Optimization the Extraction Parameters of Phenolic Compounds from Gilaburu Fruit and Encapsulation of Extract

Pınar Ünsal¹, Ebru Aydın¹, Gülcan Özkan¹

¹Department of Food Engineering, Faculty of Engineering, Suleyman Demirel University, Isparta, TURKEY

Abstract

Gilaburu (*Viburnum opulus* L.) is a fruit that contains different nutrients and bioactive components. Chlorogenic acid, L-malic acid, anthocyanins and carotenoids are the most abundant bioactive components of the fruit. Also, gilaburu fruit indicates several health-promoting activities such as antidiabetic, antioxidant and antimicrobial. In this study, it was aimed to optimize the microwave assisted extraction (MAE) of bioactive components like phenolic substances from Gilaburu fruit with the response surface method (RSM) and Box-Behnken experimental design. The optimum extraction factors for gilaburu fruit phenolic were determined as temperature 60 (°C), time (5 minutes) and solid/solvent ratio (4.18 g/100 mL) based on the maximum extraction yield (%) and total phenolic content (mg GAE/100 g extract). The water extract of the fruit that produced based on optimum parameters determined with RSM design used to analysed phenolic composition, free radical and antidiabetic activities. In addition, this phenolic-rich aqueous extract were encapsulated using ionic gelation and chitosan sytem. Also, the moisture content and encapsulation efficiency of these hydrogel beads were determined as 94.99% and 91.26% respectively. Same experiments were analysed for both extract and hyrdroge beads. It was obtained chlorogenic acid was major compound of both extract and hydrogel beads, 34.18 mg/g ekstrakt and 0.51 mg/g ekstrakt (56.45 g hydrogel beads), respectively with HPLC. The inhibition activity of α -glucosidase in the presence of extract was detected as 54.9% and 50.9% for glucose and fructose respectively. On the other hand hydrogel beads inhibited the whole α -glucosidase activity. It could be concluded that, gilaburu fruit phenolics can be extracted in shorter time with low energy needs and maximum efficiency using MAE. Furthermore, it was discovered that aqueous extract of gilaburu fruit and its hyroge beads exhibited antioxidant and antidiabetic acitivities. Consequently, both gilaburu fruit and its hyroge beads can be considered as potential sources of invaluable compounds for development of functional food industry or food supplement.

Keywords: Gilaburu (*Viburnum opulus* L.) fruit, Microwave assisted extraction, Response surface method (RSM), Antioxidant activity, Antidiabetic activity, Encapsulation

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Optimization of Industrial Drying Conditions of Organic Strawberry

Muhammed Mustafa Özçelik , Gülcan Özkan, Erkan Karacabey

¹Food Engineering, Engineering Faculty, Suleyman Demirel University, Isparta, Turkey.

Abstract

Strawberry (*Fragaria ananassa* L.) fruit contains rich nutrients and bioactive components. Preference for fresh fruits is challenging since they have a very short shelf-life due to its excessive texture softening caused by the natural ripening process. To increase shelf life and storage of the fruit, different freezing and drying processes are being applied in the industry. Drying process of fruits provides several advantages such as transportation, storage, and shelf life based on lose weight and volume. The carbonic maceration (CM) is a new and limited technique applied as pre-treatment process at drying technology. In this study, it was aimed to optimize process conditions of both CM and air-drying system using response surface methodology (RSM). In addition, those conditions were compared with and without pre-treatment applications. Temperature, CO₂ pressure, time were chosen as the dependent variables in CM, whereas it was only temperature in air drying process. In both drying processes the same model responses were used as drying time, ascorbic acid, antioxidant activity. Certificated organic Albion variety were provided from Konya/ TURKEY as strawberry material (TR-OT-014-081/02-32). Results showed that the optimum parameters of drying temperature, maceration pressure, maceration temperature and maceration time for drying conditions were 64.8 °C, 0.35 Mpa, 4.2 °C and 4 hours, respectively. In terms of drying time, air drying with CM pretreatment had an advantage of 35% compared to drying process without CM. CM significantly increased some color parameters (L* and Hue*), on the other hand, it decreased browning index compared to control samples. Significant increases in ascorbic acid content and antioxidant activity were observed in CM-treated samples, but the textural properties were weaker than control samples. However, differences in pH, titration acidity and water holding capacity were insignificant. As a result, the CM pre-treatment used in the air-drying process was a very effective method to shorten the drying time. Results revealed high potential to provide improvement in strawberry drying time and reduction of drying time by carbonic maceration provides an economic advantage for manufacturers.

Key Words: Drying characteristics, Carbonic maceration, Response surface method, Organic strawberry.

Organik Çileklerin Endüstriyel Kurutma Koşullarının Optimizasyonu

Özet

Çilek (*Fragaria ananassa* L.) meyvesi zengin besinler ve biyoaktif bileşenler içerir. Doğal olgunlaşma sürecinden kaynaklanan aşırı doku yumuşaması nedeniyle taze meyvelerin raf ömrü çok kısa olduğundan tercih edilmesi zordur. Meyvenin raf ömrünü ve depolanmasını artırmak için endüstride farklı dondurma ve kurutma işlemleri uygulanmaktadır. Meyvelerin kurutma işlemi, ağırlık ve hacim kaybına bağlı olarak nakliye, depolama ve raf ömrü gibi birçok avantaj sağlar. Karbonik maserasyon (CM), kurutma teknolojisinde ön işlem olarak uygulanan yeni ve sınırlı bir tekniktir. Bu çalışmada, yanıt yüzey metodolojisi (RSM) kullanılarak hem CM hem de havayla kurutma sisteminin proses koşullarının optimize edilmesi amaçlanmıştır. Ayrıca bu koşullar, ön işlem uygulamaları olan ve olmayan uygulamalarla karşılaştırılmıştır. CM'de sıcaklık, CO₂ basıncı, zaman bağımlı değişkenler olarak seçilirken, havayla kurutma işleminde sadece sıcaklık seçilmiştir. Her iki kurutma işleminde de kurutma süresi, askorbik asit, antioksidan aktivite değerleri modelde yanıt olarak kullanılmıştır. Sertifikalı organik Albion çeşidi, çilek materyali olarak Konya/TÜRKİYE'den temin edilmiştir (TR-OT-014-081/02-32). Sonuçlar, kurutma koşulları için kurutma sıcaklığı, maserasyon basıncı, maserasyon sıcaklığı ve maserasyon süresinin optimum parametrelerinin sırasıyla 64.8 °C, 0.35 Mpa, 4.2 °C ve 4 saat olduğunu göstermiştir. Kuruma süresi açısından, CM ön işlemi ile havayla kurutma, CM'siz kurutma işlemine göre %35 avantaj sağlamıştır. CM, bazı renk parametrelerini (L* ve Hue*) önemli ölçüde artırırken, kontrol örneklerine göre esmerleşme indeksi azalmıştır. CM ile muamele edilmiş numunelerde askorbik asit içeriğinde ve antioksidan aktivitede önemli artışlar gözlenmiş, fakat dokusal özellikler kontrol numunelerinden daha zayıf bulunmuştur. Bununla birlikte pH, titrasyon asitliği ve su tutma kapasitesindeki farklılıklar önemsizdir. Sonuç olarak havayla kurutma işleminde kullanılan CM ön işlemi kuruma süresini kısaltmak için oldukça etkili bir yöntem olmuştur. Sonuçlar, çilek kurutma süresinde iyileştirme sağlama potansiyelinin yüksek olduğunu ve karbonik maserasyon ile kuruma süresinin azaltılmasının üreticiler için ekonomik bir avantaj sağladığını ortaya koymaktadır.

Anahtar Kelimeler: Kurutma karakteristikleri, Karbonik maserasyon, Yanıt yüzey metodu, Organik çilek.

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The Secret Life of Toxins in Cocoa

Tamima ElGhandour¹, Mazen Jabbour², Sanaa Khaled¹

¹Department of Food Sciences & Technology, Faculty of Arts&Sciences, Lebanese International University, Bekaa, Lebanon

²Department of Statistical Sciences, Faculty of Sciences, Lebanese University, Beirut, Lebanon

Abstract

Food quality and safety are considered crucial elements imposing huge health and economic problems. Cocoa industry is highly valuable and anything that compromises it is solution-centered to save such treasure. Aflatoxins are one of the problems encountering this industry in the pre- and post-harvest production, and negatively affecting its revenues. Farmers are using different chemical substances to fight aflatoxins, but recently, many researches were done on introducing natural substances such as herbal oil combinations as potential controller of aflatoxins, as a step to enhance the ability of the crop to resist fungal infection and prevent production of aflatoxins. Sage is one of the herbs used in international cuisines, in culinary art and as a potential anti-fungal. A survey was conducted to collect data on the Lebanese knowledge of mycotoxins, sage and its uses as well as the presence of aflatoxins in cocoa, in a step to introduce this topic better to the community. Trying to shed the light on its health benefits as well as checking the willingness of people to try a new product combining cocoa and sage together, sensory analysis was also conducted. The results of the sensory analysis conducted on the food product showed a good overall acceptability of 7. The results of the survey showed that only 29% of the respondents know about the presence of mycotoxins, 44% are aware of the sage herb and fortunately, 65% are willing to try a new product combining cocoa and sage together. These results confirm earlier studies done on mycotoxins' knowledge that seems to be very poor and need more attention and emphases by researchers.

Key Words: cocoa, aflatoxins, sage, health benefits

Ultrasonic Extraction Optimization Of Sweet Basil Phenolics, Encapsulation By Ionic Gelation Method, Antidiabetic Activity, Antioxidant Activity

Ceylan Demircan¹, Ebru Aydın¹, Gülcan Özkan¹

¹ Gıda Mühendisliği Bölümü, Mühendislik Fakültesi, Süleyman Demirel Üniversitesi, Isparta, Türkiye

Abstract

In recent years, with the increasing importance given to healthy nutrition, consumers have started to focus on functional and natural foods rich in phenolics and volatile antioxidant components and supplements. Sweet basil (*Ocimum basilicum* L.) is an important medicinal aromatic plant that has positive health effects due to its phenolic and antioxidant volatile components and its leaves are used as traditional herbal tea and spices also have potential for use in the food and beverage industry. The primary objective of this study was to optimize some of the factors used in ultrasound water extraction of sweet basil leaves by using the response surface methodology (RSM). In the study, ultrasonic amplitude, extraction time and plant/solvent ratio were used as independent variables whereas extraction yield and total phenolic content of sweet basil leaves were considered as the responses. When the experimental parameters were optimized as maximum extraction yield (%) and total phenolic content (mg GAE/100 g leaves) of sweet basil leaves, optimum values of amplitude, time and plant/solvent ratio were found as 100 %, 45 min, 1.06 g/100 mL, respectively. Other objectives of the study were to determine polyphenol and volatile components, free radical scavenging and the content of antidiabetic activities of water extracts from basil leaves under optimum ultrasound extraction conditions, and to microencapsulate of these extracts with ionic gelation-chitosan system. The phenolic components of the extract were determined by HPLC as rosmarinic acid, caffeic acid, rutin, gallic acid, kaempferol, protocatechin acid and syringic acid while the volatile components of extract included E-citral, Z-citral limonene, anethole, 2-methyl-2 phenyltridecane, simonene, nonanal, 1,8-cineol, delta-4-carene, cis-sabinenehydrate, propenal dimethylhydrazone, n -decanal and cis-oximene using GC/MS. Rosmarinic acid (32.2 mg/g extract) as phenolic compounds and E-citral (44.28 %) and Z-citral (29.24 %) as volatile substances were the highest components detected in the aqueous extract. Based on the functional properties of extract the IC₅₀ values of the free radical scavenging and antidiabetic activities were calculated as 0.14 mg/mL and 2.30 mg/mL, respectively. Encapsulation of phenolic rich and water soluble extracts obtained from ultrasound assisted extraction of sweet basil, and the moisture content of the hydrogel beads and the encapsulation efficiency were determined as 99.6 % and 80.12 %, respectively. As a result, hydrogel beads obtained from encapsulation of sweet basil extracts have antioxidant and antidiabetic activities therefore they may be used to produce new functional foods or food supplements.

Key Words: Sweet Basil, Ultrasonic, Optimization, Antioxidant, Encapsulation

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Cultivation of Duckweed (Duckweed) and Determination of Nutrient Content

Abdullah Özbilgin¹, Recep Gümüş²

¹Department of Animal Nutrition and Nutritional Disease, Veterinary Medicine, Cumhuriyet University, Sivas, Turkey

²Department of Animal Nutrition and Nutritional Disease, Veterinary Medicine, Cumhuriyet University, Sivas, Turkey

Abstract

The aim of this study is to determine the ideal growing conditions, yield amount and nutrient content of duckweed plant. In this study, commercially available duckweed (*Lemna minor*) was used. Grouping was done in the form of 4 pools because aquatic plant study was carried out. First pool 500H (0.50kg / 250liter); second pool 750H (0.75kg / 250liter); third pool 1000H (1kg / 250liter); The fourth pool was created with 1250H (1.250kg / 250 liters) chicken manure content and distilled water. Despite being at the same ambient temperature, there was a statistical difference between all groups in terms of pool pH and water temperature ($p < 0.05$). In terms of yield characteristics, it was observed that the recurrences were similar to each other in the 500H group ($p > 0.05$), but the recurrences were statistically different ($p < 0.05$) in the 750H, 1000H and 1250H groups. In addition, the highest yield was obtained in the 1250H group at the first harvested of 96.47 g/m². According to the analysis results of the harvested duckweed, there was a statistical difference between the experimental groups in terms of crude protein, crude ash, NDF, ADF and lignin parameters ($p < 0.05$), and the highest crude protein ratio was in the 1250H group with 39.11%. As a result; The high crude protein ratio of duckweed can meet the field needs by developing products for animal feed and fertilizer. There is a need for feeding trials regarding the use of duckweed in aquaculture and poultry industry, especially due to its high protein and low cost properties.

Key Words: Chicken, Duckweed, Harvested, Plant, Pool

Su mercimeği (Su mercimeği) Yetiştiriciliği ve Besin Madde İçeriğinin Belirlenmesi

Özet

Bu çalışmanın amacı su mercimeği bitkisinin ideal yetiştirme koşulları, verim miktarı ve besin maddesi içeriğini belirlemektir. Bu çalışmada ticari olarak temin edilebilen su mercimeği (*Lemna minör*) kullanılmıştır. Sucul bitki çalışması yapıldığı için gruplandırma 4 havuz şeklinde yapılmıştır. İlk havuz 500H (0.50kg / 250litre); ikinci havuz 750H (0.75kg / 250litre); üçüncü havuz 1000H (1kg / 250litre); Dördüncü havuz 1250H (1.250kg / 250 litre) tavuk gübresi içeriği ve distile su ile oluşturulmuştur. Aynı ortam sıcaklığında olmasına rağmen, havuz pH ve su sıcaklığı açısından tüm gruplar arasında istatistiksel olarak fark vardı ($p < 0.05$). Verim özellikleri açısından 500H grubunda nükslerin birbirine benzer olduğu ($p > 0.05$), 750H, 1000H ve 1250H gruplarında nükslerin istatistiksel olarak farklı olduğu ($p < 0.05$) gözlemlendi. Ayrıca en yüksek verim 96.47 g/m² ile ilk hasatta 1250H grubunda elde edilmiştir. Hasat edilen su mercimeğinin analiz sonuçlarına göre, ham protein, ham kül, NDF, ADF ve lignin parametreleri açısından deney grupları arasında istatistiksel olarak farklılık ($p < 0.05$) bulunmuş ve en yüksek ham protein oranı %39,11 ile 1250H grubunda olmuştur. Sonuç olarak; Su mercimeğinin yüksek ham protein oranı; hayvan yemi ve gübre kullanımı için ürünler geliştirerek hayvansal üretimde ihtiyaçlarını karşılayabilir. Su mercimeğinin özellikle yüksek proteini ve düşük maliyeti gibi özelliklerinden dolayı su ürünleri yetiştiriciliği ve kanatlı endüstrisinde kullanımı ile ilgili yemleme denemelerine ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Bitki, Hasat, Havuz, Su mercimeği, Tavuk

Giriş

Su mercimekleri (*Lemna* spp.), su mercimeği familyasının (*Lemnaceae*) bilinen en küçük çiçekli bitkileridir. *Lemnaceae* familyası içinde tropik ve subtropik bölgelerde farklı türler görülmektedir. Bu türde dört cins bulunmaktadır; *Lemna* spp., *Spirodela* spp., *Wolffia* spp ve *Wolffiella* spp. olmak üzere dünya çapında yaklaşık 40 tür vardır (Les ve ark. 2002, FAO 1999). Türlerin tamamı, yaklaşık 1 mm ile 1 cm arasında oval ile yuvarlak arasında yassı yapraklara sahiptir. Su mercimeği bitkisi su üstünde sabit kalmasını sağlayan ve seyreltik konsantrasyonlarda besin maddelerini almalarına yardımcı olan kök benzeri yapıları sahiptir. Su mercimekleri, 6 - 33 °C arasındaki su sıcaklıklarda canlı kalabilmektedir. Su sıcaklığı ile büyüme hızı artar, ancak büyüme ortalama 30 °C ve bu derecenin üstünde büyüme yavaşlar hatta durur. Su mercimeğinin büyümesi için pH' nın alt ve üst limitleri 4 ile 10 arasında optimum pH 7 olması gerektiği bildirilmektedir (McLay 1976).

Su mercimeği; N, P ve K'un yüksek konsantrasyonlarında büyür, protein sentezler. Doğadan toplanan numunelere yapılan analizlerde su mercimeğinin kuru maddede %25-35 ham protein, %4.4 ham yağ, %8-10 ham selüloz ve

%15 ham kül içerdiği bildirilmiştir (Leng ve ark. 1994). Su mercimeği esansiyel amino asitler bakımından da diğer bitkilerden daha yüksek lizin ve metiyonin içeriğine sahiptir (Journey ve ark. 1991). Hayvan yemi üretiminde soya fasulyesi küspesinin yerine kullanılabilecek alternatif protein kaynakları arayışı, su mercimeği kullanımına olan ilgiyi canlandırması beklenmektedir. Bu yem bitkisi, 1960 ve 1970'lerde, Polonya'da su kuşu ile domuz beslemede rasyonlarda kullanıldığı bildirilmektedir (Lassociński 1979). Birçok araştırmacı tarafından su mercimeğinin alternatif bir ham madde olarak (Haustein ve ark. 1994, Bairagi ve ark. 2002, Goopy ve Murray 2003, Moyo ve ark. 2003, Khandaker ve ark. 2007, Effiong ve ark. 2009, Hasan ve Chakrabarty 2009, Akter ve ark. 2011, Mwale ve Gwaze 2013) ve gelecekte muhtemelen insan gıdası üretimi için de (Appenroth ve ark. 2017) bir protein kaynağı olarak kullanılabileceği bildirilmiştir. Czerpak ve Piotrowska (2005) protein, karbonhidrat, vitamin ve mineral açısından zengin yem üretmek için su mercimeği kullanımını önermiştir. Chojnacka (2006)'ya göre su mercimeği hayvan yemlerine mineral takviyeleri sağlamak için kullanılabilir. Domuz yavrularıyla yapılan bir besleme denemesinde protein kaynağı olarak balık unu, soya fasulyesi küspesi ve mısır ile su mercimeği protein konsantrisini karşılaştırmalı olarak kullanıldığı bildirilmiştir (Rojas ve ark. 2014).

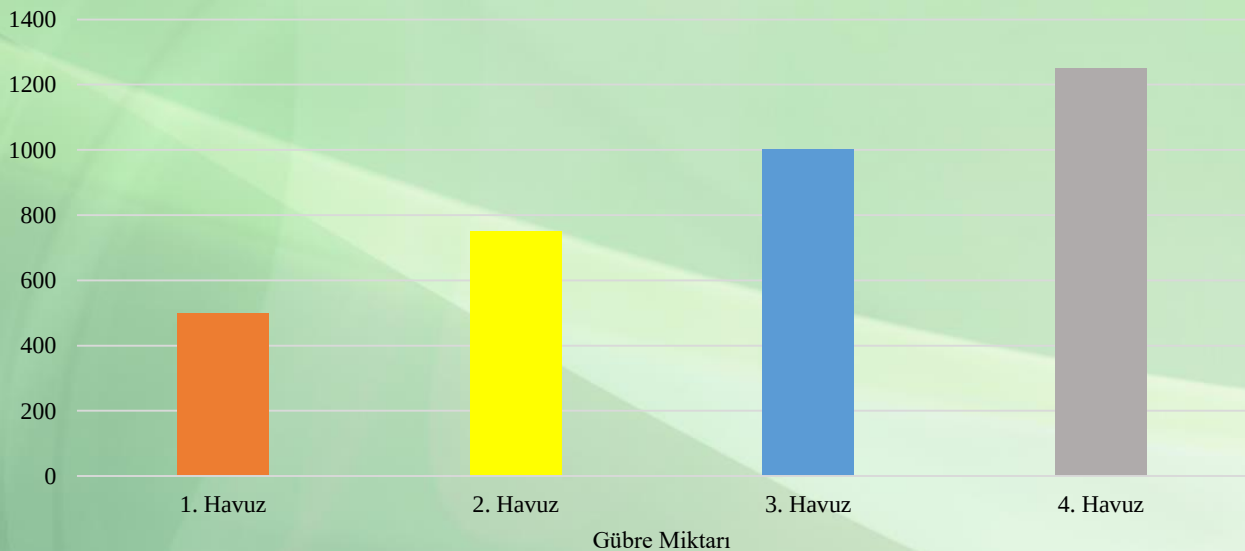
Mevcut araştırmada, havuzlarda üretilen su mercimeğinin verim özellikleri, besin madde içeriğini belirlemek amacıyla tasarlanmıştır. Ayrıca farklı miktarlarda ısıtılmış tavuk gübresi kullanılarak yetiştirilen su mercimeğinin verim özellikleri ve besin madde içeriğinde değişim olması beklenmektedir.

Materyal ve Yöntem

Bu çalışma kapsamında piyasadan saf olarak temin edilen Lemna minör cinsi su mercimeği kullanıldı. Denemede kullanılan havuz ölçüsü ((genişlik, uzunluk ve yükseklik sırasıyla 65*90*50 cm)) ve 250 litre hacim olarak belirlendi. Gruplama 4 havuz şeklinde yapıldı. Birinci havuz 500H (0.50kg tavuk dışkısı / 250litre); ikinci havuz 750H (0.75kg tavuk dışkısı / 250litre); üçüncü havuz 1000H (1kg tavuk dışkısı / 250litre); dördüncü havuz 1250H (1.250kg tavuk dışkısı / 250 litre) ve distile su ile oluşturuldu (Şekil 1). Başlangıçta havuzlara 20'er gr su mercimeği atıldı. Havuzlarda gelişmeye bırakılan su mercimeklerinde ortam pH'sı pH metre ile ölçüldü. Her bir havuzun ölçülen pH'sı ve su sıcaklığı günlük olarak kayıt edildi.

Havuzların bulunduğu ortam ısısı 23 °C' de % 50 bağıl nemde tutuldu. Genel olarak odanın ve havuzların aydınlatması için floresan lambalar ve güneş ışığı ile birlikte 16 saat aydınlık 8 saat karanlık aydınlatma programı sağlamak amacıyla deneme boyunca zaman saati (Cata CT 9181) kullanıldı. Her havuzda pH değeri kontrol edildi ve kayıt edildi. Havuzun yüzeyinin kaplanmasına bağlı olarak su mercimekleri elekler aracılığıyla hasat edilip tartıldı. Her deneme sonrasında tartım yapıldı ve her deneme 3 tekrerrür sürdü ve deneme toplam 45 günde sonuçlandırıldı. Deneme sonrası her havuzdan hasat edilen ürünler tartıldı ve metrekaredeki su mercimeği verimleri belirlendikten sonra her grup kendi arasında birleştirildi ve kuru madde verimini belirlemek amaçlı olarak Etüv' de 55 C' de 2 gün kurumaya bırakıldı. Ayrıca hasat edilen ve kurutulmuş su mercimeğine ham kül, ham yağ, ham protein, NDF, ADF, lignin analizleri yapıldı. Ham protein analizleri Kjeldal metoduyla ham yağ Soxhlet metoduyla. NDF ve ADF analizleri ise Van Soest metoduyla yapıldı. Ayrıca denemede kullanılan tavuk dışkısı aynı şekilde analiz edildi (Tablo 2).

Denemede elde edilen sonuçlar SPSS'de One way Anova ile değerlendirildi ve gruplar arası farklar ise Bonferroni testi ile ($p < 0.05$) ölçüldü.



Şekil 1. Denemede oluşturulan grupların dağılımı

Bulgular ve Tartışma

Havuz pH ve su sıcaklığı açısından deneme grupları arasında istatistiksel olarak anlamlı farklılık bulunmaktadır ($p < 0.05$) (Tablo 1).

Hasat miktarı bakımından 500H grubunda tekerrürlerin birbirine benzer olduğu ($p > 0.05$) ancak 750H, 1000H ve 1250H gruplarında tekerrürlerin istatistiksel olarak birbirinden farklı ($p < 0.05$) olduğu gözlemlenmiştir. Ayrıca en yüksek verime 1250H grubunda 1. tekerrürde 96.47 g/m² elde edilmiştir (Tablo 3).

Hasat edilen su mercimekleri analiz sonuçlarına göre ham protein, ham kül, NDF, ADF ve lignin parametreleri açısından deneme grupları arasında istatistiksel farklılık bulunduğu ($p < 0.05$) ayrıca 1250H grubu % 39.11 ile en yüksek ham protein oranına sahiptir. Ham kül parametresi 750H grubunda % 12.51 ile en yüksektir. NDF parametresinde ise 1250H grubu % 33.36 ile en yüksek değere sahiptir. ADF parametresinde ise 1000H grubu % 21.04 ile en yüksek değere sahiptir. Lignin parametresi açısından ise 750H grubu % 4.87 ile en yüksek değere sahiptir (Tablo 4).

Tablo 1. Havuzlarda ortalama sıcaklık ve pH değerleri.

	500H	750H	1000H	1250H	P
pH	7.39±0.21 ^a	7.50±0.02 ^b	7.73±0.01 ^c	7.81±0.01 ^d	0.001*
Sıcaklık, °C	21.15±0.22 ^a	21.27±0.10 ^a	20.30±0.60 ^b	20.25±0.80 ^b	0.001*

*Deneme grupları arasında istatistiksel olarak anlamlı fark bulunmaktadır.

Tablo 2. L. Minör yetiştirilmesinde kullanılan tavuk dışkısının besin madde içeriği.

	Doğal halde	Kuru maddede
TSBM, %	13.71	56.32
ME-3X, mcal/kg	0.54	2.23
Kuru madde, %	24.35	100
Ham protein, %	8.5	34.91
NDICP, %	2.51	2.51
ADICP, %	1.8	1.8
NDF, %	8.92	36.63
ADF, %	4.63	18.9
NFC, %	2.68	10.99
Lignin, %	1.2	4.91
Ham kül, %	4.25	17.46

TSBM: Toplam sindirilebilir besin maddeleri. ME-3X: Metabolik enerjinin 3 katı. NDICP: Nötral Deterjanda Yıkılanmayan Ham Protein. ADICP: Asit Deterjanda Yıkılanmayan Ham Protein. NDF: Nötral Deterjan Fiber. ADF: Asit Deterjan Fiber. NFC: Fiber Olmayan Karbonhidrat

Tablo 3. Havuzlarda elde edilen L. Minör verimleri (g/m²)

Grup	1. tekerrür	2. tekerrür	3. tekerrür	P
500H	45.74±3.13	42.36±1.48	43.86±0.92	0.53
750H	59.75±1.27 ^a	52.41±0.76 ^b	54.08±0.21 ^b	0.001*
1000H	68.61±1.38 ^a	63.35±0.68 ^b	56.97±0.37 ^c	0.001*
1250H	96.47±3.03 ^a	74.66±2.19 ^b	64.24±2.18 ^c	0.001*

*Deneme grupları arasında istatistiksel olarak anlamlı fark vardır ($p < 0.05$)

Tablo 4. Havuzlarda elde edilen L. Minör'ün besin madde analiz içeriği (Kuru Madde)

	500H	750H	1000H	1250H	p
KM.%	5.14±0.03 ^c	5.31±0.02 ^b	5.35±0.02 ^b	5.47±0.01 ^a	0.01
HP. %	36.07±0.03 ^c	36.22±0.01 ^c	37.05±0.02 ^b	39.11±0.11 ^a	0.001
HK. %	12.34±0.03 ^b	12.51±0.03 ^a	12.18±0.02 ^c	12.18±0.02 ^c	0.001
NDF. %	33.00±0.03 ^c	33.12±0.03 ^b	33.16±0.02 ^b	33.36±0.03 ^a	0.001
ADF. %	20.93±0.01 ^b	21.02±0.03 ^a	21.04±0.03 ^a	20.33±0.01 ^c	0.001
Lignin. %	4.84±0.01 ^{ab}	4.87±0.01 ^a	4.78±0.01 ^b	4.67±0.03 ^c	0.001

KM: Kuru madde. HK: Ham kül. HP: Ham protein. NDF: Nötral deterjan fiber. ADF: Asit deterjan fiber.

Verim Özellikleri

Su mercimekleri, yüksek verimli bitkilerdir. Türe, iklim koşullarına, besin madde içeriğine ve çevresel koşullara bağlı olarak değişen verim özelliklerine sahiptir. Hasat için besin madde ile güneş ışığı sağlandığında verim miktarını 16 saat- 2 gün içinde iki katına çıkarabilir. Su mercimeği bitkisi kalabalık stresi oluşup besin maddeleri tükenene kadar süren üssel bir büyüme gerçekleştirmektedir. Bitkilerin aşırı kalabalıklaşmaması için besinlerin genellikle sınırlayıcı olmadığı ve sık hasat yapıldığı durumlarda yüksek verimler elde edilebilir (FAO 1999).

Su mercimeği bitkisinin hasat miktarı bakımından çeşitli veriler bulunmaktadır. Mestayer ve ark (1984) tarafından Amerika'da yapılan çalışmada 27-38 ton/hektar/yıl; Oron ve ark (1987) tarafından İsrail'de yapılan çalışmada 36-51 ton/hektar/yıl; Landolt ve ark (1987) İsrail'de yaptıkları çalışmada 39 ton/hektar/yıl; Mbagwu ve Adenji (1988) tarafından Amerika'da yapılan çalışmada 54 ton/hektar/yıl; Edwards ve ark (1992) maksimum verim olarak 17-25 ton/hektar/yıl; Alaerts ve ark (1996) 3-9.5 ton/hektar/yıl hasat miktarı bildirmişlerdir. Günümüzde yapılan çalışmalarda ise su mercimeği 29 g /m²/gün hasat miktarı bildirmişlerdir (Cheng ve ark. 2002). Mevcut çalışmada da havuzdaki besin madde miktarı artışına bağlı olarak artan şekilde 500H grubunda ortalama 43.86 - 45.74g/m²; 750H grubunda 52.41 – 59.75 g/m²; 1000H grubunda 56.97 – 68.61 g/m² ve 1250H grubunda ise 64.24 – 96.47 g/m² hasat miktarı ile Cheng ve ark (2002) benzer sonuçlar elde edilmiştir. Tekerrürlerde ortaya çıkan dalgalanmaların ortam kalabalıklaşmasına bağlı olarak oluştuğu düşünülmektedir.

Besin Madde İçeriği

Su mercimeğinin büyümesi için pH' nın alt ve üst limitleri 4 ile 10 arasında optimum pH 7 olması gerektiği bildirilmektedir (McLay 1976). Mevcut çalışmada pH değeri gruplardaki organik madde konsantrasyonu arttıkça beklendiği gibi yükselmiştir (Tablo 1). Nhapi ve ark (2003) yaptıkları çalışmada pH değerleri açısından mevcut çalışmaya benzer şekilde pH 7.1-7.4 olarak bildirmişlerdir ve suyun besin madde miktarının artmasına bağlı olarak pH değerinin arttığını bildirmişlerdir. Sengupta ve ark. (2010) su mercimeği yetiştirilen havuzun pH' sının 7.63 olduğunu bildirmişlerdir.

Birçok çalışmada su mercimeğinin kuru madde içeriği %3-14 arasında değiştiği bildirilmiştir (Olorunfemi ve ark. 2006, Hasan ve Chakrabarty 2009). Mevcut çalışmada su mercimeğinde %5 kuru madde verimi belirlenmiştir. Khanum ve ark (2005) %7.9 kuru madde; Hang ve ark (2009) %8 kuru madde verimi ile mevcut çalışmadan daha yüksek kuru madde oranı bildirmişlerdir.

Su mercimeği bitkisinde ham protein ve diğer besin madde içerikleri büyüme ortamının kalitesine bağlı olarak büyük ölçüde değişir. Su mercimeği bitkisinde ham protein %7–45 (çoğunlukla %20–45), ham yağ %2–9, ham selüloz %12–28 ve karbonhidrat oranı %14–44'tür (FAO 1999, Iqbal 1999, Olorunfemi ve ark. 2006, Hasan ve Chakrabarty 2009). Ayrıca doğadan hasat edilen su mercimeği yaklaşık %14-25 ham protein içerdiği (Huque ve ark. 1997) benzer şekilde Erzurum bölgesinde yapılan bir araştırmada doğadan toplanan su mercimeği örneklerinin kimyasal analizlerinde %15.60 ham protein içerdiği (Kırım 1996), ancak ideal koşullar besin madde ihtiyacı karşılandığında mevcut çalışmayla benzer şekilde ham protein içeriği %35-45'e kadar çıkabildiği bildirilmiştir. Ayrıca Oron ve ark (1985) yaptıkları çalışmada, su mercimeğinin %48'e varan ham protein oranı ve yetiştiricilik yapmakta çok az girdi yatırımı yapılması işletmelerin karlarını artırmada olumlu olacağını bildirmişlerdir.

Mevcut çalışmada da ise ham kül oranı %12.18-12.51 belirlenmiştir. Hlophe ve Moyo (2011), mevcut çalışmayla benzer şekilde su mercimeğinin % 12.3 ham kül oranı bildirmişlerdir. Ancak önceki çalışmalarda Tavares ve ark. (2008) %16; Men ve ark. (1995) %19.0 ham kül oranı ile mevcut çalışmadan daha yüksek inorganik (mineral) madde miktarı bildirmişlerdir.

Sonuç olarak; su mercimeği bitkisi yüksek ham protein oranına sahip olmasıyla hayvansal üretim amaçlı bir ürün olarak büyük fırsatlar içermektedir. Mevcut çalışmada 1250H grubunda 1. tekerrürde en yüksek verim miktarına ulaşılmış olup en yüksek ham protein verimi de bu grupta elde edilmiştir. Bitkinin bulunduğu ortamda zengin besin maddelerinin içerdiğinde hayvansal yem üretiminin yanı sıra topraktaki organik madde içeriğini artırmak amaçlı gübre olarak da kullanılabilir. Mevcut çalışmada olduğu gibi tavuk dışkıları ısıtılıp işleminden geçirildikten sonra gübre olarak da kullanılabilir. Su ürünleri yetiştiriciliği ve tarla sulama kullanım için uygun alternatiflerdir. En iyi stoklama ve verim oranlarının yanı sıra en iyi besin uzaklaştırma oranlarıyla sonuçlanacak havuz derinliklerini belirlemek için daha fazla bilimsel çalışma gereklidir. Özellikle su ürünleri ve kanatlı yetiştiriciliğinde su mercimeği kullanımını kolaylaştırmak için hazırlama ve kurutma üzerine araştırmalara ihtiyaç vardır.

Teşekkür

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Production Of Jelly Sugar From Organic Molasses

Muhammed Mustafa Özçelik , Burçak Duman, Gülcan Özkan

¹Food Engineering, Engineering Faculty, Suleyman Demirel University, Isparta, Turkey.

Abstract

In this study, the possibilities of using molasses, which is a natural carbohydrate and energy source, instead of glucose-fructose syrup in the production of organic gel-sugar were investigated. It was aimed to enrich the antioxidant content by adding vitamin C to the final product and to increase the absorption of iron from molasses in the human body. Gel candies produced using grape, mulberry and carob molasses have been successful in terms of the formation and stability of the desired gel form. Physical, chemical, microbiological, sensory, and statistical analyzes were performed in each products. Total phenolic content, vitamin C amount, free radical scavenging activity (DPPH), HMF and flavonoid content of grape, mulberry and carob gel candies were determined as 886.37, 1065.81, 3171.29 µg GAE/g DM; 11.44, 12.80, 16.74 mg AA/g DM; 132.29, 157.61, 331.45 mg TE/100g DM and 3.61 4.20, 2.54 mg HMF/100g DM, 37.07, 67.70, 67.73 mg Rutin /100g DM respectively. According to the physico-chemical and textural analyze results, the best quality product has been found as carob gel sugar however grape gel sugar was the most desired one based on sensory evaluation. The results revealed that molasses gel candies produced using grape, mulberry and carob molasses may have industrial production potential.

Key Words: Jelly sugar, Organic food, Industrial product, Antioxidant and polyphenol, Molasse.

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Özet

Bu çalışmada, doğal karbonhidrat ve enerji kaynağı olan pekmezin organik jeli şeker üretiminde glukoz-fruktoz şurubu yerine kullanım olanakları araştırılmıştır. Son ürüne C vitamini katkısı yapılarak antioksidan içeriğinin zenginleştirilmesi ve insan vücudunda pekmezden gelen demirin emiliminin artırılması hedeflenmiştir. Üzüm, dut ve keçiboynuzu pekmezi kullanılarak üretilen pekmez jeli şekerleri istenilen jel formun oluşması ve stabilitesi açısından başarılı bulunmuştur. Her bir üründe; fiziksel, kimyasal, mikrobiyolojik, duyuşal ve istatistiksel analizler yapılmıştır. Üzüm, dut ve keçiboynuzu jeli şekerlerinde sırasıyla toplam fenolik madde miktarı 886.37, 1065.81, 3171.29 µg GAE/g KM, askorbik asit miktarı 11.44, 12.80, 16.74 mg A.A/g KM, serbest radikalleri yakalama aktivitesi (DPPH) 132.29, 157.61, 331.45 mg T.E./100gKM, HMF miktarı 3.61, 4.20, 2.54 mgHMF/100gKM, flavonoit miktarı 37,07, 67,70, 67,73 mg Rutin/100g KM olarak bulunmuştur. Yapılan fiziko-kimyasal ve tekstür analizleri sonuçları bakımından en iyi ürün keçiboynuzu jeli şekeri olmasına rağmen, duyuşal analiz sonuçlarına göre ilk sırayı üzüm jeli şekeri almıştır. Sonuçlar, üzüm, dut ve keçiboynuzu pekmezi kullanılarak üretilen pekmez jeli şekerlerinin endüstriyel anlamda üretim potansiyeline sahip olabileceğini ortaya koymaktadır.

Anahtar Kelimeler: Jeli şeker, Organik gıda, Endüstriyel ürün, Antioksidan ve polifenol, Pekmez.

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Overview of *In-ovo* sex Determination of Layer Chicken Embryos

Brian Tainika¹, Ahmet Şekeroğlu²

^{1,2}Department of Animal Production and Technologies, Faculty of Agricultural Sciences and Technologies, Niğde Ömer Halisdemir University, Niğde, Turkey

Abstract

Due to the ban on culling of day-old male layer chicks, research on possible alternatives have accelerated over time. Currently, the successfully proven methods include rearing male layers for meat purposes, producing dual-purpose chickens, techniques to influence sex ratio, and *in ovo* sex determination. Here, we reviewed *in ovo* sex or gender determination, which is defined as the identification of the sex of embryos within the egg. The reviewed evidence suggests *in ovo* sexing methods such as biochemical (endocrine variance e.g., analysis of estradiol and estrone sulfate), and optical and imaging (e.g., fluorescence, infrared and Raman spectroscopy) are ready for commercial application. The contactless *in ovo* sexing methods (optical and imaging) neither have damaging effect on embryo nor decrease hatchability. On the other hand, methods that require withdrawal of biological materials (biochemical) from the egg result in increased infection risks, reduced hatchability and decreased rearing performance. Generally, all the *in ovo* sexing methods do not affect laying performance. The sexing accuracy of these methods is between 90% and 98%. *In ovo* sexing timing is day 7 of incubation, however; day 9 of incubation is suggested as the time when estrone sulfate in the allantoic fluid is highly significant in sex determination. It is suggested that *in ovo* sexing on both days (6 and 7) of embryogenesis is the reliable time before the onset of pain perception in the embryonic body. In conclusion, studies on *in ovo* sex determination of chicken embryos are insufficient although several surveys in countries like the Netherlands and Germany indicate that it is the most acceptable alternative to culling of day-old male layer chicks. Therefore, more studies on the *in ovo* sexing application are required. Meanwhile, legal bans come with export restrictions, thus countries and institutions should update their information and direct research towards alternative approaches to culling of day-old male layer chicks and adapt accordingly.

Key Words: day-old male chick, endocrine variance, incubation, *in ovo* gender identification, layer chicken, spectroscopy

Impact of Essential Oil Applications in Storage Period on Sugar Beet (*Beta vulgaris* L.) Root Quality

Fatma Zehra Ok¹, Arif Şanlı², Yeşim Cirit², Bekir Tosun³

¹Isparta University of Applied Sciences Faculty of Agriculture Field Crops Department, Isparta, Turkey

²Isparta University of Applied Sciences Atabey Vocational High School, Isparta, Turkey

³Burdur Mehmet Akif Ersoy University, Agriculture, Livestock and Food Research and Application Center, Burdur, Turkey

*Corresponding Author: fhzehraok@gmail.com

Abstract

This study was carried out under storage conditions in 2019-2020 in order to determine the effects of dill, clove and hyssop essential oils and fungicide applications applied to sugar beet root stems during the storage period. In the study, the root stems of Esperanza (KWS) variety, which was produced in the experimental areas in 2019, were used. Root stems were treated with 100, 500 and 1000 ppm doses of dill (*Anethum graveolens* L.), clove (*Syzygium aromaticum*) and hyssop (*Echinophora tenuifolia*) essential oils, synthetic fungicide and Tween-80 in 3 replications, after harvest. It was placed in the cold storage (+ 8-10 °C). Weight loss on root stems at 15-day intervals from the beginning of the storage period, dry matter ratio, brix, polar sugar, reducing sugar and alpha amino nitrogen contents, phytotoxicity and fungal infection development at the end of the 3-month storage period were determined. The applications made in the research significantly affected the post-harvest weight and quality losses in beet. Depending on the applications, the weight losses at the end of the 3-month storage period varied between 9.43-19.90%, and the weight losses in essential oil applications were lower than the control. The highest dry matter content and brix values were obtained from clove essential oil and fungicide and Tween-80 applications. While Tween-80 and fungicide applications increased the polar sugar content compared to the control, 1000 ppm clove essential oil caused a significant decrease in the polar sugar content. In the study, reducing sugar and alpha amino nitrogen contents of root stems applied 1000 ppm essential oil of black seed oil were lower. Hyssop essential oil showed the highest antifungal activity against white mold and green mold infections on the root stem. In the study, it was concluded that the weight and quality losses of sugar beet can be reduced with the application of essential oil to the root stems after harvest, however, similar studies should be carried out using different active substances and doses because some applications cause phytotoxicity.

Keywords: Weight loss, Antifungal activity, Storage quality change, Polar sugar, Sugar beet

Depolama Devresinde Yapılan Uçucu Yağ Uygulamalarının Şeker Pancarı (*Beta vulgaris* L.) Kalitesine Etkileri

Özet

Bu çalışma, depolama devresinde şeker pancarı kök gövdelerine yapılan dereotu, karanfil ve çörtük otu uçucu yağları ile fungusit uygulamalarının kök gövdelerin depo kalitesine etkilerinin belirlenmesi amacıyla depo şartlarında 2019-2020 yılında yürütülmüştür. Çalışmada 2019 yılı deneme alanlarında üretimi yapılan Esperanza (KWS) çeşidinin kök gövdeleri kullanılmıştır. Kök gövdeler hasattan hemen sonra 100, 500 ve 1000 ppm dozlarında dereotu (*Anethum graveolens* L.), karanfil (*Syzygium aromaticum*) ve çörtük otu (*Echinophora tenuifolia*) uçucu yağları ile sentetik fungusit ve Tween-80 ile muamele edilerek 3 tekerrürlü olacak şekilde plastik kasalar içerisinde soğuk hava deposuna (+ 8-10 °C) konulmuştur. Depo devresi başından itibaren 15 gün aralıklarla kök gövdelerde ağırlık kaybı, 3 aylık depolama devresi sonunda ise kuru madde oranı, briks, polar şeker, indirgen şeker ve alfa amino azot içerikleri ile fitotoksiste ve fungal enfeksiyon gelişimleri belirlenmiştir. Araştırmada yapılan uygulamalar pancarda hasat sonrası ağırlık ve kalite kayıplarını önemli derecede etkilemiştir. Uygulamalara bağlı olarak 3 aylık depolama devresi sonunda ağırlık kayıpları % 9.43-19.90 arasında değişmiş, uçucu yağ uygulamalarında ağırlık kayıpları kontrole göre daha düşük olmuştur. En yüksek kuru madde oranı ve brix değerleri karanfil uçucu yağı ile fungusit ve Tween-80 uygulamalarından elde edilmiştir. Tween-80 ve fungusit uygulamaları polar şeker içeriğini kontrole göre arttırırken, 1000 ppm karanfil uçucu yağı polar şeker oranının önemli derecede azalmasına neden olmuştur. Çalışmada, 1000 ppm çörtük otu uçucu yağı uygulanan kök gövdelerin indirgen şeker ve alfa amino azot içerikleri daha düşük olmuştur. Kök gövde üzerinde gelişen beyaz küf ve yeşil küf enfeksiyonlarına karşı en yüksek antifungal aktiviteyi çörtük otu uçucu yağı göstermiştir. Çalışmada, hasat sonrası kök gövdelerine yapılan uçucu yağ uygulamaları ile şeker pancarında ağırlık ve kalite kayıplarının azaltılabileceği, bununla birlikte bazı uygulamaların fitotoksisteye neden olması nedeniyle benzer çalışmaların farklı aktif maddeler ve dozlar kullanılarak yapılması gerektiği sonucuna varılmıştır.

Anahtar kelimeler: Ağırlık kaybı, Antifungal aktivite, Depo, kalite değişimi, Polar şeker, Şeker pancarı

The effect of Electro Magnetic Fields (EMFs) on seed germination and seedlings Physiological changes of *Coriandrum sativum* L. to achieve the optimum frequency of Electro Magnetic Field.

Zahra Atghia

Department of Botany , Science and Research Branch of Azad University, Science and Research Branch of Azad University, Tehran, Iran

Abstract

According to 2 decades, there are some reports and researches that have been focused on Pharmacological and Medicinal Plants to consider on Antioxidant components and Secondary Metabolites. *Corianderum sativum* by scientific name as Coriander is one of the most important Medicinal plants from Apisaceae family. One of the ways for arising up the amount of Secondary Metabolites is to utilize Stress such as Electro-Magnetic Fields (EMF) which influences their effects on seed germination and seedlings Physiological changes by changing intensities and times of effects. The Positive and Negative effects of them are influenced the features such as rate of seeds and seedlings growth as well as on Biomass of them. The Process is influenced by changing in potential electricity of cells membrane and physiological process while there is no engineer manipulated in cells; Valsivoski, 2003. So this physiological way has been be the most functional optimum that causes the next generous will appear without any engineered manipulation. It is considered 3 frequencies of EMF such as 3, 5, 7 miliTesla as the treatments in 3 different times 5 min, 10 min, 15min, for each of the treatments in 2 repeats. Due to numerical SPSS analyzers the result shows the functional optimum in 7 miliTelsa in seeds germination and growth of normal seedlings, thus this test is repeated in 3 new different EMF under the 7 miliTesla to up. The frequencies from 6.5, 7.5, 8.5 miliTesla are selected and it has done in 2 repeats again. The new SPSS analyzers data displays that the average of time as 10 min of EMF in both 7.5miliTesla and 8.5miliTesla are 2 important factors to imply the high rate of seeds germination and growth of Coriander seedlings up to upper leaves than first step as 2 leaves seedlings meanwhile in other EMF frequencies, the other seedlings treatments has abnormal leaves in shapes and sizes, consequently they are going to necrosis and apoptosis.

Keywords:

Current Status of Fish Production in Sinop Province, Turkey

Şennan Yücel¹, Birol Baki², Tuçe Altın³, Gülşen Uzun Gören⁴

¹Sinop Üniversitesi, Su Ürünleri Fakültesi, Su Ürünleri Temel Bilimleri, 57000, Sinop/Türkiye

²Sinop Üniversitesi, Su Ürünleri Fakültesi, Su Ürünleri Yetiştiriciliği ABD, 57000, Sinop/Türkiye

³Sinop Üniversitesi, Fen Bilimleri Ens. Su Ürünleri Temel Bilimleri ABD, 57000, Sinop/Türkiye

⁴Sinop Üniversitesi, Su Ürünleri Fakültesi, Su Ürn. Yetiştiriciliği ABD, 57000, Sinop/Türkiye

Abstract

Turkey has a sea coast of 8333 km with different ecological conditions, 1685 km of which is in the Black Sea, and it is ranked 31st in terms of coastal lengths of countries with a coast. Average fish production in Turkey was 650 327 tons in the last ten years, and the production of 2019 was 836 523.7 tons. 80% of Turkey's fisheries production was obtained from the Black Sea Region. The fish production amount of the last five years (2015-2019) of Sinop province, located in the Black Sea Region, where a significant part of fish production is carried out, was evaluated in the study. For this purpose; Sinop Provincial Directorate of Agriculture and Forestry and TUIK data were used. There are 2 326 commercial fishermen and 444 fishing boats in Sinop. Currently, 5 enterprises are engaged for aquaculture in cages in Sinop marine area. The 2 potential sea areas determined in Sinop have an annual production capacity of 32 430 tons (31 enterprises). In addition, 5 bivalve production facilities (4940 tons / year) and fry production with a capacity of 1 000 000 pieces / year are at the project stage. The total fish production of the province in 2019 was 34 620.9 tons, and 1 505 tons of it was obtained from aquaculture. In addition to these, 3 924 tons of fish processing facilities and 35 tons of fish meal and oil processing facilities operate annually. Of the sea fish caught in Sinop, 66% was anchovy (*Engraulis encrasicolus ponticus*), 16% was sprat (*Sprattus sprattus phalericus*), 13% was horse mackerel (*Trachurus trachurus*) 3% was bluefish (*Pomatomus saltatrix*) fish and 2% was other species. The most preferred sea fish by the consumer are anchovy (*Engraulis encrasicolus ponticus*), horse mackerel (*Trachurus trachurus*), whiting (*Merlangus merlangus*), red mullet (*Mullus barbatus*), bluefish (*Pomatomus saltatrix*), turbot (*Psetta maxima*) and bonito (*Sarda sarda*). Among the cultured fish, sea bream (*Sparus aurata*), sea bass (*Dicentrarchus labrax*) and rainbow trout (*Oncorhynchus mykiss*) are the species offered for sale throughout the year.

Key Words: Sinop, fisheries, Aquaculture, fish production

Sinop İli Su Ürünleri Üretiminin Mevcut Durumu ve Türkiye Su Ürünleri Üretimindeki Yeri Özet

Türkiye, 1685 km'si Karadeniz'de olmak üzere 8333 km'lik farklı ekolojik şartlara sahip deniz kıyı yapısına sahip olup, denize kıyısı olan ülkelerin kıyı uzunluklarına göre sıralamasında 31.sırada yer almaktadır. Türkiye'de su ürünleri üretimi son on yılda ortalama 650327 ton olup, 2019 yılı üretimi 836 523,7 ton olarak gerçekleşmiştir. Türkiye su ürünleri avcılık üretiminin %80'i Karadeniz Bölgesinden elde edilmiştir. Araştırmada su ürünleri üretiminin önemli bir kısmının gerçekleştirildiği Karadeniz Bölgesinde yer alan Sinop ilinin son beş yılındaki (2015-2019) üretim miktarı değerlendirilmiştir. Bu amaçla; Sinop Tarım ve Orman İl Müdürlüğü ve TUIK verilerinden yararlanılmıştır. Sinop ilinde 2 326 adet ticari balıkçı ve 444 adet balıkçı teknesi bulunmaktadır. Sinop deniz alanında halen 5 işletme kafeslerde su ürünleri yetiştiriciliği yapmaktadır. Sinop'ta belirlenen 2 potansiyel deniz alanının yıllık 32 430 ton (31 işletme) üretim kapasitesi bulunmaktadır. Ayrıca 5 adet çift kabuklu üretim tesisi (4940 ton/yıl) ile 1 000 000 adet/yıl kapasiteli yavru üretimi proje aşamasındadır. İlin 2019 yılı toplam su ürünleri üretimi 34 620,9 ton olup, 1 505 tonu yetiştiricilikten sağlanmıştır. Bunların yanında yıllık 3 924 tonluk balık işleme, yıllık 35 tonluk balık unu ve yağı işleme tesisleri faaliyet göstermektedir. Sinop'ta avlanan deniz balıklarının %66'sı hamsi (*Engraulis encrasicolus ponticus*), %16'sı çaça (*Sprattus sprattus phalericus*), %13'ü istavrit (kraça) (*Trachurus trachurus*) %3'ü lüfer (*Pomatomus saltatrix*) balıkları ve %2'si diğer türlerden oluşmaktadır. Tüketicinin en fazla tercih ettiği deniz balıkları hamsi (*Engraulis encrasicolus ponticus*), istavrit (*Trachurus trachurus*), mezgit (*Merlangus merlangus*), barbunya (*Mullus barbatus*), lüfer (*Pomatomus saltatrix*), kalkan (*Psetta maxima*) ve palamut (*Sarda sarda*) olup, kültür balıklarından çipura (*Sparus aurata*), levrek (*Dicentrarchus labrax*) ve gökkuşağı alabalığı (*Oncorhynchus mykiss*) yıl boyunca satışa sunulan türlerdir.

Anahtar Kelimeler: Sinop, balıkçılık, Su Ürünleri yetiştiriciliği, balık üretimi

Variance planting density effects growth and yield attributes of hybrid maize (*Zea mays* L.) in single and twin rows planting

Sadık Yalçın¹, Ömer Konuşkan²

¹Institute of Natural and Applied Sciences, Hatay Mustafa Kemal University, Hatay, Turkey

²Department of Field Crops, Faculty of Agriculture, Hatay Mustafa Kemal University, Hatay, Turkey

Abstract

This investigation was conducted to compare single and twin-row planting pattern and to verify optimum plant density for hybrid maize (DKC5364, P0573), grown in West Blacksee condition of Turkey, through the main crop growing season in 2020. The experimental design was a randomized complete block in a split-plot arrangement with three replications. Main plots were arranged plant densities of 8, 9, 10, 11 and 12 plants/m². Split-plots were arranged planting patterns (single row (70 cm) and twin row (70-20cm). In current study, plant height, first ear height, stem diameter, ears number per plant, ear length, ear diameter, and cob weight were measured. For every growing condition, it should be plant pattern, plant density and maize cultivars. DKC 5364 cultivars sowed higher than P0573 cultivar. The most suitable plant density is determined a 11 plants/m² for grain production and 12 plants/m² for herbal production in twin row planting in West Blacksee condition of Turkey.

Key Words: Corn, cultivars, twin row, plant density

Değişik bitki sıklıklarının tek ve çift sıralı ekimlerde hibrit mısırın (*Zea mays* L.), büyüme ve verim özelliklerine etkisi

Özet

Bu araştırma, tek ve çift sıra ekimde en uygun bitki sıklığını belirlemek için 2020 yılı ana ürün yetiştirme sezonunda Batı Karadeniz koşullarında yürütülmüştür. DKC5364 ve P0573 melez mısır çeşitleri materyal olarak kullanılmıştır. Deneme, bölünen bölünmüş deneme desenine göre üç tekerrürlü olarak kurulmuştur. Ana parselleri çeşitler ile tek ve çift sıra ekim deseni, alt parselleri ise bitki sıklıklarıdır (8.000, 9.000, 10.000, 11.000 ve 12.000 bitki/da). Çalışmada, mısırın bitkisel özelliklerinden, bitki boyu, ilk koçan yüksekliği, sap kalınlığı, bitkide koçan sayısı, koçan uzunluğu, koçan kalınlığı ve koçan ağırlığı bazıları incelenmiştir. İncelenen bitki boyu, ilk koçan yüksekliği, bitkide koçan sayısı ve koçan ağırlığı özelliklerinin çeşit, ekim şekli ve bitki sıklıklarının istatistiki olarak önemli bulunmuştur. Herbir yetiştiricilik bölgesi için uygun çeşit, ekim yöntemi ve bitki sıklığının belirlenmesi sonucuna varılmıştır. İncelenen özellikler açısından DKC5364 çeşidi P0573 çeşidinden daha yüksek değerler göstermiştir. Batı karadeniz bölgesi için en uygun ekim sıklıkları, tane üretimi için metrede 11 bitki, yeşil aksam için 12 bitki sıklığı, çift sıra ekim uygulamasında belirlenmiştir.

Anahtar Kelimeler: Mısır, çeşit, çift sıra, bitki sıklığı

Giriş

Buğdaygiller (Gramineae) familyasının Maydeae oymağından olan mısır; birim alandan oldukça fazla kuru madde üretebilen, tüm sıcak ve serin iklim tahıllarının içerisinde verim potansiyeli en yüksek olan, güneş enerjisini de etkin kullanabilen C4 bitkisidir. Mısır, yüksek düzeyde enerji depo edebilmesi, çok fazla kullanım alanının bulunması ve yüksek verime sahip olması sayesinde sanayinin vazgeçilmez ürünlerinden biri durumundadır (Kırtok, 1998;Kün, 1985).

Mısır bitkisi dünya genelinde hububat ürünleri içerisinde buğday ekim alanından sonra ikinci ekim alanına sahip olup, toplam üretim miktarı ve birim alandaki verim bakımından ise birinci sırada yer almaktadır. Dünya mısır üretimi miktarının %31'i Amerika Birleşik Devletleri, %24'ü Çin, %9'u Brezilya ve %6'sı ise Avrupa Birliği Ülkeleri tarafından gerçekleştirilmektedir (Anonim, 2020 a).

Ülke genelinde yüksek verimli çeşitlerin kullanımı, bilim insanlarının araştırmaları ve yeni tarım tekniklerinin uygulanmasına bağlı olarak mısır üretimi her yıl düzenli olarak artarak, 2001 yılında 2.200.000 ton/yıl olan mısır üretimimiz 2020 yılı itibarıyla 6.500.000 ton/yıl olarak gerçekleşmiştir (Anonim, 2021). İnsan gıdası ve hayvan yemi hammaddesi olarak kullanılan, alternatif hububat fiyatlarına ve temin kolaylıklarına göre tane mısır tüketimimiz halihazırda 8 milyon ton/yıl'a kadar çıkabilmektedir (Anonim, 2020 a).

En yüksek verimin alınabilmesi için birim alandaki optimum bitki sayısı, üretim yapılan yöre iklim şartları ve toprak verimliliği ile kullanılan çeşidin verim özelliklerine ve üretilen ürünün kullanma amacına göre

değişilmektedir (Walton, 1988). Bitki yetiştiriciliğinde optimum bitki sıklığının belirlenmesi, daha yüksek verim almak için önemli bir unsurdur (Gözübenli, 2010; Jia ve ark., 2018; Haarhoff ve Swanepoel, 2020).

Mısır yetiştiriciliğinde sıra üzeri aralıkların verimi direk etkilediği, aşırı bitki sıklığının ve seyrek ekimin verim olumsuz etkilediğini çok sayıda araştırmacı tespit etmiştir (Aydın, 1991). Sıklığın artmasıyla beraber verimin belli bir seviyeye kadar yükseldiği, yüksek bitki sıklıklarında ise verimde düşüş olduğunu bildirmiştir (Konuskan ve Gözübenli, 2001).

Yetiştirme teknikleri arasında olan ekim sıklığı, bitki başına gelişme alanının azaltılması veya arttırılması bakımından tane verimini etkileyen önemli bir faktör olarak karşımıza çıkmaktadır (Özata ve ark., 2016). En yüksek verim için belirlenecek en uygun ekim sıklığı bölgeden bölgeye değişebilmektedir (Yıldırım ve Baytekin, 2003).

Mısır yetiştiriciliğinde ekim sıklığı faktörünün verim ve verime etki edebilecek özellikleri gözlemlemek amacıyla yapılan çalışmalarda, farklı ekim uygulamaları ve sıklıklarının tane verimi başta olmak üzere, incelenen özelliklere göre çeşitler bazında denemenin yapıldığı lokasyonlara göre çok farklı ve önemli değişiklikler gösterebilmektedir (Sönmez ve ark., 2013; Gökmen ve Sakin, 2001; Gözübenli ve Konuşkan, 2010). Konunun öneme binaen; Batı Karadeniz koşullarında mısır bitkilerinin tek ve çift sıra ekiminde ve değişik bitki sıklıklarında bitki özelliklerin belirlenmesi amaçlanmıştır.

Materyal ve Yöntem

Bu çalışmada FAO500 olum grubunda yer alan DKC5364 ve P0573 olmak üzere iki farklı atdışi mısır (*Zea mays* L.) çeşidi kullanılmıştır.

Bu araştırma, 2020 yılı ana ürün yetiştirme sezonunda, Kastamonu İli Tosya İlçesinde yürütülmüştür.

Deneme bölünmüş parseller deneme desenine göre üç tekerrür, beş farklı bitki sıklığı (8.000, 9.000, 10.000, 11.000 ve 12.000 bitki/da) ve iki ayrı sıra arası (70 cm ve 50 cm + 20 cm) olarak kurulmuştur. Deneme parselleri 2.8 m genişlikte ve 5 m uzunluğunda olmak üzere 14 m² alana sahip, toplam 60 parselden oluşmuştur.

Bir önceki yılın sonbaharında derin sürüm yapılmış, ilkbaharda ise ızgara ile ikileme yapılmış ve rotavatör ile tohum yatağı hazırlanmış parsellere ekim öncesi taban gübresi olarak; 60 kg/da 15-15-15 (NPK) içerikli kompoze gübre verilmiştir.

Tek sıra ekimlerde sıra arası 70 cm olacak şekilde; 8.000 bitki/da (17,9 cm), 9.000 bitki/da (15,9 cm), 10.000 bitki/da (14,3 cm), 11.000 bitki/da (12,98 cm) ve 12.000 bitki/da (11,9 cm) olacak şekilde ekim 4 Nisan 2020 tarihinde elle yapılmıştır.

Çift sıra ekimlerde ise; sıra arası geniş aralık 50 cm, dar aralık ise 20 cm olacak şekilde sıra üzeri aralık tek sıra ekim aralığının iki katı olacak şekilde, çift sıra olarak gerçekleştirilmiştir.

Çizelge 1. Deneme alanına ait iklim verileri

Aylar	Ort. Sıcaklık (°C)		Yağış Miktarı (mm)		Nem (%)	
	1965-2020	2020	1965-2020	2020	1965-2020	2020
Ocak	0.1	1.3	57.7	9.4	76.5	79.4
Şubat	1.9	3.0	33.8	12.8	69.4	70.1
Mart	5.8	8.7	41.7	12.0	62.6	66.0
Nisan	10.8	10.2	50.2	27.8	59.3	59.3
Mayıs	15.2	16.1	59.9	46.8	60.6	60.1
Haziran	18.8	19.2	52.6	72.2	58.5	68.9
Temmuz	21.4	23.5	26.5	24.2	53.1	53.9
Ağustos	21.9	22.9	21.6	0.2	52.6	49.9
Eylül	18.1	22.3	23.7	2.4	54.9	23.7

Anonim, (2020 b).

Üst gübreleme, iki dönem halinde ve 10 kg/da saf azot olark %46 Üre gübresi olmak üzere; Bitkinin beş yapraklı döneminde ilk üst gübreleme yapılmış olup, ikinci üst gübreleme ise bitkinin on yapraklı döneminde yapılmıştır. Üst gübreleme sonrası çapalama işlemi, çapalama makinası ile yapılmıştır. Çapalama haricinde ayrıca yabancı ot mücadelesi, mekanik olarak da yapılmıştır. Bitkinin ihtiyacına göre altı yapraklı dönem, on yapraklı dönem ve onbeş yapraklı dönemlerde olmak üzere üç defa sulama yapılmıştır. Mısır koçan kurduna karşı, bitkinin sekiz yapraklı döneminde kimyasal mücadele yapılmıştır. Deneme parsellerinin hasat işlemi 12 – 13 Eylül 2020 tarihlerinde yapılmıştır.

Araştırma bulguları MSTAT-C İstatistik programı vasıtasıyla tesadüf blokları bölünen bölünmüş deneme desenine göre varyans analizine tabi tutulmuştur, LSD testi uygulanarak ortalamaların karşılaştırılması yapılmış ve sonuçlar yorumlanmıştır.

Çizelge 2. Deneme alanına ait toprak tahlil raporu

Analiz Adı	Sonuç	Derecesi	Analiz Metodu / Referansı
Saturasyon	64.026	Killi-tınlı	TS 8333 (+%10) (hava kuru)
Ph	7.63	Hafif alkali	Yurdakul 2018
Toplam tuz	0.03	Tuzsuz	TS 8334 (çamurda)
Kireç	13.99	Orta kireçli	TS EN ISO 10693
Organik madde (%)	0.88	Çok az	TS 8336
Alınabilir fosfor	8.02	Orta (kg/da)	Tüzüner 1990 (konsantrasyon)
Alınabilir potasyum	15.9	Az (kg/da)	TS 8341 (konsantrasyon)

Anonim, (2020 c).

Bulgular ve Tartışma

Ana ürün mısır yetiştiriciliğinde, FAO 500 olum grubunda yer alan DKC5364 ve P0573 mısır çeşitlerinin tek ve çift sıra ekim şeklinde farklı bitki sıklıklarının; bitki boyu, ilk koçan yüksekliği, sap kalınlığı, bitkide koçan sayısı, koçan uzunluğu, koçan kalınlığı, koçan ağırlığı parametreleri incelenmiştir. İncelenen özelliklere ait varyans analiz değerleri Çizelge 3’de verilmiştir.

Çizelge 3. Farklı ekim şekli ve sıklığında yetiştirilen mısır çeşitlerinde bazı bitkisel özelliklere ait varyans analiz tablosu

		B B	İKY	SK	BKS	KU	KK	KA
V K	SD	F Değerleri						
Tekerrür	2	144.2664	39.8777	686.9875	7.000	267.3015	11.6009	0.4495
Çeşit(A)	1	192.4720**	105.5473**	381.8097**	4.000	405.5783**	1.3571	2.3874
Hata	2							
Ekim Şekli (B)	1	3.0879	9.2691*	13.4419*	3.4483	40.7398**	29.434**	6.3244
(AB)	1	1.8604	0.4878	0.0893	1.2414	19.2807*	2.6395	6.3475
Hata	4							
Bitki Sıklığı (C)	4	74.5545**	225.7666**	272.9125**	44.8759**	206.9650*	96.4175**	2205.1664**
(AC)	4	15.5717**	2.4407	0.4606	0.9635	0.8424	4.1302**	12.6363**
(BC)	4	6.5427**	6.5445**	8.8479**	6.5693**	2.6017	2.3790	37.3435**
(ABC)	4	4.3242**	2.6903*	0.2771	8.0876**	1.4166	1.5802	12.9784**
Hata	32							
Genel	59							
CV (%)		0,79	1.86	2.88	1.10	1.90	1.42	0.85

*: $p \leq 0.05$, **: $p \leq 0.01$ düzeyinde önemli, VK; varyasyon kaynakları, SD; serbestlik dereceleri, BB; bitki boyu, İKY; ilk koçan yüksekliği, SK; Sap kalınlığı; BKS; Bitkide koçan sayısı, KU; koçan uzunluğu, KK; koçan kalınlığı, KA; koçan ağırlığı

Bitki Boyu (cm)

Çeşit faktörünün bitki boyuna etkisi önemli bulunan çalışmamızda, en yüksek bitki boyu ortalaması DKC5364 çeşidinde saptanmıştır (Çizelge 2). DKC5364 çeşidinin bitki boyu uzunluğu ortalaması 242.2 cm, P0573 çeşidinin ise 239.6 cm olarak belirlenmiştir.

Bitki sıklıklarının bitki boyuna etkisi önemli bulunmuştur. En yüksek bitki boyu ortalaması 11 bitki/m² bitki sıklığında 247.1 cm olarak ölçülürken, en düşük bitki boyu ortalaması 8 bitki/m² bitki sıklığında 234.9 cm olarak belirlenmiştir (Çizelge 2). Bitki boyu yükseklik ortalamaları bitki sıklığına bağlı olarak önce artmış ancak belli bir sıklıktan sonra azalmıştır. Bitki sıklığına bağlı olarak artan bitki boyu 11 bitki/m² bitki sıklığında ortalama 247.1 cm’ye ulaştıktan sonra 12 bitki/m² bitki sıklığında 240.2 cm’ye düşmüştür.

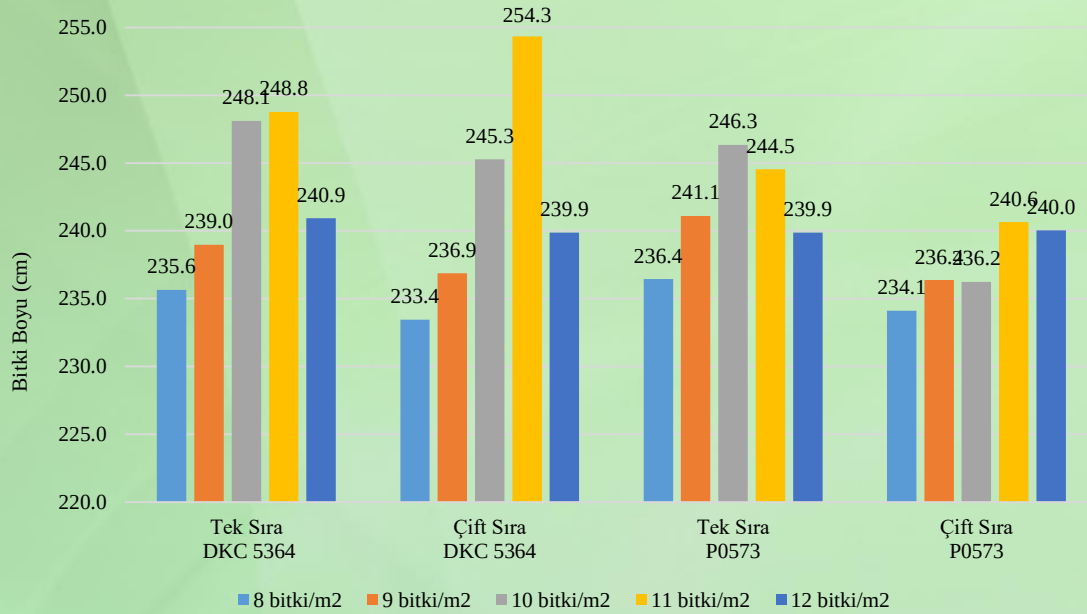
Çeşit x ekim şekli x sıklık interaksyonu önemli bulunmuştur. En yüksek bitki boyu uzunluğu DKC 5364 çeşidinin çift sıra ekim şeklinin 11 bitki/m² bitki sıklığında 254.3 cm olarak belirlenirken, en düşük bitki boyu ise DKC5364 çeşidinin çift sıra ekim şeklinin 8 bitki/m² bitki sıklığında 233.4 cm olarak tespit edilmiştir (Şekil 1).

Artan bitki sıklıklarında mısırın bitki boyu artış göstermiş, belli bir sıklıktan sonra azalmalar göstermiştir. Bitki boyunun genetik faktörlerin yanında iklim, toprak özellikleri ve yetiştirme tekniklerinin önemli olduğunu ve bitki boyu yönünden çeşitler arasında farklılıklar olabileceği Tanrıverdi ve Kabakçı (1999), Cesurer ve Ünlü (2001), Demir ve Konuskan (2016), Konuskan ve ark. (2015) tarafından yapılan çalışmalarda da belirlenmiştir. Mısır bitkisinin ana ürün ve ikinci ürün olarak yetiştirilmesi ve denemede kullanılan çeşitlerin genetik yapısına bağlı olmasının yanında ekolojik ve iklim faktörlerine bağlı olarak morfolojik farklılıklar görülebilir.

Çizelge 4. Bitkisel özellikler ortalamalarına ait mısır çeşitleri, ekim şekli ve sıklığı ortalama değerleri ve LSD testine göre oluşan gruplar

	BB	İKY	SK	BKS	KU	KK	KA
Çeşitler							
DKC 5364	242.2 A**	98.8 A	26.73 A	0.97	18.4 A	43.14	178.61
P 0573	239.6 B	96.5 B	26.14 B	0.97	17.8 B	42.75	177.03
Lsd	1.2898	1.4873	0.2059		0.1984		
Ekim şekli							
Tek sıra	242.1	98.8 X *	25.91 Y	0.97	17.9 Y	42.68 Y	177.27
Çift sıra	239.7	96.5 Y	26.97 X	0.97	18.4 X	43.22 X	178.37
Lsd		2.506	1.049		0.474	0.8416	
Ekim sıklığı							
8	234.9 e**	86.5 d	30.36 a	0.99 a	19.8 a	45.20 a	203.6 a
9	238.3 d	92.4 c	28.76 b	0.99 ab	19.2 b	43.90 b	190.2 b
10	244.0 b	101.6 b	27.32 c	0.98 b	18.0 c	42.83 c	179.3 c
11	247.1 a	104.6 a	24.53 d	0.97 c	17.5 d	42.19 d	164.9 d
12	240.2 c	103.3 a	21.21 e	0.95 d	16.2 e	40.62 e	151.2 e
Lsd	1.589	1.510	0.632	0.0026	0.2857	0.5072	

*,** Aynı sütün içerisinde yer alan harfle gösterilen faktör ortalamaları istatistiksel olarak birbirinden farklıdır.



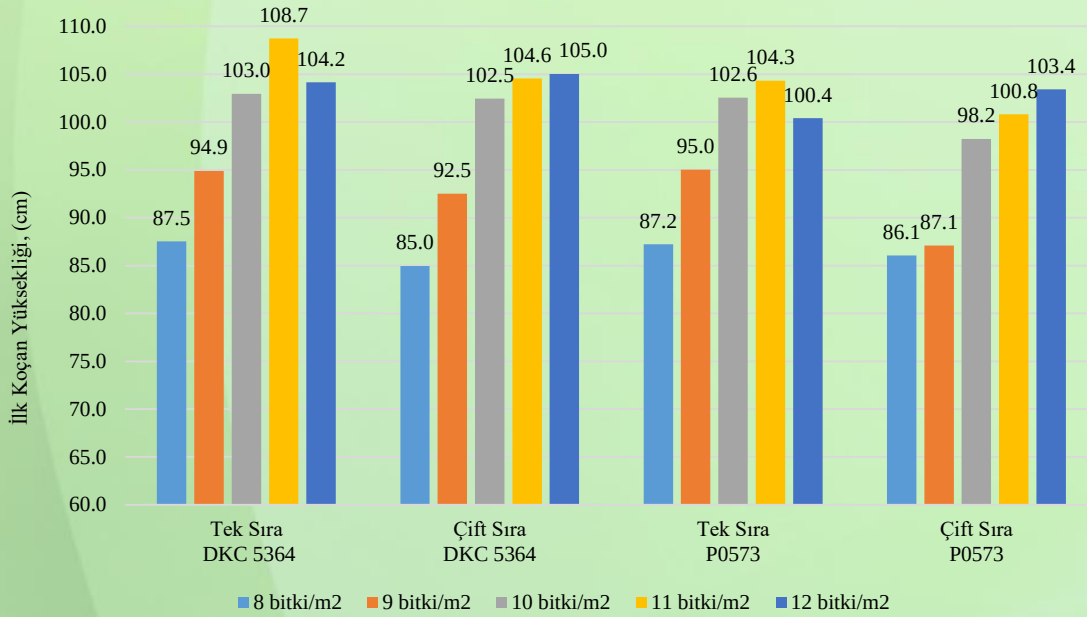
Şekil 1. Bitki boyuna ait çeşit x ekim şekli x sıklık interaksyonu

İlk Koçan Yüksekliği (cm)

Çeşitlerin, ilk koçan yüksekliğine etkisi önemli bulunmuştur. En yüksek ilk koçan yüksekliği ortalaması DKC5364 çeşidinde saptanmıştır. DKC5364 çeşidinin ilk koçan yüksekliği ortalaması 98.8 cm olarak belirlenirken, P0573 çeşidinin ilk koçan yüksekliği ortalaması ise 96.5 cm olarak tespit edilmiştir (Çizelge 2).

İlk koçan yüksekliğine ekim şekli etkisi önemli bulunmuş, tek sıra ekim şeklinde 98.8 cm, çift sıra ekim şeklinde ise 96.5 cm olarak tespit edilmiştir (Çizelge 2).

Bitki sıklıklarının ilk koçan yüksekliğine etkisi önemli bulunan çalışmamızda, en düşük ilk koçan yüksekliği ortalaması 8 bitki/m² bitki sıklığında 86.5 cm, en yüksek ilk koçan yüksekliği ortalaması 11 bitki/m² bitki sıklığında 104.6 cm olarak belirlenmiştir. İlk koçan yüksekliği ortalamaları bitki sıklığına bağlı olarak önce artmış ancak belli bir bitki sıklığından sonra azalmıştır. Bitki sıklığına bağlı olarak artan ilk koçan yüksekliği bitki/m² bitki sıklığında ortalama 104.6 cm'ye ulaştıktan sonra 12 bitki/m² bitki sıklığında 103.3 cm'ye düşmüştür (Çizelge 2).



Şekil 2. İlk Koçan Yüksekliğine ait çeşit x ekim şekli x sıklık interaksyonu

Çeşit x ekim şekli x sıklık interaksyonu önemli bulunmuştur. En yüksek ilk koçan yüksekliği DKC5364 çeşidinin tek sıra ekim uygulamasının 11 bitki/m² bitki sıklığında 108.7 cm olarak belirlenirken, en düşük ilk koçan yüksekliği ise DKC536 çeşidinin çift sıra ekim şeklinde 8 bitki/m² bitki sıklığında 85.0 cm olarak tespit edilmiştir (Şekil 2).

Ekim şekli ve sıklık faktörlerinin ilk koçan yüksekliğine etkisi önemli bulunmuş olup, ekim şekli x sıklık interaksyonu da önemli bulunmuştur. Ekim şekli x sıklığı interaksyonunda en yüksek ilk koçan yüksekliği ortalamasının tek sıra ekim şeklinde ve 11 bitki/m² bitki sıklığında 106.5 cm olarak belirlendiği çalışmamızda en düşük ilk koçan yüksekliği ortalaması, çift sıra ekim şeklinde 8 bitki/m² bitki sıklığında 85.5 cm olarak tespit edilmiştir. Çeşit, ekolojik faktörler ve özellikle sıklık ve gübreleme bitkisel özellikleri önemli ölçüde etkilenmektedir (Gözübenli ve Konuşkan, 2010).

Sap Kalınlığı (mm)

Çeşit faktörünün sap kalınlığına tesiri önemli bulunan çalışmada, en yüksek sap kalınlığı ortalaması DKC5364 çeşidinde saptanmıştır. DKC5364 çeşidinin sap kalınlığı ortalaması 26.73 mm olarak belirlenirken, P0573 çeşidinin sap kalınlığı ortalaması ise 26.14 mm olarak tespit edilmiştir (Çizelge 2).

Ekim şekli faktörünün sap kalınlığına etkisi önemli bulunmuş olup, tek sıra ekim şeklinin sap kalınlığı ortalaması 25.91 mm olarak gerçekleşirken çift sıra ekim şekli ortalaması 26.97 mm olarak gerçekleşmiştir (Çizelge 2).

Çeşit ve ekim şekli ile sıklık faktörleri ile ekim şekli x sıklık interaksyonu önemli bulunmuştur. Ekim şekli x sıklık interaksyonunda; en yüksek sap kalınlığı ortalamasının çift sıra ekim şeklinde 8 bitki/m² bitki sıklığında 30.55 mm olarak tespit edilirken, en düşük sap kalınlığı ortalaması ise tek sıra ekim şeklinde 12 bitki/m² bitki sıklığında 19.55 mm olarak belirlenmiştir.

Ekim şekli x sıklık interaksyonu önemli bulunan çalışmamızda; en yüksek sap kalınlığı ortalaması çift sıra ekim şeklinde 8 bitki/m² bitki sıklığında 30.55 mm, en düşük sap kalınlığı ortalaması ise tek sıra ekim şeklinde 12 bitki/m² bitki sıklığında 19.55 mm olarak belirlenmiştir.

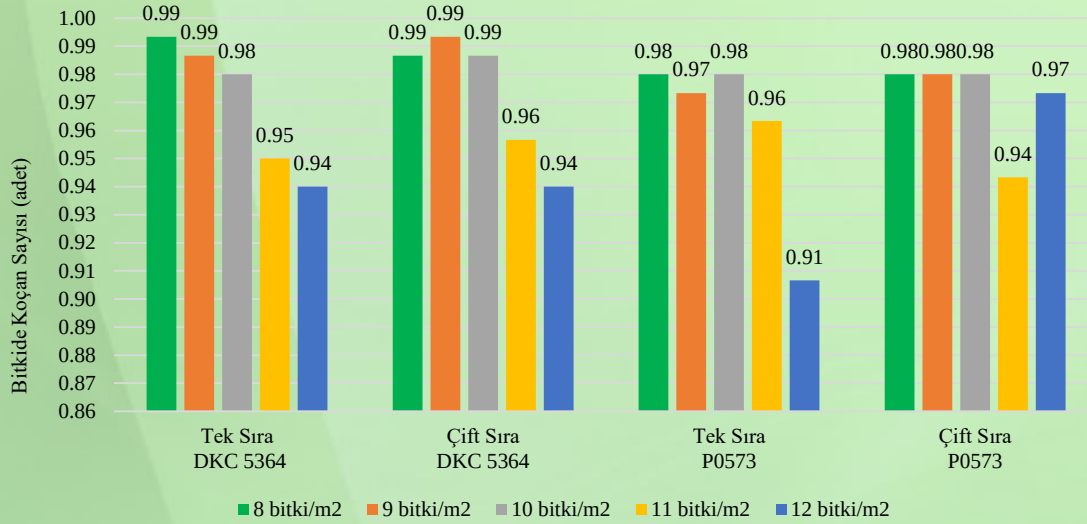
Bitki sıklığı faktörünün sap kalınlığına etkisi önemli bulunmuş ve en yüksek sap kalınlığı ortalaması 8 bitki/m² /da bitki sıklığında 30.36 mm olarak tespit edilirken, en düşük sap kalınlığı ortalaması 12 bitki/m² bitki sıklığında 21.21 mm olarak belirlenmiştir (Çizelge 2). Sap kalınlığı ortalamaları ekim sıklığı ile ters orantılı olarak bir değişim göstermiştir. Bitki sıklığı arttıkça sap kalınlığı azalmıştır. Işıklanma ve bitkibaşına düşen alanın az olması bitkilerin daha ince olmasına sebep olmuş olabilir. Benzer çalışmalarda da bitki sıklığı arttıkça bitki sap kalınlığının azaldığı Konuşkan ve Gözübenli (2001), Sener ve ark., (2004), Gözübenli ve ark. (2003), Konuşkan ve ark., (2020) tarafından bildirilmiştir.

Bitkide Koçan Sayısı (koçan/bitki)

Bitki sıklığı faktörünün bitkideki koçan oranına etkisi önemli bulunmuş, ekim şekli x sıklık interaksyonu da önemli bulunmuştur. Ekim şekli x sıklık interaksyonunda bitkide koçan sayısı ortalaması bakımından en yüksek değer tek sıra ekim şeklinin 8 bitki/m² bitki sıklığında 0.99 adet olarak belirlenirken, en düşük koçan sayısı tek sıra ekim şeklinin 12 bitki/m² bitki sıklığında 0.92 adet olarak belirlenmiştir.

Bitkideki koçan sayısı bakımından, sıklık faktörü önemli bulunmuş, en yüksek koçan sayısı ortalaması 8 bitki/m² bitki sıklığında 0.99 olarak tespit edilirken, en düşük koçan sayısı ortalaması 12 bitki/m² bitki sıklığında 0.91 olarak belirlenmiştir (Çizelge 3). Bitkideki koçan sayısı ortalamaları bitki sıklığı ile ters orantılı olarak bir değişim göstermiş, bitki sıklığı arttıkça bitkideki koçan sayısı ortalamaları azalmıştır.

Bitkideki koçan sayısına, çeşit x ekim şekli x sıklık interaksyonunun önemli etki ettiği ve en yüksek koçan sayısı oranı DKC5364 çeşidinin çift sıra ekim uygulamasında 8 bitki/m² bitki sıklığında 0.99 olarak belirlenirken, en düşük koçan ortalaması ise P0573 çeşidinin tek sıra ekim şeklinde 12 bitki/m² bitki sıklığında 0.91 olarak belirlenmiştir (Şekil 3).



Şekil 3. Bitkide Koçan Sayısına ait, çeşit x ekim şekli x sıklık interaksyonu

Mısır çeşitlerinin ekim sıklıklarına ve ekim şekline farklı tepki göstermesi çeşit × ekim şekli x ekim sıklığı interaksyonunun önemli çıkması sonucuna neden olmuştur. Özellikle bitki sıklıkları artışında çeşitlere göre değişmekle birlikte, koçansız bitkilerin arttığı tespit edilmiştir. Birim alan ışıklanma ve bitki rekabeti koçansız bitkilerin artışına sebep olmuş olabilir. Bu sonuçlar, daha önce Karasu (2012); Golla ve ark., (2020) yapmış olduğu çalışma ile uyum içerisinde.

Koçan Uzunluğu (cm)

Çeşidin koçan uzunluğuna etkisi önemli bulunmuş ve en yüksek koçan uzunluğu DKC5364 çeşidinde saptanmıştır. DKC5364 çeşidinin ortalama koçan uzunluğu 18.4 cm, P0573 çeşidinin ise 17.8 cm olarak belirlenmiştir (Çizelge 2).

Ekim şekli faktörünün koçan uzunluğuna etkisi önemli bulunmuş; çift sıra ekim şeklinde koçan uzunluğu ortalaması 18.4 cm olarak belirlenirken, tek sıra ekim şeklinde 17.9 cm olarak tespit edilmiştir (Çizelge 3). Ekim şekli uygulamalarında bitkiler arası mesafe artırılarak bitkisel özelliklerin arttığını Liang ve ark.(2019) belirtmiştir. Çeşit ile ekim şekli faktörünün koçan uzunluğuna etkisi önemli bulunan çalışmamızda çeşit x ekim şekli interaksyonunun da koçan uzunluğu ortalamalarına etkisi önemli bulunmuştur. Çeşit x ekim şekli (AB) interaksyonunda en yüksek koçan uzunluğu ortalaması DKC5364 çeşidinin çift sıra ekim şeklinde 18.5 cm olarak belirlenirken, en düşük koçan uzunluğu ortalaması P0573 çeşidinin tek sıra ekim şeklinde 17.4 cm olarak tespit edilmiştir. Gözübenli ve ark. (2004) çift sıra mısır çalışmasında bitki sap kalınlığını (18.4 ile 18.8 mm), koçan uzunluğunu (18.0 ile 18.2 cm), koçan tane ağırlığını (149.7 ile 154.0 g) arasında tespit etmişlerdir.

Koçan uzunluğuna ekim sıklığı faktörünün etkisi önemli bulunmuş ve en yüksek koçan uzunluğu ortalaması 8 bitki/m² bitki sıklığında 19.8 cm olarak tespit edilirken, en düşük koçan uzunluğu ortalaması 12 bitki/m² bitki sıklığında 16.2 cm olarak belirlenmiştir (Çizelge 3). Araştırmamızda, koçan uzunluğu ortalamaları, ekim sıklığı ile ters orantılı olarak bir değişim göstermiş, ekim sıklığı arttıkça koçan uzunluğu ortalamaları azalmıştır. Koçan uzunluğu büyük ölçüde genetik faktörler tarafından belirlenmesine rağmen, çevre koşullarının da önemli ölçüde etkisi altında bulunmaktadır. Daha önce yapılan farklı çalışmalarda da koçan uzunlukları bakımından genotipler arasında anlamlı farklılıklar tespit edilmiştir (Gözübenli ve ark., 2004; Szymanek, 2012). Mısır bitkisi, artan bitki sıklıklarında ışık, su ve besin elementleri alımında birbirleriyle rekabet etmektedir (Thapa ve ark., 2020).

Koçan Kalınlığı (mm)

Çeşit x sıklık interaksyonunun koçan kalınlığına tesirini önemli bulunmuş, en yüksek koçan kalınlığı ortalaması DKC5364 çeşidinin 8 bitki/m² bitki sıklığında 45.27 mm olarak tespit edilirken, en düşük koçan kalınlığı ortalaması DKC5364 çeşidinin 12 bitki/m² bitki sıklığında 40.30 mm olarak belirlenmiştir. Mısır çeşitlerinin ekim sıklıklarına farklı reaksiyon göstermesi çeşit × sıklık etkileşiminin önemli çıkmasına sebep olmuştur.

Koçan kalınlığına, ekim şekli faktörü tesirini önemli bulduğumuz çalışmamızda, koçan kalınlığı çift sıra ekim şeklinde 43.22 mm olarak gerçekleşirken, tek sıra ekim şekli ortalaması 42.68 mm olarak tespit edilmiştir (Çizelge 2).

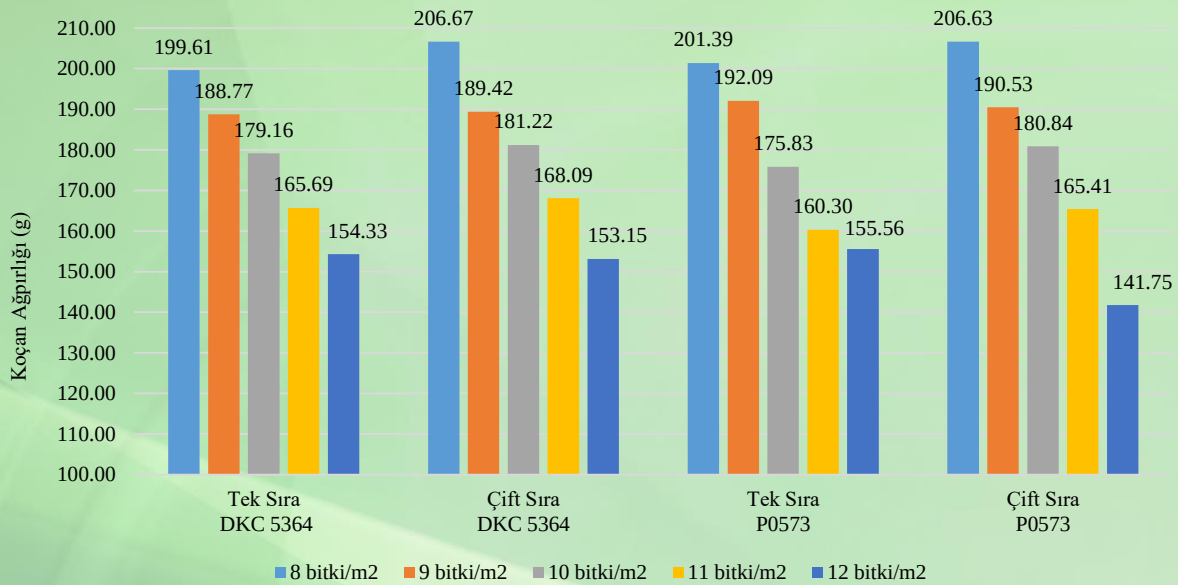
Bitki sıklığı faktörünün koçan kalınlığına etkisi önemli bulunmuş ve en yüksek koçan kalınlığı ortalaması 8 bitki/m² bitki sıklığında 45.20 mm olarak tespit edilirken, en düşük koçan kalınlığı ortalaması 12 bitki/m² bitki sıklığında 40.62 mm olarak belirlenmiştir (Çizelge 3). Araştırma sonuçlarımıza göre koçan kalınlığı ortalamaları, ekim sıklığı ile ters orantılı olarak bir değişim göstermiştir. Ekim sıklığı arttıkça koçan kalınlıkları azalmıştır. Koçan kalınlığı artan bitki sıklığı ile azaldığını (Gözübenli ve ark. 2004; Fan ve ark. 2020). Bitki sıklığı ile karbonhidrat birikimi artmakta ve buda mısırın verimine katkı sağlamaktadır (Lee ve Tollenaar, 2007).

Koçan Ağırlığı (g)

Bitki sıklığı faktörünün koçan ağırlığına tesiri önemli bulunan çalışmada en yüksek koçan ağırlığı ortalaması 8 bitki/m² bitki sıklığında 203.58 g olarak tespit edilirken, en düşük koçan ağırlığı ortalaması 12 bitki/m² bitki sıklığında 151.20 g olarak belirlenmiştir (Çizelge 3). Koçan ağırlığı ortalamaları, ekim sıklığı ile ters orantılı olarak bir değişim göstermiş, sıklık arttıkça koçan ağırlığı ortalamaları azalmıştır.

Çeşit x ekim sıklığı interaksyonunun koçan ağırlığına etkisi önemli bulunmuş ve en yüksek koçan ağırlığı ortalaması P0573 çeşidinin 8 bitki/m² bitki sıklığında 204.01 g olarak tespit edilirken, en düşük koçan ağırlığı ortalaması yine P0573 çeşidinin 12 bitki/m² bitki sıklığında 148.65 g olarak belirlenmiştir. Araştırma sonuçlarımıza göre denemede kullanılan mısır çeşitlerinin ekim sıklıklarına farklı tepki göstermesi, çeşit × sıklık etkileşiminin önemli çıkmasına sebep olmuştur.

Ekim şekli x sıklığı interaksyonunun koçan ağırlığına tesiri önemli bulunan çalışmada, en yüksek koçan ağırlığı ortalaması çift sıra ekim şeklinin 8 bitki/m² bitki sıklığında 206.65 g olarak belirlenirken, en düşük koçan ağırlığı ortalaması ise çift sıra ekim şeklinin 12 bitki/m² bitki sıklığında 147.45 g olarak belirlenmiştir.



Şekil 4. Koçan Ağırlığına ait, çeşit x ekim şekli x sıklık interaksyonu

Çeşit x ekim şekli x sıklık interaksyonunun koçan ağırlığına etkisi önemli bulunan çalışmada; en yüksek koçan ağırlığı DKC çeşidinin çift sıra ekim şeklinde 8 bitki/m² bitki sıklığında 206.67 g olarak belirlenirken, en düşük koçan ağırlığı ise P0573 çeşidinin çift sıra ekim şeklinde 12 bitki/m² bitki sıklığında 141.75 g olarak tespit edilmiştir (Şekil 4). Mısır çeşitlerinin ekim sıklıklarına ve ekim şekillerine farklı reaksiyon göstermesi, çeşit x ekim şekli x sıklık etkileşiminin önemli çıkmasına neden olmuştur. Koçanda tane ağırlıklarının iklim şartlarından, özellikle gece gündüz sıcaklıklarından önemli derecede etkilenebileceği (Aldrcih ve ark., 1982), batı karadeniz gibi mısır yetiştirilen alanlarda özellikle koçan özelliklerinin bitki verimlerine önemli düzeyde katkı yapabileceği görülmektedir.

Araştırma Sonucu ve Öneriler

Araştırma sonuçları, çeşitler için incelenen özelliklere bakıldığında bitkide koçan sayısı ve koçan kalınlığı özellikleri hariç diğer özellikler önemli bulunmuştur. DKC 5364 mısır çeşidi P0573 mısır çeşidinden daha yüksek değerler göstermiştir.

Ekim şekillerine bakıldığında, ilk koçan yüksekliği, sap kalınlığı, koçan uzunluğu ve koçan kalınlığı özellikleri önemli bulunmuştur. Sap kalınlığı, koçan uzunluğu ve koçan kalınlığı değerleri çift sıra ekimde daha yüksek, ilk koçan yüksekliği değeri ise tek sıra ekimde daha yüksek bulunmuştur.

Ekim sıklıklarına bakıldığında incelenen tüm özellikler önemli bulunmuştur. Artan bitki sıklıklarında sap kalınlığı, bitkide koçan sayısı, koçan uzunluğu, koçan kalınlığı ve koçan ağırlığı değerleri azalmıştır. Çeşit, ekim yöntemi ve ekim sıklığı interaksyonlarına bakıldığında çeşitlerin ve ekim şekillerinin bitki sıklıklarına tepkilerinin farklı olması, interaksyonların önemli çıkmasına neden olmuştur. Herbir çeşidin ekim şekline bağlı olarak ekim sıklıklarında farklı değerler gösterebileceği tespit edilmiştir. Tane amacı ile yapılacak ekimlerde 10 000 bitki/da, silaj amacı için ise 11 000 bitki/da bitki sıklığında, çift sıra ekimlerin tek sıralı ekimlere göre daha uygun olabileceği sonucuna varılmıştır.

Teşekkür

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Assessment of some selected essential minerals in milk and their dietary intake for different age group children through milk consumption

Abdul Waheed Ghanghro

Institute of Biochemistry University of Sindh Jamshoro Sindh Pakistan

Abstract

In this study we analyzed seven essential minerals calcium (Ca), magnesium (Mg), phosphorus (P), sodium (Na), potassium (K), copper (Cu) and zinc (Zn) in buffalo milk by using flame atomic absorption spectroscopy in order to evaluate their dietary intake for 1-3, 4-8 and 9-12 years age group children based on their daily milk consumption data. The results showed that the mean concentrations of Ca, Mg, P, Na, K, Cu and Zn in milk samples were 1209.57, 157.08, 785.74, 393.05, 1529.21, 0.839 and 1.838 mg/kg respectively. Multivariate statistical analysis viz., Pearson's correlation and Principle component analysis (PCA) were applied to determine the interdependence between the essential minerals. Significant positive correlation in Mg/P, Mg/K and P/Na and negative correlation in Mg/Ca was determined. Intakes of Ca, Mg, P, Na, K, Cu and Zn were significantly ($P<0.01$) higher in 1-3 years children compared to 4-8 and 9-12 years. In selected essential minerals K and Ca were highly consumed followed by P, Na, Mg, Zn and Cu in all age group children. Furthermore the results revealed that the majority of children had lowest intake for essential minerals compared to their recommended ranges.

Key Words:

Black soldier fly (*Hermetia illucens*) prepupae meal as a possible alternative to fish meal in in Rainbow trout (*Oncorhynchus mykiss*) diets

Ali Atila Uslu^{1,*}, Osman Tolga Özel², Nedim Örnekçi¹, Ekrem Cem Çankırlıgil², İsa Coşkun³, Gülşad Uslu Şenel⁴

¹Fisheries Research Institute, Department of Aquaculture, Elazığ, Turkey

²Central Fisheries Research Institute, Department of Aquaculture, Trabzon, Turkey

³Ahi Evran University, Faculty of Agriculture, Department of Animal Science, Kırsehir, Turkey

⁴Department of Environmental Engineering, Firat University, 23100 Elazığ, Turkey

Abstract

This study was conducted to determine the effect on growth performance and intestinal histomorphology of the Rainbow trout (*Oncorhynchus mykiss*) fed diets with black soldier fly (*Hermetia illucens*) prepupae meal substituted for fish meal instead. This study was carried out in freshwater research unit fed with dam lake at Elazığ Fisheries Research Institute in Turkey. Rainbow trout (*Oncorhynchus mykiss*) used in the study were obtained from a private commercial farm producing in Elazığ. After 21 days of adaptation, fish (34.17±0.88g) were randomly placed in triplicate (30 for each) into 4 treatment groups of 90 fish each in 500 L fiberglass tanks (112x112 cm square with depths 40 cm). Three diets with black soldier fly meal at three different levels (10%, 20% and 30%) and control diet were prepared. Test diets were respectively encoded as BSF0 (Control), BSF10, BSF20 and BSF30. Fish were fed by hand 2.5% of body weight three times at day for 90 days. Results demonstrated that the growth performance and intestinal histomorphology were significantly affected by black soldier fly (BSF) prepupae meal substitution ($p<0.05$). BSF prepupae meal used instead of fish meal had a negative effect on the growth performance, but not on the intestinal villi length. In addition to, in feeding with diet containing 10% and 20% BSF prepupae meal, intestinal villi width decreased. We can say that future studies should be expanded by being use partially defatted BSF prepupae meal.

Key Words: Aquaculture, trout, fly, growth, intestinal villi

Usage of Whey Proteins as Coating Material in Nanoencapsulation and Microencapsulation Technology

Nergiz Yüksel¹, Merve Muti İstek², Selda Bulca³

¹Aydın Adnan Menderes University, Germencik Yamanturk Vocational School, Aydın, Turkey

²Aydın Adnan Menderes University, Institute of Science and Technology, Department of Food Engineering, Aydın, Turkey

³Aydın Adnan Menderes University, Faculty of Engineering, Department of Food Engineering, Aydın, Turkey

Abstract

The encapsulation technique is used for various purposes such as increasing the stability of the coated components, protecting and masking them, facilitating their use, preventing unwanted reactions and providing controlled release of active ingredients during storage. At the same time, this technique helps to reduce the interaction between the core material to be encapsulated and environmental factors, preventing the loss of sensory properties such as aroma, color or nutritional value. Encapsulation techniques can be divided into two classes, chemical and physical encapsulation methods. There are three different methods of chemical encapsulation techniques known as coacervation, molecular inclusion and crystallization. Spray drying, extrusion, freeze drying, fluidized bed coating and vacuum drying are physical encapsulation methods. In addition, encapsulation techniques can be divided into two methods according to the size of the capsule; these are microencapsulation and nanoencapsulation. Emulsion-based techniques used in these techniques are considered as new generation encapsulation techniques. Since there are different types of encapsulation techniques, the most important thing is the selection of the most suitable coating material and the selection of the application technique for the intended use of the material to be encapsulated. Whey proteins, one of the most important by-products of dairy technology, have an important place in the food industry with their important functional and nutritional properties. It is particularly suitable for encapsulation systems of bioactive molecules due to their surface activity and hydrogel forming abilities in encapsulation applications. The use of whey proteins as a capsule material for the encapsulation of food ingredients by micro/nanoencapsulation techniques is becoming more and more common. This both reduces the use of whey as a waste material and enables these proteins to show their functional properties as coating material. This study focuses on studies in which whey proteins are used as coating material in nanocapsulation and microencapsulation applications and gives information about production processes with different technologies. In addition, the main advantages of using whey proteins as coating material in food technology are reviewed.

Key Words: Encapsulation, Microencapsulation, Nanoencapsulation, Whey Proteins

Peynir Altı Suyu Proteinlerinin Nanoenkapsülasyon ve Mikroenkapsülasyon Teknolojisinde Kaplama Malzemesi Olarak Kullanımı

Özet

Kapsülasyon tekniği, kaplanmış bileşenlerin stabilitesini artırmak, korumak ve maskelemek, kullanımlarını kolaylaştırmak, istenmeyen reaksiyonları önlemek ve depolama sırasında aktif bileşenlerin kontrollü salınımını sağlamak gibi çeşitli amaçlarla kullanılmaktadır. Aynı zamanda bu teknik, kapsüllenecek olan çekirdek malzeme ile çevresel faktörler arasındaki etkileşimi azaltmaya yardımcı olarak aroma, renk veya besin değeri gibi duyu özelliklerinin kaybına engel olmaktadır. Kapsülleme teknikleri, kimyasal ve fiziksel enkapsülasyon yöntemleri olmak üzere iki sınıfa ayrılabilir. Koaservasyon, moleküler inklüzyon ve kristalizasyon olarak bilinen üç farklı kimyasal kapsülleme tekniği yöntemi vardır. Sprey kurutma ekstrüzyon, dondurarak kurutma, akışkan yataklı kaplama ve vakum kurutma fiziksel kapsülleme yöntemlerindendir. Ayrıca kapsülün boyutuna göre kapsülleme teknikleri iki yönetime ayrılabilir; bunlar mikroenkapsülasyon ve nanoenkapsülasyondur. Bu tekniklerde kullanılan emülsiyon tabanlı teknikler ise yeni nesil kapsülleme teknikleri olarak kabul edilmektedir. Farklı tipte enkapsülasyon teknikleri bulunduğundan dolayı, önemli olan en uygun kaplama materyalinin seçimi ve enkapsüle edilecek malzemenin kullanım amacına yönelik uygulama tekniğinin seçimidir. Süt teknolojisinin en önemli yan ürünlerinden biri olan peynir altı suyu proteinleri, önemli fonksiyonel ve besinsel özellikleri ile gıda endüstrisinde önemli bir yere sahiptir. Kapsülleme uygulamalarında yüzey aktiviteleri ve hidrojel oluşturma yetenekleri nedeniyle biyoaktif moleküllerin kapsülleme sistemleri için özellikle uygundur. Peynir altı suyu proteinlerinin mikro/nanoenkapsülasyon teknikleri ile gıda bileşenlerinin enkapsülasyonu için bir kapsül materyali olarak kullanımı giderek daha yaygın hale gelmektedir. Bu hem atık madde olarak peynir altı suyunun kullanımını azaltır hem de bu proteinlerin kaplama malzemesi olarak fonksiyonel özelliklerini göstermelerini sağlar. Bu çalışma, peynir altı suyu proteinlerinin nanokapsülasyon ve mikroenkapsülasyon uygulamalarında kaplama malzemesi olarak kullanıldığı çalışmalara odaklanmakta ve farklı teknolojilerle üretim süreçleri hakkında bilgi vermektedir. Ayrıca, gıda teknolojisindeki kaplama malzemesi olarak peynir altı suyu proteinlerinin kullanılmasının başlıca avantajları gözden geçirilmiştir.

Anahtar Kelimeler: Enkapsülasyon, Mikroenkapsülasyon, Nanoenkapsülasyon, Peyniraltı Suyu Proteinleri

The Presence of Coliform Bacteria in Some Ready-To-Eat Food

Mehtap Çiftçi¹, Nilgün Öncül²

¹Department of Nutrition and Dietetics, Faculty of Fethiye Health Science, Muğla Sıtkı Koçman University, Muğla, Turkey

²Department of Nutrition and Dietetics, Faculty of Fethiye Health Science, Muğla Sıtkı Koçman University, Muğla, Turkey

Abstract

Since coliform bacteria are common both in the intestine and in nature (soil, plant, etc.), they are considered as a sanitation indicator in the food industry. It is known that the majority of bacteria defined as fecal coliform in the coliform group are *Escherichia coli*. The presence of *E. coli* or fecal coliform bacteria in any sample is an indication that the necessary hygienic measures were not taken during production, storage, and sale. That means the sample is directly or indirectly contaminated with faeces, and/or other intestinal pathogens may also exist. In this study, raw milk, freshly squeezed fruit juices, unpackaged ice cream, shaved ice, and ice-cold samples were purchased from the famous touristic destination Fethiye and analyzed for coliform bacteria. For this purpose, the samples were purchased from local marketplaces, buffets, cafes, patisseries, restaurants, and roadsides at Fethiye. In total 60 samples were analyzed using Violet Red Bile (VRB) Agar. The results ranged $<1.00(\pm 0.000)$ - $9.62(\pm 0.037)$ log CFU/mL for raw milk samples, $<1.00(\pm 0.000)$ - $2.71(\pm 0.048)$ log CFU/mL for freshly squeezed fruit juices, $<1.00(\pm 0.000)$ - $5.09(\pm 0.047)$ log CFU/g for unpackaged ice creams, and $<1.00(\pm 0.000)$ - $1.81(\pm 0.028)$ log CFU/mL in shaved ice and icing samples. Then confirmation tests were performed by using Brilliant Green Bile Broth (BGBB). The coliform bacteria was detected in 86.66% of raw milk, 13.33% of fruit juice, 80% ice cream, and 6.66% of shaved ice and icing samples.

Key Words: *E. coli*, Raw Milk, Freshly Squeezed Fruit Juices, Ice Cream, Shaved Ice, Food Safety

Tüketime Hazır Bazı Gıdalarda Koliform Grubu Bakterilerin Varlığı

Özet

Koliform bakteriler hem bağırsak hem de doğada yaygın (toprak, bitki, vb.) olarak bulunduklarından, gıda endüstrisinde sanitasyon indikatörü olarak değerlendirilmektedir. Koliform grup içinde fekal koliform olarak tanımlanan bakterilerin büyük çoğunluğunun *Escherichia coli* olduğu bilinmektedir. Herhangi bir örnekte *E. coli*'ye veya fekal koliform bakterilere rastlanması; üretim, depolama ve satış esnasında gerekli hijyenik önlemlerinin alınmadığının, örneğe doğrudan ya da dolaylı olarak dışkı bulaştığının ve yine bağırsak kökenli diğer patojenlerin de olabileceğinin bir göstergesidir. Bu araştırmada; turistik bir yer olan Fethiye'de ticari olarak satılan çiğ süt, taze sıkılmış meyve suları, paketli olmayan dondurma, kar şerbeti ve buzlaş örneklerinin koliform grubu bakteri içeriği analiz edilmiştir. Bu amaçla; örnekler Fethiye halk pazarlarından, büfe, cafe, pastane, restoran ve yol kenarlarından temin edilmiştir. Toplamda 60 adet örnek Violet Red Bile (VRB) Agar besiyeri kullanılarak test edilmiştir. Yapılan analizler sonucunda; çiğ süt örneklerinde $<1.00(\pm 0.000)$ - $9.62(\pm 0.037)$ log kob/mL, taze sıkılmış meyve sularında $<1.00(\pm 0.000)$ - $2.71(\pm 0.048)$ log kob/mL, paketli olmayan dondurmelerde $<1.00(\pm 0.000)$ - $5.09(\pm 0.047)$ log kob/g, kar şerbeti ve buzlaş örneklerinde $<1.00(\pm 0.000)$ - $1.81(\pm 0.028)$ log kob/mL bulunmuştur. Ardından Brilliant Green Bile Broth (BGBB) besiyeri kullanılarak doğrulama testleri uygulanmış olup çiğ süt, meyve suyu, dondurma ve kar şerbeti ile buzlaş ürünlerinin sırasıyla %86.66, %13.33, %80 ve %6.66'sında kanıtlanmış koliform tespit edilmiştir.

Anahtar Kelimeler: *E. coli*, Çiğ Süt, Taze Sıkılmış Meyve Suyu, Dondurma, Kar Şerbeti, Gıda Güvenliği

Some of the Plant-Based Fermented Beverages

Gizem Aslan¹, Nilgün Öncül²

¹Department of Nutrition and Dietetics, Faculty of Fethiye Health Sciences, Muğla Sıtkı Koçman University, Muğla, Turkey

²Department of Nutrition and Dietetics, Faculty of Fethiye Health Sciences, Muğla Sıtkı Koçman University, Muğla, Turkey

Abstract

Fermentation is one of the most economical techniques that have been used in food production, preservation, and consumption for centuries. As well as extending the shelf life of products, fermentation is an important preservation method that increases the nutritional value of food by synthesizing the macro and micro nutrients. The fermentation process also provides rich flavor products to consumers. Several types of food and beverages produced from vegetables, fruits, grains, meat, and milk are produced and consumed worldwide by the fermentation method. Fermented beverages are frequently preferred because of their refreshing properties as well as their health-promoting effects. Grain-based beverages such as boza and malt, fruit-vegetable based beverages such as şalgam and hardaliye, and milk-based such as koumiss, kefir, and ayran are the fermented beverages that are widely consumed in our country. Health-conscious consumers, functional food manufacturers, and researchers have a great interest in fermented beverages. This situation is directly related to the increase in health problems such as lactose intolerance, cow's milk protein allergy, and high cholesterol in societies. Besides, popular trends such as veganism and vegetarianism, consumers' interest in innovative and functional foods plays an important role in the development of this product category. This study aims to discuss the properties, production, and health effects of fermented beverages of malt, boza, şalgam, and hardaliye which are obtained from grains, vegetables, and fruits in our country.

Key Words: *Fermented Beverage, Boza, Malt, Şalgam, Hardaliye*

Bazı Bitkisel Fermente İçecekler

Özet

Fermentasyon, insanların yüzyıllardır gıda üretimi, muhafazası ve tüketiminde kullandıkları en ekonomik tekniklerden biridir. Fermentasyon ile gıdaların raf ömrünün uzatılmasının dışında, sağlık için yararlı makro ve mikro besin öğeleri de sentezlendiğinden bu yöntem gıdanın besin değerini de artıran önemli bir doğal muhafaza yöntemidir. Fermentasyon süreci ayrıca tüketicilere zengin aromaya sahip ürünler de sunmaktadır. Fermentasyon yöntemiyle dünya genelinde sebze, meyve, tahıl, et ve süttan üretilen birçok farklı yiyecek ve içecek çeşitleri üretilmekte ve tüketilmektedir. Fermente içecekler sağlığı geliştirici etkilerinin yanı sıra ferahlatıcı özelliklerinden dolayı da sıklıkla tercih edilmektedir. Ülkemizde yaygın olarak tüketilen fermente içecekler; boza ve malt içeceği gibi tahıl bazlı içecekler, şalgam suyu ve hardaliye gibi meyve-sebze bazlı içecekler ve kımız, kefir, ayran gibi süt bazlı içeceklerdir. Fermente içecekler; sağlık bilincine sahip tüketiciler, fonksiyonel gıda üreticileri ve araştırmacılar tarafından büyük ilgi görmektedir. Bu durum; toplumlarda laktoz intoleransı, inek sütü protein alerjisi ve yüksek kolesterol gibi sağlık sorunlarının geçmişe göre artmasıyla doğrudan ilişkilidir. Bununla birlikte veganizm ve vejetaryenlik gibi giderek daha popüler hale gelen trendler, tüketicilerin yenilikçi ve fonksiyonel gıdalara olan ilgisi, bu ürün kategorisinin gelişmesinde önemli rol oynamaktadır. Bu çalışmada; ülkemizde tahıllardan elde edilen malt içeceği ve boza, sebze ve meyvelerden elde edilen hardaliye ve şalgam suyu fermente içeceklerinin özellikleri, üretimi ve sağlık üzerine etkileri ile ilgili bilgi verilmesi amaçlanmıştır.

Anahtar Kelimeler: *Fermente İçecek, Boza, Malt, Şalgam, Hardaliye*

The Composition and Health Benefits of Flaxseed (*Linum usitatissimum*)

Mehtap Çiftçi¹, Nilgün Öncül²

¹Department of Nutrition and Dietetics, Faculty of Fethiye Health Science, Muğla Sıtkı Koçman University, Muğla, Turkey

²Department of Nutrition and Dietetics, Faculty of Fethiye Health Science, Muğla Sıtkı Koçman University, Muğla, Turkey

Abstract

Flax has been used in many areas of our lives for food or non-food purposes from past to present. Recently, flaxseed has been in high demand due to its high nutritional properties. Flaxseed is rich in protein, fat, and fiber. It is an important plant source of essential fatty acids, omega-3 and 6 fatty acids, linoleic acid (LA), alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), which has important roles in the protection and development of health. Flaxseed is also a natural source of phytochemicals such as flavonoids, lignans, and phenolic acids in addition to the basic nutrients. It reduces the risk of many diseases such as diabetes, cardiovascular diseases, cholesterol and cancer, and plays a curative role in the treatment of the disease with its components. The positive effects of flaxseed on health have been proven by several types of research. It is a powerful antioxidant source, as well as showing anticarcinogenic properties against various types of cancer. In addition, it shows anti-inflammatory, antimicrobial, and hypocholesterolemic effects. It can be consumed 2-3 times a day, 10-15 g, with 150 mL of liquid. In this study, the bioactive component of flaxseed and its health benefits were compiled.

Key Words: Flaxseed, Bioactive Component, Health, Food

Keten Tohumunun (*Linum usitatissimum*) İçeriği ve Sağlık Üzerine Faydaları

Özet

Keten geçmişten günümüze kadar gıda veya gıda dışı amaçla hayatımızın birçok alanında kullanılmıştır. Son zamanlarda ise keten tohumu yüksek besleyici özellikleri sayesinde yoğun talep görmektedir. Keten tohumu; protein, yağ ve lif açısından zengindir. Sağlığın korunması ve geliştirilmesi için önemli rolleri bulunan esansiyel yağ asitleri, omega-3 ve 6 yağ asitleri, linoleik asit (LA), alfa-linolenik asit (ALA), eikosapentaenoik asit (EPA) ve dokosaheksanoik asit (DHA) açısından önemli bir bitkisel kaynaktır. Keten tohumu içerdiği temel besin öğelerine ek olarak flavonoid, lignan ve fenolik asitler gibi fitokimyasalların da doğal kaynağıdır. İçeriğinde bulunan bileşenler sayesinde diyabet, kardiyovasküler hastalıklar, kolesterol ve kanser gibi pek çok hastalığın oluşum riskini azaltmakla birlikte tedavilerinde de rol almaktadır. Keten tohumunun sağlık üzerindeki olumlu etkileri son zamanlarda yapılan birçok çalışmayla kanıtlanmıştır. Çeşitli kanser tiplerine karşı antikanserijen özellik göstermekle beraber güçlü bir antioksidan kaynağıdır. Ayrıca; antiinflamatuar, antimikrobiyal ve hipokolesterolemik etki göstermektedir. Günde 2-3 kez 10-15 g olacak şekilde 150 mL sıvı ile tüketilmesi tavsiye edilmektedir. Bu çalışmada; keten tohumunun bioaktif bileşenleri ve sağlık üzerine etkileri hakkında bilgi verilmiştir.

Anahtar Kelimeler: Keten Tohumu, Bioaktif Bileşen, Sağlık, Gıda

Milk-Based Fermented Beverages

Gizem Aslan¹, Nilgün Öncül²

¹Department of Nutrition and Dietetics, Faculty of Fethiye Health Sciences, Muğla Sıtkı Koçman University, Muğla, Turkey

²Department of Nutrition and Dietetics, Faculty of Fethiye Health Sciences, Muğla Sıtkı Koçman University, Muğla, Turkey

Abstract

Milk is a fundamental food that meets all the macronutrient requirements of the individual. Milk, which is the raw material of fermented dairy products, consists of water (87%), fatty acids, proteins, essential amino acids, carbohydrates, water, and fat-soluble vitamins and minerals. A wide variety of products such as cheese, yogurt, and beverages are produced by fermentation of milk. These products provide positive effects on health with both their nutritional composition and live microorganism contents. The consumer attention is focused on fermented milk beverages due to the high demand for functional food which provides extra benefits with fundamentals of nutrition. Milk and dairy products have beneficial effects on health such as preventing cardiovascular and gastrointestinal diseases, strengthening the immune system, protecting bone health, and reducing the negative effects of free radicals. Kefir, kumiss, and ayran, which are fermented milk drinks, are produced both traditionally and industrially in our country and are consumed with love by the public. In this study; the definition, properties, production, and health effects of milk-based fermented beverages such as kefir, kumis, and ayran that are produced in our country were compiled.

Key Words: Milk, Kefir, Koumiss, Ayran, Fermentation, Beverage

Süt Bazlı Fermente İçecekler

Özet

Süt, bireyin tüm makro besin gereksinimlerini tek başına karşılayan temel bir gıdadır. Fermente süt ürünlerinin hammaddesi olan sütün yaklaşık %87'si su iken, geri kalanı; yağ asitleri, proteinler, esansiyel aminoasitler, karbonhidratlar, suda ve yağda çözünen vitamin ve minerallerden oluşmaktadır. Sütün fermantasyonu ile peynir, yoğurt, içecekler gibi çok çeşitli ürünler üretilmektedir. Bu ürünler hem besinsel kompozisyonları hem de canlı mikroorganizma içerikleri ile sağlık üzerine olumlu etkiler sağlamaktadır. Temel beslenmenin ötesinde sağlık üzerine ekstra faydalar sağlayan fonksiyonel gıdalara olan ilgi tüketicilerin taleplerini fermente süt içecekleri üzerinde toplamıştır. Süt ve süt ürünlerinin sağlık üzerine kardiyovasküler ve gastrointestinal hastalıkların önlenmesi, bağışıklık sistemini güçlendirmesi, kemik sağlığını koruması ve serbest radikallerin zararlı etkilerini azaltması gibi yararlı etkileri mevcuttur. Fermente süt içecekleri olan kefir, kıymız ve ayran ülkemizde hem geleneksel hem de endüstriyel olarak üretilmekte ve halk tarafından sevilerek tüketilmektedir. Bu çalışmada; ülkemizde üretilen kefir, kıymız ve ayran fermente içeceklerinin tanımı, özellikleri, üretimi ve sağlık etkileri hakkında bilgiler derlenmiştir.

Anahtar Kelimeler: Süt, Kefir, Kıymız, Ayran, Fermantasyon, İçecek

Giriş

Sütün genel tanımı “memeli hayvanların meme bezlerinden doğumdan sonra salgılanan biyolojik sıvı” olarak yapılmaktadır. Ancak; insanların tüketimine sunulan sütler için taşıması gereken niteliklerin de belirtildiği daha özel bir tanıma gereksinim vardır. Bu tür bir tanımla süt; ‘Bir veya birden fazla memeli süt hayvanının sağılması ile elde edilen ve minimum %8.25 oranında yağsız kuru madde ve %3.25 oranında süt yağı içeren taze meme salgısı’ olarak ifade edilmektedir (Biçer, 2019). Gıda, Tarım ve Hayvancılık Bakanlığının ilgili yönetmeliğinde ise çiğ sütün tanımı “bir veya birden fazla çiftlik hayvanının meme bezlerinden salgılanan, 40°C üzerinde ısıtılmamış veya eşdeğer etkili herhangi bir işlem görmemiş kolostrum dışındaki süt” şeklinde ifade edilmektedir (Anonim, 2011).

Süt, içerisindeki makro ve mikro besin öğeleri ile temel bir gıda maddesidir. Süt proteinlerinde esansiyel aminoasitler yeterli ve dengeli bir biçimde bulunmaktadır. Sütün karbonhidratı olan laktoz ise bağırsak mikroflorasının oluşumu ve devamlılığı için gereklidir. Laktozun fermantasyonu sonucunda üretilen laktik asit; aside duyarlılığı olan patojenlerin gelişmesini inhibe etmektedir. Laktozun sindirim hızı yavaş olduğundan kan şekerinin hızlı yükselmesini de engellemektedir. Sütün bileşiminde bulunan bu makro besinlerin yanı sıra yağda

çözünen vitaminler (A, D, E, K), B grubu vitaminleri, elzem yağ asitleri, kalsiyum ve fosfor gibi mineraller insan beslenmesi için önemlidir (Biçer, 2019).

Son yıllarda dünya çapında gıda üretimi ve tüketiminde sağlık yanlısı eğilimler artmaktadır. Bu eğilimler doğrultusunda meydana gelen gelişmelerden biri spesifik özellikleri sayesinde hastalık oluşum riskini azaltmaya ve yaşam kalitesini iyileştirmeye katkıda bulunan fonksiyonel gıdaların geliştirilmesidir. Fonksiyonel gıda tabiri çeşitli süt ürünleri de dahil olmak üzere farklı gruplardan ürünleri kapsamaktadır. Süt ve süt ürünlerinin sağlık üzerine olumlu etkileri çalışmalarla gösterildiğinden fonksiyonel gıdalar içerisinde yer alan bu gıdalara son yıllarda talepler artmaktadır. Bununla birlikte laktoz intoleransı gibi sindirim ve emilim bozuklukları giderek çoğalan beslenme sorunları haline gelmektedir. Bu durum, fermente süt içecekleri pazarının büyümesi ve yeni ürünlerin tasarımı teşvik etmektedir (Grajek ve ark., 2005). Fermente süt ürünü, Uluslararası Süt Ürünleri Federasyonu (International Dairy Federation-IDF) tarafından yağsız süttten belirli kültürlerle hazırlanan süt ürünü olarak tanımlanmaktadır (Akin ve Özcan, 2017). Türk Gıda Kodeksinin 2009/25 nolu Fermente Süt Ürünleri Tebliği'nde ise "Sütün uygun mikroorganizmalar tarafından fermente edilmesi ile pH'nın koagülasyona neden olacak ya da olmayacak şekilde düşürülmesi sonucu oluşan ve bulundurulması gereken mikroorganizmaları yeterli sayıda, canlı ve aktif olarak bulunduran süt ürünü" olarak açıklanmıştır (Anonim, 2009).

Binlerce yıldır insan beslenmesinin önemli bir kısmını süttün fermentasyonu ile elde edilen ürünler oluşturmaktadır. M.Ö. 100-150 yıllarında süttün, çiğ sütte doğal olarak bulunan mikroorganizmalar ile fermente edilerek tüketildiğini gösteren bulgular mevcuttur. Süt fermentasyonunda yararlanılan temel mikroorganizmalar laktik asit bakterileridir (LAB). LAB fermentasyon sürecinde laktozu laktik aside dönüştürerek ortamın asitliğini artırmakta ve böylece gıdada LAB dışındaki mikroorganizmaların gelişmesini engelleyen koşulları oluşturmaktadır. Fermente süt ürünlerinde bulunan en yaygın LAB cinsleri *Lactobacillus*, *Lactococcus*, *Streptococcus*, *Enterococcus* ve *Leuconostoc*'tur (Demirgöl ve Sağdıç, 2018). Günümüzde dünya genelinde fermente süt içecekleri hem geleneksel yolla hem de şehirleşme ve tüketici bilincinin gelişmesi neticesinde endüstriyel olarak üretilmektedir. Dünya genelinde yaygın olarak üretilen bazı geleneksel ve endüstriyel fermente süt içecekleri Tablo 1'te verilmiştir. Bu çalışmada; ülkemizde süttün fermentasyonu ile üretilen kefir, kıymız ve ayran içeceklerinin tanımı, bileşimi, üretimi ve sağlık üzerine etkileri hakkında bilgi verilecektir.

Tablo 1. Fermente Süt İçecekleri

İçecek	Bölge	Ham Madde	Mikroorganizma	Kaynak
Asidofilin	Kafkaslar	İnek sütü	<i>Lb. acidophilus</i> , <i>Lb. delbrueckii</i>	Ender ve ark., 2006
Asidofilus Sütü	ABD	İnek sütü	<i>Lb. acidophilus</i>	Farag ve ark., 2020
Ayran	Türkiye	İnek sütü	<i>Lb. bulgaricus</i> , <i>Str. thermophilus</i>	Şanlı ve ark., 2011
Bifidus S.	Almanya	İnek Sütü	<i>Bifidobacterium bifidum</i> , <i>B. longum</i>	Daşnik, 2014
Bulgaricus Sütü	Bulgaristan	İnek, koyun ve keçi sütleri	<i>Lb. delbrueckii</i> ssp. <i>bulgaricus</i>	Ender ve ark., 2006
Chal	Türkmenistan	Deve sütü	<i>Lb. casei</i> , <i>Str. thermophilus</i>	Soleymanzadeh ve ark., 2016
Chhaas	Nepal	İnek Sütü	<i>Lactobacillus</i> spp.	Ansari ve ark., 2019
Dahi(Dadli)	Hindistan	İnek, Manda sütü	<i>Lb. delbrueckii</i>	Sahoo ve ark., 2017
Kefir	Kafkaslar	İnek, koyun	<i>Lb. kefir</i> , <i>Leuconostoc</i> , <i>Lactococcus</i> , <i>Acetobacter</i> cinsleri	Ünal ve ark., 2020
Kıymız	Kırgız- Kazak- Tatar- Özbekistan	Kısrak Sütü	<i>Lb. acidophilus</i> , <i>Lb. helveticus</i> , <i>Ligilactobacillus salivarius</i> , <i>Str. thermophilus</i> , <i>Kluyveromyces lactis</i>	Petrova ve ark., 2021
Mahi	Nepal	İnek, bufalo sütü	LAB	Dahal ve ark., 2005
Mil-Mil	Japonya	İnek sütü	<i>B. bifidum</i> , <i>B. breve</i> , <i>Lb. acidophilus</i>	Matsuoka ve ark., 2018
Miru-Miru	Japonya	-	<i>Lb. casei</i> , <i>Lb. acidophilus</i> , <i>B. breve</i>	Achi ve Halami, 2017
Shubat	Kazakistan	Deve sütü	<i>Brettanomyces claussenii</i>	Nadtochii ve ark., 2018
Skyr	İzlanda	Koyun sütü	<i>Str. thermophilus</i> , <i>Lb. delbrueckii</i>	Gudmundsson ve Kristbergsson, 2016
Viili (Fiili)	Finlandiya	İnek sütü	<i>Str. lactis</i> , <i>Le. mesenteroides</i> , <i>Geotrichum candidum</i>	Kahala ve ark., 2008
Yakult	Japonya, Singapur	Soya sütü	<i>Lb. casei shirota</i>	Matsuoka ve ark., 2018
Ymer	Danimarka	İnek sütü	<i>Str. lactis</i> ssp. <i>diacetilactis</i> , <i>Le. mesenteroides</i> ssp. <i>cremoris</i>	Robinson ve ark., 2002

Türkiye’de Üretilen Süt Bazlı Fermente İçecekler

Kefir

İnsanların sağlık konusunda bilinç düzeylerinin yükselmesiyle doğal ürünlere olan talepleri artmış, bu da fonksiyonel gıdaların dünya çapında önem kazanmasını sağlamıştır. Uluslararası Yaşam Bilimleri Enstitüsü (ILSI), fonksiyonel gıdayı “fizyolojik olarak aktif gıda bileşenleri sayesinde temel beslenmenin ötesinde sağlık üzerinde olumlu etkiler bırakan gıdalar” olarak tanımlamaktadır. Fonksiyonel bir gıda olan kefir geleneksel olarak sütün kefir daneleri katılarak fermente edilmesiyle üretilirken endüstride ise danelerden izole edilen mikroorganizmaların starter kültür olarak kullanımıyla üretilen asidik, fermente bir süt içeceğidir (Köroğlu ve ark., 2015; Tomar ve ark., 2017).

Kefir içilmesiyle ağızda kalan ferahlatıcı his, mayanın tipik aroması ve kendine özgü lezzeti kefirin tercih edilme nedenlerindendir. Kefir kelimesi kaynağını ‘iyi ve güzel hissettiren’ anlamındaki ‘keyf’ sözcüğünden almaktadır. Kafkasya’da bu sözcük ‘en iyi yapılan’ anlamında kullanılmaktadır. Bu kullanımın dışında kefir için farklı toplumlarda ‘kefer’, ‘kiaphur’, ‘kippi’ ve ‘kanphon’ sözcükleri de kullanılmaktadır (Duran, 2020). Kefir, Kafkaslar’da sağlık için faydalı etkileri olduğundan oldukça fazla tüketilmektedir. Günümüzde ise sadece Kafkaslar’da değil Asya ve Avrupa ülkeleri ile Rusya’da da sıklıkla tercih edilmektedir. Fermantasyonda etkin olan mikroorganizmaların (laktik asit bakterileri, mayalar ve asetik asit bakterileri) arasındaki simbiyotik ilişkinin kefirin kendine özgü tat ve aromasının oluşmasında etkili olduğu bilinmektedir (Ünal ve ark., 2020).

Kefir Danesi: Kefir, kefir danesi ilavesi ile sütün fermantasyona uğraması sonucu oluşan asidik bir süt ürünüdür. Ortadoğu ülkelerinde Peygamber Darısı diye anılan kefir daneleri, karnabahar çiçeklerine veya patlamış mısıra benzeyen; 3-20 mm çapında, düzensiz, beyaz-sarımtırak renkli ve sert dokusu olan küçük tanecikler olup kefirin ana unsurudur. Bir başka tanıma göre kefir daneleri Kafkasya’da inek sütünün keçi tulumunda dana ve koyun şirdeni kullanılarak pıhtılaştırılması sonucu oluşan kabuk tabakasından elde edilen küçük topaklardır (Koyu-Bellikçi ve Demirel, 2018; Arda, 2020). Fermantasyon, bu taneciklerin ısı işlem uygulanmış süte %2 oranında eklenmesinden sonra uygun şartlar da başlamaktadır. 25°C’de yaklaşık 22 saatin sonunda fermantasyon tamamlanmakta ve aseptik koşullara uygun olarak daneler kefirde süzülerek alınmaktadır. Alınan daneler doğru şekilde muhafaza edildiği takdirde yıllarca yeni fermantasyonlar için kullanılmaktadır. Zamanla kefir danelerinde hacimce ve sayıca artış gözlenmektedir. Kefir danesinin oldukça zengin bir mikroflorası olduğundan, kefir üretimi için benzersiz bir doğal starter kültür olduğu söylenmektedir. Kefir danesi mikrobiyal açıdan heterofermentatif ve homofermentatif laktik asit bakterileri (*Lactococcus*, *Lactobacillus*), asetik asit bakterileri (*Acetobacteria*) ve mayalardan (*Klu. fragilis*, *C. kefir*) oluşan bir mikroorganizma karışımıdır (Tomar ve ark., 2017). Danede bulunan bu mikroorganizmalar danenin farklı tabakalarında yoğunlaşmıştır; iç katmanlarda laktozu fermente eden mayalar yer alırken; dış katmanlarda laktozu fermente edemeyen mayalar, laktik asit bakterileri ve asetik asit bakterileri yer almaktadır. Kefir daneleri; yaklaşık %90 oranında su, %6 karbonhidrat (laktoz), %3 protein, %0.2 de yağ içermektedir. Kefir danelerindeki mayaların bir kısmı sütteki laktozu büyük ölçüde fermente ettiğinden laktoz intoleransı olan bireyler de kefir tüketebilmektedir. Diğer milletler tarafından Türklerin gürbüz, sağlıklı ve uzun ömürlü olmalarının kefir tüketmeleri sayesinde olduğu düşünülmüştür. Bu nedenle kefir diğer devletlerde de popüler bir ürün olarak yayılmış ve daneleri çoğaltılıp endüstriyel üretime geçilmeye başlanmıştır (Arda, 2020). Kefir danelerinin mikroflorasını oluşturan bazı mikroorganizmalar Tablo 2’de verilmiştir (Duran, 2020).

Tablo 2. Kefir Danelerinden İzole Edilen Mikroorganizmalar

Laktik Asit Bakterileri	Asetik Asit Bakterileri	Mayalar
<i>Lb. kefiranofaciens</i>	<i>A. lovaniensis</i>	<i>Kazachstania aerobia</i>
<i>Lb. acidophilus</i>	<i>A. pasteurianus</i>	<i>K. servazzii</i>
<i>Lb. amylovorus</i>	<i>A. syzygii</i>	<i>K. solicola</i>
<i>Lb. gallinarum</i>		<i>K. unispora</i>
<i>Lb. plantarum</i>		<i>Kluyveromyces dobzhanskii</i>
<i>Lb. delbrueckii</i>		<i>Klu. marxianus</i>
<i>Lb. fermentum</i>		<i>Klu. lactis</i>
<i>Lb. parakefiri</i>		<i>Saccaromyces unisporus</i>
<i>Lb. buchneri</i>		<i>Sac. cerevisiae</i>
<i>Lb. crispatus</i>		<i>Sac. turicensis</i>
<i>Lb. gasseri</i>		<i>Torulaspora delbrueckii</i>
<i>Lb. brevis</i>		<i>Pichia fermentas</i>
<i>Lac. cremoris</i>		<i>C. friedricchi</i>
<i>Lac. lactis</i>		<i>C. albicans</i>
<i>Str. thermophilus</i>		<i>C. lambica</i>
<i>Leu. mesenteroides</i>		<i>C. holmii</i>
<i>Leu. lactis</i>		<i>C. kefir</i>

Kefir Üretimi

Geleneksel Yöntem: Kefir üretiminde yaygın olarak inek sütü kullanılırken; deve, keçi, koyun gibi diğer bazı hayvanların sütlerinden ya da Hindistan cevizi, soya ve pirinç sütü gibi bitkisel kaynaklar da tercih edilmektedir. Kefir üretimi 2 temel yöntemle gerçekleştirilmektedir. İlki çoğunlukla evlerde uygulanan geleneksel yöntem, ikicisi de endüstriyel yöntemdir. İlk yöntemde kefir daneleri starter kültür olarak kullanıp pastörize inek sütüne ilave edilmektedir. Danenin süte katılmasında yaklaşık 1:30-1:50 g/l gibi bir oran kullanılmaktadır. Geleneksel olarak evlerde üretilirken ise oranı göz kararı belirlemektedir. Daneler süte eklendikten sonra, kapalı bir kapta, 8-25°C civarındaki sıcaklıklarda, 10-40 saat boyunca fermantasyon işlemi gerçekleştirilmektedir (Koyu-Bellikçi ve Demirel, 2018). Geleneksel yöntemle kefir üretim aşamaları Şekil 1’de gösterilmiştir (Duran, 2020).



Şekil 1. Geleneksel Yöntemle Kefir Üretimi

Endüstriyel Yöntem: Endüstriyel yöntemle kefir üretiminde ticari liyofilize kefir kültürü ya da kefir danesi kullanılarak gerçekleştirilen iki çeşit üretim şekli bulunmaktadır ve temel prensipler geleneksel yöntemle aynıdır. Kefir üretiminde kullanılacak çiğ sütün ilk olarak kuru madde (%8 oranında) ve yağ standardizasyonu yapıp ardından homojenize edilmektedir. Kefirde istenen iyi kıvam, tat, aroma ve yüksek viskozitenin sağlanması için homojenizasyon işleminin doğru uygulanması (70°C’ de 150 kg/cm² basınçta) gerekmektedir. Süt, homojenizasyonun ardından 90-95°C’de 5-10 dakika ısıtılma tabi tutularak pastörize edilmektedir. Daha sonra 18-24°C’ye soğutma işlemi uygulanıp %2-8 oranında kefir kültürü eklenmektedir. 18-24 saatlik fermantasyon sürecinde pH 4.5-4.6’ya düşüncü hızlı bir şekilde 4-6°C’ye soğutulmaktadır. Fermantasyon sonrası ürün karıştırılıp aseptik koşullarda ambalajlanıp 4°C’de depolanmaktadır (Ürkek ve ark., 2011; Arda, 2020). Kefirin endüstriyel yöntemle üretim aşamaları Şekil 2’te gösterilmiştir (Ürkek ve ark., 2011).



Şekil 2. Endüstriyel kefir üretiminin akım şeması

Standardizasyon: Kefir, zengin starter kültür içeriğiyle diğer fermente süt ürünlerinden ayrılmaktadır (Yıldız-Akgül ve ark., 2018). Hem bileşimindeki besin öğeleri hem de probiyotik özelliği dolayısıyla fonksiyonel bir besin olan kefir; sağlıklı bir diyetin önemli parçalarından biridir. Ancak; diğer süt ürünleri tüketiminden farklı olarak kefire ilişkin dikkat edilmesi gereken bir nokta kefirin standardizasyonudur. Türk Gıda Kodeksi'nde belirli düzenlemeler yer almaktadır fakat üretilen ve kullanılan kefirlerin mikrobiyal bileşimlerinde ve miktarlarında standart olmadığı bilinmektedir (Koyu-Bellikçi ve Demirel, 2018). Türk Gıda Kodeksi Fermente Süt Ürünleri Tebliği'nde kefir 'fermantasyonda spesifik olarak *Lb. kefir*, *Lactococcus*, *Leuconostoc* ve *Acetobacter* cinslerinin değişik suşları ile laktozu fermente eden mayaları (*Klu. marxianus*) ve etmeyen (*Sac. unisporus*, *Sac. cerevisiae*, *Sac. exiguus*) mayaları içeren starter kültürlerin veya kefir danelerinin kullanıldığı fermente süt ürünü' olarak tanımlanmaktadır. Tebliğde kefire ilişkin ürün özellikleri: süt proteini ağırlıkça en az %2.7, süt yağı ağırlıkça en fazla %10, titrasyon asitliği (laktik asit olarak) ağırlıkça en az % 0.6, spesifik mikroorganizmaların toplamı en az 10^7 kob/g, etikette yer alan ilave mikroorganizmaların toplamı en az 10^6 kob/g ve mayalar en az 10^4 kob/g şeklinde belirtilmiştir (Anonim, 2009).

Sağlık üzerine etkileri: Günümüzde giderek artan ve çeşitlenen araştırmalar, fermente süt ürünlerinin probiyotik etkilerine yoğunlaşmaktadır. Bu çalışmalarda sıklıkla yer alan kefir kendine özgü probiyotik özellikli mikroorganizmaları içermektedir. Bu probiyotik özelliği ile fonksiyonel bir süt ürünü olan kefirin sağlık üzerine birçok yararı bulunmaktadır (Köroğlu ve ark., 2015). Kefirde bulunan mikroorganizmaların canlı ve aktif kültürleri; patojen mikroorganizmaların inhibe edilmesinde ve sindirim sistemi mikroflorasının doğru yapılandırılmasında rol almaktadır. Ayrıca; kefir, sindirimde rolü olan bazı vitamin ve minerallerle esansiyel aminoasitlerini içermektedir (Yalçın ve Işık, 2017). Kefirin besin bileşenleri Tablo 3'da verilmiştir (Yalçın ve Işık, 2017).

Tablo 3. Kefirin Besin Bileşenleri

Besin Öğesi	Ortalama değer (100g)	Besin Öğesi	Ortalama değer (100g)
Su %	87.5	Vitaminler(mg)	
Laktoz %	4	A Vitamini	0.06
Protein %	3.3	Karoten	0.02
Yağ %	3.5	B1 Vitamini	0.04
		B2 Vitamini	0.17
Etil Alkol (g)	0,9	B6 Vitamini	0.05
Laktik Asit (g)	1	Mineraller(g)	
		Kalsiyum	0.12
Kolesterol (mg)	13	Fosfor	0.1
Fosfatidler (mg)	40	Magnezyum	12
		Potasyum	0.15
		Sodyum	0.05

Kefir; üretimi sırasında gerçekleşen laktik asit ve etil alkol fermentasyonları sayesinde kolay sindirilen, ferahlık veren, iştahın düzenlenmesini sağlayan ve bazı rahatsızlıkların iyileşmesinde hızlandırıcı etkisi olan biyoyararlılığı yüksek bir besin haline gelmektedir (Akdan ve ark., 2020). Terapötik özelliklerinin yanısıra kefirdeki laktik asit ve asetik asit gibi organik asitlerin antibiyotik ve antifungal etkileri bulunmaktadır. Kefirin damarlarda kolesterol birikmesini önlediği ve antihiperkolesterolemik etkilerinin olduğu kanıtlanmıştır (Arda, 2020). Kefirin antihipertansif ve kolesterol düşürücü etkilerinin yanısıra, kefirin da kolesterolü ve kan basıncı düzeylerini iyileştirdiği tespit edilmiştir. Kefiran, kefir tanelerinde oluşan polisakkarit bir matris olup kefir üretiminde kullanılmaktadır (Weschenfelder ve ark., 2018). Yağlı diyetle beslenen, spontan hipertansif ve inme eğilimi olan sıçanlarda kefirin takviyesi ile serum toplam kolesterol, serum LDL, serum trigliserit, karaciğer kolesterolü ile karaciğer trigliseritlerinin azaldığı tespit edilmiştir (Tomar ve ark., 2017).

Laktoz intoleransı olanlar, vejetaryenler, kardiyovasküler hastalığı olanlar ve diyabetli bireyler için alternatif bir kefir üretmeyi amaçlayan bir çalışmada badem sütü, bal ve muz kullanılmış ve ürünün kabul edilebilirliği değerlendirilmiştir. Çalışmada yalnızca inek sütüyle ve yalnız badem sütüyle üretilen ve farklı oranlarda inek sütü ve badem sütü karışımlarıyla üretilen kefirlerin depolamanın belirli günlerinde (1., 7. ve 14.) fizikokimyasal, mikrobiyolojik ve duyuşal özellikleri incelenmiştir. Çalışmada kefirlerin pH değerleri depolama boyunca düşmüş ve en yüksek pH değeri inek sütü ile yapılan kefirde ölçülmüştür. Örneklerde depolama boyunca viskozitede düşüş olduğu gözlenmiştir. Yalnız badem sütü içeren örneklerdeki viskozitenin, inek sütü içeren örneklerden düşük olduğu saptanmıştır. Muz içeren örneklerin viskozitesi, diğer örneklerle kıyasla daha yüksek bulunmuştur. Serum ayrılması değerlendirildiğinde depolamanın 1. gününde en yüksek serum ayrılmasının %95 badem sütü içeren kefir örneğinde meydana geldiği görülmüştür. Yalnızca inek sütü içeren kefirde serum ayrılması gözlenmezken diğer örneklerde badem sütü oranının artmasıyla serum ayrılmasının arttığı gözlenmiştir. Kefirler kabul edilebilirlik açısından değerlendirildiğinde %60 badem sütü +%5 bal +%10 muz içeren kefir, kontrol ürününden sonraki en yüksek puanı almıştır. Bu örnek; tat ve aroma açısından kontrol kefirine eş değer puanlar almıştır.

Çalışmadan elde edilen sonuçlar kefir üretiminde inek sütüne alternatif olarak badem sütünün başarıyla kullanılabileceğini göstermiştir (Erol, 2020).

Maraş tarhanası üretiminde yoğurda alternatif olarak kefir kullanılması üründe meydana getireceği farklılıkların incelendiği bir çalışmada son ürünün bazı tekstürel özellikleri ile toplam fenolik madde içerikleri ve antioksidan kapasiteleri kıyaslanmıştır. Çalışmada yoğurt yerine kefir kullanılan örneklerde nem, kül, yağ ve protein miktarlarında önemli bir değişim meydana gelmemiştir. Fakat toplam asitlik miktarındaki azalma anlamlı bulunmuştur. Ayrıca; kefir kullanımıyla tekstürel özelliklerden çıtırılık ve sertlik değerlerinde önemli bir azalma gözlenmiştir. Çalışmada, tarhana üretimi için yoğurda alternatif olarak kefir kullanımının tarhananın antioksidan kapasitesinde önemli bir artış sağladığı gösterilmiştir (Erinç ve Çiççi, 2018). Başka bir çalışmada yoğurt ve kefir kullanılarak üretilen tereyağları karşılaştırılmıştır. Çalışmada bu iki farklı ham maddeyle üretilen tereyağı örneklerinin genel besin bileşimleri, bazı kalite parametreleri ve birtakım duyuşal özellikleri depolamanın farklı günlerinde (1., 30. ve 60. günler) karşılaştırmalı olarak incelenmiştir. Starter kültürleri farklı olan bu ham maddelere bağlı olarak, son ürünün titrasyon asitliği değerleri arasındaki fark anlamlı bulunmuştur. ΔE değerleri incelendiğinde depolamanın 30. gününde kefirden üretilen tereyağının renginde belirgin bir farklılık olduğu saptanmıştır. Duyusal analizlerin sonuçları, tekstür bakımından ürünler arasında belirgin farkların olmadığını ancak tat, koku ve genel kabul edilebilirlik özellikleri yönünden farklılıkların olduğunu göstermektedir. Kefirden üretilen tereyağı örneğinin yoğurttan üretilene kıyasla daha fazla beğenildiği saptanmıştır. Çalışmada, kefirin fonksiyonel özellikleri dolayısıyla tereyağına; yoğurda kıyasla daha üstün bazı özellikler kazandırabilmek amacıyla iyi bir alternatif olabileceği sonucuna varılmıştır (Anlı ve ark., 2020).

Kımız

Türklerin beslenme, barınma, giyinme ve eğlenme gibi konulardaki bazı alışkanlıkları yaşadıkları kültür çevresinin imkânlarından büyük ölçüde etkilenmiştir. Bozkır hayatı, Türklerin yaşama koşullarını belirlemede önemli bir etken olmuştur. Özellikle bozkır kültürünün yaygın olduğu yerlerde temel geçim kaynağı hayvancılık olduğundan Türklerin içecekleri de çoğunlukla hayvanların sütlerinden yapılmıştır. Bu hayvanların sütlerini içmelerinin yanı sıra sütleri fermente ederek elde ettikleri ürünleri de tüketmişlerdir. Ayran ve kımız Türklerin sıklıkla içtikleri içecekler arasındadır. Türkler için kısırak sütünden yaptıkları kımızın önemli bir yeri vardır. Kısırak sütü sindirilebilirliği yüksek olduğundan ve esansiyel besin öğeleri içerdiğinden özellikle çocukluk çağı beslenmesinde önemli bir yere sahiptir (Karimova, 2019).

Kımız adı Uygur lehçesi dışındaki Türk lehçelerinin tümünde “kımız” olarak geçmektedir. Uygur lehçesinde ise “gımız” olarak isimlendirilmektedir. Rusça’da kımız için “kumis” adı kullanılmaktadır. Kaşgarlı Mahmud’un Divanı Lügat-it Türk adlı eserinde ekşi elma için “kımız almıla” tabirinin kullanılması “kım” sözcüğünün ekşilik ifade etmek için kullanıldığını göstermektedir (Durmuş, 2014). Orta Asya Türkleri kımızı; yiğitlere cesaret, ozanlara ilham veren, yeis ve kötü düşünceleri def eden bir süt ürünü olarak tanımlamaktadır. Türkler, kımızı beşikten mezara herkesin içeceği olarak tanımlayıp; ihtiyarlık, güçsüzlük ve birçok hastalığa karşı hakiki ve doğal bir ilaç olarak tüketmektedir (Yaygın, 1996). Kısırak sütünden yapılan kımızın “Tünemel Kımız, Uvız Kımız, Karabalı Kımız, Sarı Kımız, Sirge Kımız ve Cmyar Kımız” gibi iyi bilinen türleri olduğu gibi bunların dışında da daha az bilinen 25 türü vardır (Üstün, 2009). Kımız, laktik asit fermentasyonu ile oluşan ve yaklaşık %2 oranında alkol içeren, albümin ve kazein parçalanmasının da meydana geldiği, beyazımsı renkte, köpüklü, kokusu ve tadı ekşimsi peynir suyuna andıran bir süt içeceğidir. Laktoz içeriği diğer sültere göre daha yüksek olduğundan ham madde olarak kısırak sütü kullanılmaktadır (Karagözlü, 2019). Ancak; bazı kımız üreticileri inek ve keçi sütünü kullanarak da kımız üretmektedir.

Kımız Çeşitleri: Kımız’ın bileşiminde, üretiminde kullanılan ham maddeye ve işlenme şekline göre birtakım farklılıklar görülmektedir. Bileşimindeki laktik asit ve alkol miktarı fermentasyon süresine göre değişkenlik göstermektedir. Buna göre;

- bir günlük fermentasyon ile “Tatlı Kımız” olarak bilinen zayıf (%0.7 laktik asit, %1. etil alkol),
- iki günlük fermentasyon ile “Kunan Kumis” olarak adlandırılan orta (%1.1, laktik asit, %1.8 etil alkol),
- üç günlük fermentasyon sonunda ise “Donen Kumis” olarak adlandırılan sert (%1.8 laktik asit, %2.5 etil alkol) kımız elde edilmektedir.

Kımız çeşitlerinden “Juas Kumis” olarak bilinen içeceği elde etmek için kımızın içerisine taze kısırak sütü katılmaktadır. “Balkumis” olarak adlandırılan içecek ise yine kımıza bal, kayısı veya üzüm eklenmesi ile elde edilen bir içecektir. Yedi gün ve daha uzun süre fermentasyonla üretilen kımız içeceği ise Türkler tarafından “Toneme Kumis” olarak adlandırılmaktadır (Koboyeva ve Güzeler, 2020).

Kımız içeceğinin üretim aşamasında fermentasyona bırakılma sürelerindeki farklılıklara göre içerik ve duyuşal özelliklerinde meydana gelen farklılıklar Tablo 4’te gösterilmiştir (Yaygın, 1991).

Tablo 4. Kımız Çeşitlerinin Duyusal Özellikleri

Tatlı Kımız	Orta Sertlikte Kımız	Sert Kımız
pH 4.5-5.0 Asitlik: 24-32 SH Alkol: %1 ve daha az CO ₂ miktarı azdır, karıştırıldığında köpüğü çabuk dağılır. Kıvamlı, ekşiliği az, gerçek kımız tadı yoktur. Karıştırılmaz ise üstte serum ayrılması görülür. Bardağın kenarına ufak parçacıklar yapışır.	pH 3.9- 4.5 Asitlik: 32.4-40 SH Alkol: %1.1-1.5 CO ₂ miktarı fazladır, karıştırıldığında köpürür ve köpüğü hemen dağılmaz. Kısrak sütünden daha akışkandır, ekşi ve biraz acıdır. Karıştırılmadığında serum ayrılması görülmez. Bardağın kenarına homojen yapıda incecik yapışır.	pH 3.3-3.6 Asitlik: 40-48 SH Alkol: %1.6-3 Az köpürür, karıştırılınca köpükler yavaşça dağılır. Diğer türlerden daha akışkan, ekşi ve biraz acıdır. Serum ayrılması görülmez. Bardağın kenarına parlak olarak yapışır.

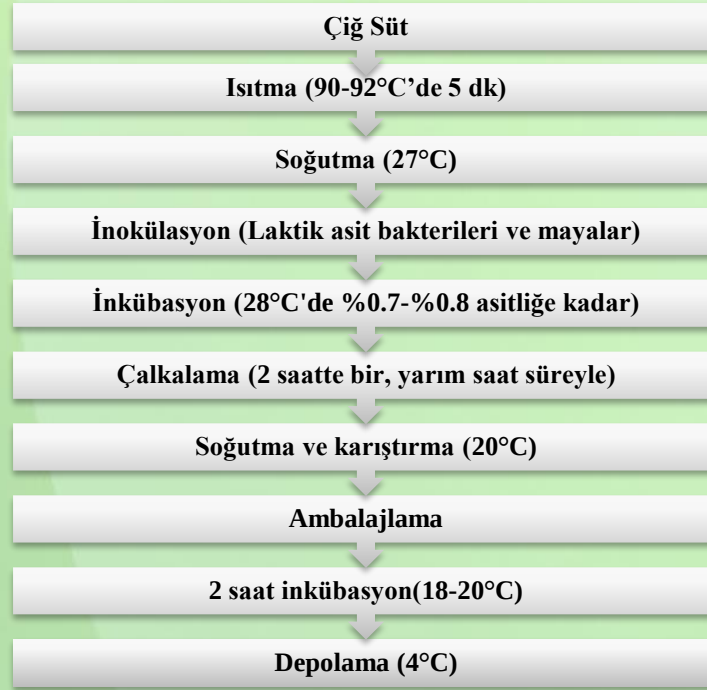
Kımız Üretimi

Kımız üretimi geleneksel yöntemlerin kullanılmasıyla evlerde ve çiftliklerde; endüstriyel olarak da işletmelerde yapılmaktadır. Geleneksel üretimle endüstriyel üretim arasında teknolojik işlemlerle alet ve ekipmanlar açısından farklılıklar bulunmaktadır (Oğuzhan ve Yangılar, 2013).

Geleneksel Yöntemle Kımız Üretimi: Süte daha önce üretilen kımızın ilavesiyle laktik asit ve etil alkol fermentasyonları gerçekleşmekte ve kımız meydana gelmektedir. Geleneksel yöntemde “Saba” ya da “Torsuk” olarak adlandırılan fiçilerde yapılmaktadır. Bu fiçiler birçok yerde çam kozalağıyla tütsülenmektedir ve fiçilerin iç kısımları may (inek sütü kaymağının ısıtılmasıyla üretilen bir çeşit tereyağı) adı verilen sarı bir yağla kaplanmaktadır. Bu işlem kımızın fiçiden dışarı sızmasını engellemekte ve kımızın kendine has aromasına katkı sağlamaktadır. Kımızı soğuktan ya da aşırı sıcaktan korumak için tahta fiçilerin dış yüzeyi keçe ile kaplanmaktadır (Yalimel, 2021). Kımız üretimi için kısrak sütüne (3 hacim) daha önce yapılmış kımızdan (1 hacim) ilave edilmekte ardından 1 gün boyunca oda sıcaklığında fermentasyona bırakılmaktadır. Kımız bu süreçte her iki saatte bir, yarım saati geçkin bir süre boyunca ahşap bir sopayla karıştırılıp çalkalanmaktadır. Üreticilerin bazıları karıştırma işlemi sürerken taze kısrak sütü de eklemektedir. Bir günlük fermentasyonun sonunda hazır hale gelen kımız plastik şişelere doldurulmakta ve ağzı hava almayacak şekilde kapatılmaktadır. Ardından hareket ettirilmeden soğuk odalarda saklanmaktadır. Kımız genellikle soğuk olarak tüketilmektedir (Koboyeva ve Güzeler, 2020).

Endüstriyel Kımız Üretimi: Kımızın endüstriyel olarak üretiminde birtakım zorluklarla karşılaşmaktadır. Endüstride ürünün standart hale getirilmesi için öncelikle üretimde kullanılacak starter kültürün hazırlanması gerekmektedir. Bu amaçla; 70°C sıcaklıkta 30 dakika pastörize edilmiş yağsız inek sütüne *Lb. bulgaricus* eklenmekte ve 35-37°C'de 6-7 saat inkübasyona bırakılmaktadır. İnkübasyon sürecinden sonra süte içinde *Torula* spp. bulunan ikinci bir kültür ilave edilmekte ve 28-30°C'de yaklaşık 15-18 saat ikinci kez inkübasyona bırakılmaktadır. İkinci inkübasyonun ardından, kısrak sütü 28°C'lik inkübasyon sıcaklığındaki üretim tankına asitlik laktik asit cinsinden (LA) yaklaşık %0.7 olana kadar yavaş ve sürekli bir biçimde çalkalanarak ilave edilmektedir. Tank istenilen seviyeye kadar bu şekilde doldurulmaktadır. Süt, %1.4 asitliğe ulaşıncaya kadar 3-4 gün fermente edilmektedir. Böylece; kımız üretimi için starter kültür hazırlanmış olmaktadır. Kımız üretimi için taze kısrak sütüne, hazırlanan starter kültürden %30 düzeyinde katılmaktadır. Kımız; 28°C' de 1 saat %0.7- %0.8 asitliğe (LA) ulaşıncaya kadar, etkili bir şekilde çalkalanarak inkübe edilmektedir. İnkübasyon süresi sonunda kımız şişelenip 2 saat 18-20°C' de inkübasyona bırakılmaktadır. İnkübasyonun tamamlanmasının ardından şişelenmiş kımızlar 24 saat boyunca 4-5°C'de muhafaza edilmektedir (Tegin ve Gönülalan, 2014). Kımızın endüstriyel yöntemle üretim aşamaları Şekil 3'te gösterilmektedir (Bayat, 2020).

Mikrobiyolojik Yapısı: Kımız kültürü mikroorganizmalardan oldukça zengindir. Genel olarak kımız kültüründe mezofilik ve termofilik LAB'leri (*Lb. bulgaricus*, *Lb. casei*, *Str. lactis* ve *Str. thermophilus*) ile laktozu fermente edebilen *Torulopsis* cinsi mayalar yer almaktadırlar. Bazı kımız türlerinde *Bakterium orenburgi* de bu kültürde yer alabilmektedir ve *Lb. bulgaricus* 'un yerine kullanılmaktadır. *Bak. orenburgi* de tüm özelliklerinin yanında laktik asit (%3.2) oluşturma yeteneğine sahiptir. Bu zengin mikroflora kımızda iki tür fermentasyonun gerçekleşmesine olanak sağlamaktadır. İlki, laktik asit bakterilerinin meydana getirdiği laktik asit fermentasyonu, ikincisi de mayalar tarafından meydana getirilen etil alkol fermentasyonudur. Bunların yanısıra kımızın mikroflorasında üretildiği yere göre de önemli farklılıklar görülebilmektedir (Karagözlü, 2019). Kımızın mikroflorasında görülen mikroorganizmalar Tablo 5'te verilmiştir (İstanbul, 2017).



Şekil 3. Kımızın Endüstriyel Üretimi Akış Şeması

Tablo 5. Kımızın Mikroflorasında Görülen Bazı Mikroorganizmalar

Laktik Asit Bakterileri	Mayalar	Diğer Bakteriler
<i>Lb. kefiranofaciens</i>	<i>C. pararugosa</i>	<i>Lac. lactic ssp. cremoris</i>
<i>Lb. casei</i> Zhan	<i>Dekkera anomala</i>	<i>Leu. mesenteroides</i>
<i>Lb. coryniformis</i>	<i>Geotrichum sp.</i>	<i>Str. thermophilus</i>
<i>Lb. bulgaricus</i>	<i>Issatchenkia orientalis</i>	<i>Str. macedonicus</i>
<i>Lb. pentosus</i>	<i>K. unispora</i>	<i>Enterococcus faecalis</i>
<i>Lb. plantarum</i>	<i>Klu. marxianus</i>	<i>Lac. lactis</i>
<i>Lb. acidophilus</i>	<i>P. deserticola</i>	<i>B. mongoliense</i>
<i>Lb. helveticus</i>	<i>P. fermentans</i>	<i>Weissella kandleri</i>
<i>Lb. fermentum</i>	<i>P. manshurica,</i>	<i>A. pasteurianus</i>
<i>Lb. curvatus</i>	<i>P. galeiformis</i>	<i>E. faecium</i>
<i>Lb. salivarius</i>	<i>P. membranaefaciens</i>	<i>Ruminococcus torques</i>
<i>Lb. casei</i>	<i>Sac. cerevisiae</i>	
<i>Lb. kitasatonis</i>	<i>Sac. unisporus</i>	
<i>Lb. paracasei</i>	<i>T. delbrueckii</i>	
<i>Lb. jensenii</i>		
<i>Lb. buchneri</i>		

Standardizasyon: Kımız, Türkiye Cumhuriyeti resmi gazetesinde yayımlanmış olan Türk Gıda Kodeksi'nin 16.02.2009 tarihli Fermente Süt Ürünleri Tebliği'nde "Fermentasyonda spesifik olarak *Lb. bulgaricus* ile *Klu. marxianus* kültürlerinin kullanılmasıyla üretilen fermente süt ürünü" olarak tanımlanmaktadır. Türk Gıda Kodeksi'nin aynı isimli tebliğinde kımızın ürün özellikleri şöyle belirtilmektedir: Etanolün hacim/ağırlık oranı en az %0.5, süt yağı ağırlıkça en fazla %10, titrasyon asitliği (laktik asit olarak) ağırlıkça en az %0.7, spesifik mikroorganizmaların toplamı en az 10⁷ kob/g, etikette yer alan ilave mikroorganizmaların toplamı en az 10⁶ kob/g ve mayalar en az 10⁴ kob/g şeklinde olmalıdır (Anonim, 2009).

Kımız, Kırgızistan Cumhuriyeti Ulusal Standartları'nın süt ve süt ürünlerinin işlenmesi hakkındaki teknik yönetmeliğinde "Kısrak sütünün *Lb. acidophilus*, *Lb. bulgaricus* ve mayalarla fermentasyonu ile oluşan fermente bir süt ürünü" olarak tanımlanmaktadır. Kırgız standartları birimine göre kımızın fiziko-kimyasal özellikleri şu şekilde belirtilmektedir: Süt yağı ağırlıkça en az %1, protein en az %2.8 ve kuru madde oranı % 7.8-9.5 arasında olmalıdır (İstanbul, 2017).

Kımızın Sağlık Üzerine Etkileri: Kımız yapımında kullanılan kısrak sütü, diğer sütlerle göre düşük kalorili ve sindirimi kolay olup günümüzde bazı ülkelerde diyet sütü olarak kullanılmaktadır. Kısrak sütündeki proteinler; inek, keçi ve deve sütlerine göre insan sindirim sisteminde bulunan enzimler tarafından kolayca sindirilmektedir.

Kımız; laktik, sitrik ve asetik asit gibi organik asitleri ve fenilalanin, lösin, glutamik asit gibi amino asitleri içermektedir. Mikro besin içeriği de yüksek olan kımızda çinko, magnezyum, bakır gibi mineraller ve B1, B2, B12, folik asit, pantotenik asit ve C vitamini gibi bazı önemli vitaminler bulunmaktadır. Kımızın besin bileşenlerinin ortalama değerleri Tablo 6’da verilmiştir (Yılmaz ve Kurdal, 2002; Çelebi ve ark., 2019).

Tablo 6. Kımızın Besin Bileşimi

Bileşenler	(%)	Bileşenler	(µg/L)
Kuru madde	10.2-11.8	Vitamin B1	203.4
Yağ	1.21-1.9	Vitamin B2	375
Laktoz	6.10-6.37	Vitamin B12	2.1
Toplam Protein	2.14-2.70	Pantotenik asit	2010
Kül	0.42-0.50	Folik asit	265
Alkol	0.5-2.5	Asitlik (SH)	4 -52

Kımız üzerine yapılan çalışmalar oldukça sınırlıdır. Geleneksel kımızdaki baskın mikroorganizmalar laktik asit bakterileri ve mayalardır, bu durum kımızın karakteristik lezzet, doku ve asitliğinin oluşmasında önemli rol oynamaktadır. Bu nedenle kımızla yapılan çalışmaların birçoğu, kımızdaki laktik asit bakterilerinin tanımlanmasına ve bunların işlevsel özelliklerine odaklanmaktadır (Bao ve ark., 2019). Kımızın antimikrobiyal özelliklerinin incelendiği bir çalışmada çiğ kısrak sütü kullanılarak üretilen kımızda bazı patojen bakterilerin (*Escherichia coli*, *Listeria monocytogenes* ve *Staphylococcus aureus*) fermantasyon sürecinde üreme ve canlı kalma kabiliyetleri araştırılmıştır. Çalışma için çiğ kısrak sütüne bu patojen bakteriler ayrı ayrı ve üçü birlikte olmak üzere 10^6 kob/ml düzeyinde inoküle edilmiştir. Fermantasyonun 1., 5. ve 24. saatlerinde ve 2., 3., 4. ve 5. günlerinde her gruptan numune alınıp kimyasal ve mikrobiyolojik analizleri yapılmıştır. Çalışmada fermantasyon süresince kımız örneklerinin pH, kuru madde oranı ve protein miktarında azalma olduğu gözlenirken titrasyon asitliği ve alkol miktarında artış olduğu saptanmıştır. Fermantasyonun 5. saatinden itibaren *E. coli*, *L. monocytogenes* ve *S. aureus* sayısında azalma olduğu ve ikinci günden itibaren de tespit edilebilir seviyenin altına düştükleri gözlenmiştir. Çalışmada çiğ kısrak sütüyle üretilen kımızın fermantasyonun 2. gününden sonra tüketiminin halk sağlığı açısından daha güvenilir olacağı sonucuna varılmış ve de üreticilerin iyi üretim tekniklerine dikkat etmesinin önemi vurgulanmıştır (İstanbulgul, 2017). Anjiyotensin I-dönüştürücü enzim (ACE; EC 3.4.15.1); periferik kan basıncının düzenlenmesinde yer alan, çok işlevli bir ektoenzimdir. Bu enzim, dolaylı bir şekilde vazokonstriktör etki göstererek kan basıncının artmasına neden olmaktadır. ACE inhibitörlerinin ise periferik kan basıncını düşürdüğü ve antihipertansif etki gösterdiği *in vivo* olarak birçok çalışmada bildirilmektedir. Moğolistan’ın Xilingole bölgesinde yapılan bir çalışmada kımızda bulunan ve ACE inhibitör aktivitesi gösteren biyoaktif peptitler analiz edilmiştir. Çalışmada ACE inhıbe edici aktivite HPLC Yöntemi ile ölçülmüş ve kımızdaki biyoaktif peptitlerin çeşitli sıcaklık ve pH değerlerinde de oldukça yüksek ACE inhibitör etkilerinin olduğu saptanmıştır. Sonuç olarak çalışmada kımızın antihipertansif etkilerinin olması dolayısıyla fonksiyonel bir ürün olduğu bildirilmiştir (Chen ve ark., 2010). Moğolistan’da 43-57 yaş arası şiddetli hiperlipidemi teşhisi konulmuş 13 gönüllü hasta ile yapılan bir çalışmada (çalışmadan önceki son 3 ay hiçbir antibiyotik tedavisi uygulanmamış) kımız tüketiminin hastalığın seyrine etkisi değerlendirilmiştir. Hastaların tümünden hiperlipidemi tedavisi için başka herhangi bir ilaç veya takviye almamaları istenmiş ve çalışma boyunca katılımcılar her gün 750 ml kımız tüketmiştir. Çalışmanın belirli günlerinde hastalara kan tahlilleri yapılmış, dışkı örnekleri değerlendirilmiş ve semptomlardaki değişikliklerin belirlenmesi için 0. ve 60. günlerde anket uygulanmıştır. Uygulanan anket değerlendirildiğinde hastaların hiperlipidemi ile ilişkili semptomlarının, kımızla diyet tedavisinin ardından önemli ölçüde azaldığı tespit edilmiştir. Kandaki karaciğer ve böbrek fonksiyonlarının göstergeleri incelendiğinde HDL-c konsantrasyonlarının 60 günlük kımız tüketiminden sonra önemli ölçüde arttığı ve kolesterol, LDL-c ve Trigliserit (TG) değerlerinin azaldığı saptanmıştır. Hastaların bağırsak mikrobiyotasının kımız tüketimi ile önemli düzeyde zenginleştiği ve semptomlardaki azalmanın nedeni olarak mikrobiyotadaki iyileşme gösterilmiştir. Kımızda fermantasyonla üretilen metabolitlerin bağırsak mikroflorasında birçok zararlı mikroorganizmanın çoğalmasını önlediği düşünülmüştür. Çalışmada sonuç olarak kımızın faydalı besin bileşenleri ve mikrobiyotası dolayısıyla hiperlipidemili hastaların tedavisinde oldukça yararlı olduğu bildirilmiştir (Hou ve ark., 2019).

Ayran

Temel geçim kaynağı hayvancılık olan Türkler yüzyıllar boyunca göçebe yaşamış, baharın gelişiyle bitki örtüsü zengin olan obalara, havalar soğuduğu zaman da kışı rahat geçirebilecekleri kışlalara göç etmişlerdir. Türkler bu göçebe yaşamlarında en çok hayvanlarından sağdıkları sütlerden yaptıkları yoğurt, ayran, katık, kurut, çalap, çökelek ve çeşitli peynirleri tüketmişlerdir. Hemen hemen tüm Türk boyları tarafından bilinen ayran, bu ürünler arasında en yaygın olan ve günümüze kadar en çok kullanılan üründür. Süt (yılık sütü, deve sütü), şubat ve kımız gibi Türklere özgü diğer milli içeceklerle kıyasla ayranın, günlük hayatta içilmesi ve sindirimi daha kolaydır

(Otyzbay, 2019). Ayran, Türkiye, Azerbaycan, Kırgızistan, Kazakistan, Bulgaristan, Makedonya ve İran'da popüler olan, yoğurttan üretilen, tuzlu, fermente bir süt içeceğidir. Ayran tüketildiği ülkelerde farklı isimlerle bilinmektedir. Ayran için dough (İran), tan (Ermenistan), moru (Hindistan), laban arbil (Irak) ve şenina (Ürdün) gibi farklı isimlendirmeler mevcuttur. Ayranın tarihçesi ile ilgili bilgilerin kesinliği olmamakla birlikte Göktürkler tarafından tesadüf eseri bulunduğu öne sürülmektedir. Göktürklerin ekşimiş yoğurdun ekşiliğini azaltmak amacıyla yoğurda su ekledikleri ve ayranın bu şekilde ortaya çıktığı ifade edilmektedir (Altaş 2017; Karagözlü, 2020). Ayran sözcüğünün "ayırma" fiilinden türetildiği ileri sürülmektedir. Türkiye, Azerbaycan, Tatar, Nogay, Karaim ve Kumuk Türkçelerinde ayran sözcüğünün 'yağı ayrılmış ekşi süt' anlamı bulunmaktadır. Bu anlamının dışında ayran için farklı lehçelerde; 'ekşi süt', 'mayalanmış süt', 'kefire benzeyen içecek' şeklinde tanımlar da mevcuttur (Otyzbay, 2019). Ayran için üretim tekniği ve yağ oranlarına göre çeşitli sınıflandırmalar yapılmaktadır. Yağ oranlarına göre; tam yağlı, yarım yağlı ve yağsız olarak üç şekilde üretilmektedir. Yapım tekniklerine göre sınıflandırıldığında ise yine 3 gruba ayrılmaktadır:

- 1) Kısa ömürlü ayran; çoğunlukla evlerde yapılan ayran türüdür ve endüstriyel olarak da üretilmektedir.
- 2) Uzun ömürlü ayran; kısa ömürlü ayranlarda meydana gelen birtakım problemlerin ortadan kaldırılması ile üretilmektedir. Bu ayrana daha uzun raf ömrü için üretim aşamalarında katkı maddeleri eklenmektedir. Katkı maddesi ilavesinin ardından homojenize edilip üretilen ayranın raf ömrünün, oda sıcaklığında minimum 30 gün, düşük sıcaklıklarda ise minimum 60 gün olduğu tespit edilmiştir.
- 3) Yayıklı ayran; yoğurttan tereyağı elde edilen bölgelerde üretilir. Yoğurt ile suyun yayıklanmasının ardından üzerindeki yağ alınır ve geride kalan kısım yayıklı ayran olarak adlandırılmaktadır (Hayatoğlu, 2021).

Ayran Üretimi: Ayran, yoğurda su eklenmesiyle ya da sütün kuru madde yüzdesinin ayarlanmasından sonra süte *Str. thermophilus* ve *Lb. bulgaricus* kültürlerinin eklenmesiyle üretilen fermente bir süt içeceğidir. Ülkemizde genellikle geleneksel yolla üretilen, yoğurda belirli oranda su ilave edilmesiyle yapılan ayran tercih edilmektedir. Bunun yanı sıra bazı yoğurt firmaları doğrudan seyreltilmiş sütün fermente edilmesi ile de ayran üretmektedirler (Şanlı ve ark., 2011). Yabancı kaynaklarda ayran için "içilebilir yoğurt (drinking yoghurt)" adına da rastlanmaktadır (Temen, 2018). Endüstride ayran üretiminin aşamaları Şekil 4'te verilmiştir (Karagözlü, 2020).



Şekil 4. Ayran Üretimi Akış Şeması

Ayranın Mikrobiyolojik Yapısı: Geleneksel yöntemle evde yapılan ayranın mikrobiyolojik içeriği, üretiminde kullanılan yoğurttaki mikrobiyolojik içerikle uyumludur. Yoğurt üretiminde starter kültür olarak kullanılan bakterilerden olan *Str. thermophilus* ve *Lb. bulgaricus* endüstriyel yolla ayran üretiminde sütün fermentasyonu için kullanılmaktadır. Endüstriyel yöntemle üretilen ayranın bulunan bakteri sayısı geleneksel yöntemle yapılan ayrana kıyasla daha yüksektir. Ayranın reolojik ve dokusal özellikleri üzerinde starter kültürün seçimi etkili olmaktadır (Tongur, 2019).

Standardizasyon: Türk Gıda Kodeksi Fermente Süt Ürünleri Tebliği'ndeki tanıma göre ayran; yoğurda su eklenerek veya kuru maddesinin standardize edilmesinin ardından süte *Str. thermophilus* ve *Lb. bulgaricus*

kültürlerinin katılmasıyla hazırlanan fermente süt ürününü ifade etmektedir. Türk Gıda Kodeksi Fermente Süt Ürünleri Tebliği'nde ayranla ilişkin ürün özellikleri; süt proteinini ağırlıkça en az %2.0, titrasyon asitliği (laktik asit olarak) ağırlıkça en az % 0.5, en fazla %1.0, spesifik mikroorganizmaların toplamı en az 10^6 kob/g, etikette yer alan ilave mikroorganizmaların toplamı en az 10^6 kob/g olarak bildirilmektedir (Anonim, 2009).

Ayranın Sağlık Üzerine Etkisi: Geleneksel yolla ayran üretiminde kullanılan yoğurt, en çok bilinen probiyotik içeren gıdadır. Süt ile aynı mikro besin bileşimine sahip olmakla birlikte yoğurt, daha fazla protein, B12 ve B2 vitamini, kalsiyum, magnezyum, potasyum ve çinko içermektedir. Ayranın besin bileşenleri Tablo 7'de verilmiştir (Anonim, 2021).

Tablo 7. Ayranın Besin Bileşenleri

Besin bileşeni	100 ml için
Enerji (kcal)	37
Su(g)	92.26
Kül	1.05
Protein (g)	1.98
Yağ (g)	2.0
Karbonhidrat (g)	2.71
Demir(mg)	0.01
Kalsiyum (mg)	81.0
Fosfor (mg)	41
Tuz (mg)	578
Potasyum (mg)	88
Sodyum (mg)	231

Sütün yoğurda fermentasyonu sırasında biyolojik olarak aktif peptitler ve folat sentezlenmektedir. Ayranın; protein ve Konjuge Linoleik Asit(CLA) içeriği, raf ömrü, protein sindirilebilirliği ve kalsiyum absorpsiyonu süte kıyasla daha yüksektir. Endüstriyel olarak üretilen ayran ise geleneksel üretimdekine kıyasla daha yüksek oranda probiyotik bakteri bulunmaktadır (Şanlıer ve ark., 2019). Ayran yüksek miktarlarda asetik ve laktik asit içermekte ve süttten önemli ölçüde daha yüksek antioksidan kapasitesi göstermektedir (Grishina ve ark., 2011). Ayran fonksiyonel özellikler kazandırmayı amaçlayan bir çalışmada farklı oranlarda (%0, %0.1, %0.2, %0.3 ve %0.4) kinoa unu eklenerek ayran üretimi gerçekleştirilmiştir. 14 gün boyunca depolanan ayranların depolama süresi boyunca (1., 7. ve 14. günlerde) bazı mikrobiyolojik, fiziksel, kimyasal ve duyuşsal özellikleri incelenmiştir. Ayran kinoa ilavesinin pH, titrasyon asitliği, kuru madde, serum ayrılması ve renk değerleri üzerindeki etkileri istatistiksel olarak anlamlı bulunmuştur. Örneklerdeki kinoa unu oranı arttıkça pH'ın düştüğü, titrasyon asitliğinin de değiştiği gözlenmiştir. Kinoa unu oranının artması serum ayrılmasını da etkilemiş olup en fazla serum ayrılması %0.4 kinoa unu içeren ayran örneğinde meydana gelmiştir. Kinoa unu ilavesi ile protein değerleri de etkilenmiş ve en yüksek değer, %0.4 kinoa unu içeren ayran örneğinde saptanmıştır. Mikrobiyolojik açıdan incelendiğinde kinoa unu ilavesinin *Str. thermophilus* ve *Lb. bulgaricus* bakterilerinin gelişimini olumlu etkilediği tespit edilmiştir. Depolamanın ilk gününde görünüm ve koku yönünden en çok beğenilen örnek kontrol örneği olmuştur. Depolamanın sonunda ise kinoa unu oranı %0.2 olan örneğin diğer örneklerle kıyasla tat, kıvam ve genel beğeni puanlarının daha yüksek olduğu saptanmıştır. Çalışmada depolama boyunca, örneklerin içerdiği toplam fenolik madde miktarı azalırken, antioksidan aktivitelerinin depolama sürecinde arttığı görülmüştür. Çalışmada ayran kinoa unu eklenmesinin birtakım fonksiyonel özellikleri geliştirdiği gözlenmiştir fakat kinoa ununun zamanla çökeltme meydana getirmesi gözlemlendiğinden yapılacak benzer çalışmalarda kinoa unu kullanılacaksa uygun hidrokolloidlerin eklenmesi ya da kinoa ununun; farklı fermente süt ürünlerine yönelik çalışmalarda denenmesi önerilmiştir (Temen, 2018). Başka bir çalışmada ayran *Spirulina platensis* ilavesiyle probiyotik bakterilerin miktar ve aktivitesini artırmak amaçlanmıştır. Pastörize edilen süte farklı konsantrasyonlarda (%0, %0.25, %0.5 ve %1) eklenen *S. platensis*' in probiyotik bakteri gelişimi üzerindeki etkileri fermentasyondan önce, hemen sonra ve depolamanın 7., 14. ve 21. günlerinde incelenmiştir. Çalışmada *S. platensis*' in eklenmesinin depolama boyunca kontrole kıyasla "*Str. thermophilus*, *Lb. bulgaricus*, *Lb. acidophilus* ve *B. lactis*" bakterilerinin çoğalmasını önemli ölçüde artırdığı tespit edilmiştir. *S. platensis* içeren numunelerin, çalışma süresi boyunca kontrole kıyasla önemli ölçüde daha yüksek titre edilebilir asit seviyelerine sahip olduğu gözlenmiştir. *S. platensis*'in %1 oranında eklendiği örneklerin, kontrol numunelerine kıyasla en yüksek toplam katı madde ve protein içeriğine sahip olduğu görülürken *S. platensis* içeren numunelerin viskozite değerlerinin de depolama süresi boyunca düştüğü saptanmıştır. Çalışmada *S. platensis*' in, probiyotik bakterilerin sayısını ve ayranın besin içeriğini artırmak için büyük bir potansiyele sahip olduğu tespit edilmiştir (Çelekli ve ark., 2019).

Fermente Süt İçeceklerinin Sağlık Üzerine Etkileri

Süt ve süt ürünleri önerilen seviyelerde tüketildiğinde sağlığa olumlu etkileri bulunmaktadır. Bağışıklık sistemini geliştirmek, antimikrobiyal etkiler, kardiyovasküler hastalıklarda ve mide-bağırsak hastalıklarında riskin düşürülmesi, psikolojik işlevleri iyileştirme, düşük kemik kütlesi riskini azaltma ve serbest radikal hasarına karşı antioksidan aktivite gösterme gibi birçok sağlık yararı bulunmaktadır (Akin ve Özcan, 2017). Fermente gıdalarla ilişkili sağlık yararlarının; genellikle gıdalardaki fermentasyonda yer alan bakteriler tarafından oluşturulan proteinler ve ekzopolisakkaritlerden kaynakladığı düşünülmektedir. Fermentasyon sırasında proteinlerden üretilen biyoaktif peptitlerin en önemli alt grubu, süt proteinlerinin laktik asit bakterilerinin hücre duvarındaki proteinazlar tarafından oluşturulan anjiyotensin-1-dönüştürücü enzim (ACE) inhibitörüdür. Fermente gıdalardaki biyoaktif peptitlerin, özellikle valil-prolil-prolin (VPP) ve izolösil-prolil-prolin (IPP) olmak üzere bilinen antihipertansif etkileri nedeniyle, fermente süt ürünleri, hipertansiyon tedavisinde farmakolojik olmayan bir strateji olarak önerilmektedir. Fermentasyon sırasında çeşitli mikroorganizmalar (bazı LAB) tarafından hücre dışında üretilen başka bir biyoaktif bileşen olan ekzopolisakkaritlerin antioksidan, antidiyabetik, antikarsinogenez, kolesterol düşürücü ve immünomodülatör olmak üzere birçok potansiyel sağlık yararı bulunmaktadır. Bakteriyel ekzopolisakkaritlerin toplam serum kolesterol düzeylerini azaltma mekanizması diyet lifinde olduğu gibi kolesterolü bağlamayı, kolesterol emilimini düşürmeyi ve safra asidi salınımını indüklemeyi içermektedir (Chakrabarti ve Wu, 2015; Şanlı ve ark., 2019).

Fermente süt ve süt ürünleri tüketiminin; kardiyovasküler sağlık, gastrointestinal sistem sağlığı, kanser riski, kilo yönetimi, diyabet ve metabolik sendrom üzerindeki etkilerinin incelendiği çalışmada fermente süt ürünleri ile diyabet ilişkisi değerlendirilmiştir. Çalışmalarda yoğurt ve fermente süt içecekleri kullanılmıştır. Protein-karbonhidrat oranları ve fiziksel formlarından bağımsız olarak yoğurdun ve yağsız sütün insülin metabolizmasında iyileştirici etkisi olduğu gözlenmiştir. Başka bir çalışmada ise, günlük tüketilen her yoğurt porsiyonu için (200 g), metabolik sendrom insidansının %57 azaldığı tespit edilmiştir. Metabolik Sendrom tanı kriterlerinden biri olan abdominal yağlanmanın, yüksek yoğurt tüketimi ile önemli ölçüde ters ilişkili olduğu sonucuna varılmıştır (Savaiano ve Hutkins, 2021).

Hipertansiyon; normal aralığı aşan kan basıncı değerleri ile karakterize, kronik dejeneratif bir hastalık olup dünya çapında 1 milyardan fazla insanı etkilemektedir. Hipertansiyon; kardiyovasküler hastalıklar, felç, böbrek yetmezliği, serebrovasküler hastalıklar ve diğer birçok komplikasyonun meydana gelmesinde önemli bir risk faktörüdür. Hipertansiyon tedavisinde kullanılan antihipertansif ilaçların yan etkileri bulunduğundan antihipertansif gıda maddelerinin araştırılması amacıyla birçok çalışma yapılmaktadır. Yapılan çalışmalarda bazı fermente süt ürünlerinin antihipertansif etkilerinin bulunduğu gösterilmiş ve bu etkiler çoğunlukla sütteki peptitlere atfedilmiştir. Birtakım fermente süt ürünlerinin, sentetik Anjiyotensin dönüştürücü enzim inhibitörü (ACEI) kadar etkili olduğu tespit edilmiştir. Gıdaların antihipertansif etki göstermesi, anjiyotensin dönüştürücü enzimi inhibe eden peptitler bulundurmaları ile mümkün olmaktadır. Bazı fermente süt ürünlerinde birkaç farklı ACE inhibe edici peptit tanımlanmıştır. Antihipertansif etkilere sahip *Lb. helveticus* ile üretilen ticari fermente sütler mevcut olup ürün çeşitliliğini artırmak için spesifik yeni laktik asit bakterileriyle yeni fermente fonksiyonel süt ürünlerinin geliştirilmesi ile ilgili çalışmalar planlanmalıdır (Beltrán-Barrientos ve ark., 2016).

İrritabl bağırsak sendromu (IBS); kabızlık, ishal veya ikisinin birlikteliği şeklinde görülebilen, karın ağrısı, şişkinlik ve düzensiz defekasyon ile karakterize bir bağırsak hastalığıdır. Karın şişkinliği IBS'li hastaların yaklaşık %96'sı tarafından bildirilmektedir. Kadınlarda daha yaygın görülmekte olup en rahatsız edici semptom olarak belirtilmektedir. Şişkinlik şikayeti özellikle kalın bağırsakta gecikmiş gastrointestinal geçiş olan hastalarda daha yaygın olduğu gösterilmiştir. Bu durum gastrointestinal geçiş hızlandıracak uygulamaların distansiyon tedavisinde potansiyelinin olabileceğini düşündürmektedir. IBS'de gastrointestinal geçişten sorumlu mekanizmalar net olmasa da, dengesiz bağırsak mikrobiyotasının sorunu artırabileceğini gösteren bazı çalışmalar vardır. Bununla birlikte bağırsak mikrobiyotasının modifikasyonunun, potansiyel olarak bağırsak hareketliliğini değiştirebileceğini gösteren çalışmalar da mevcuttur. Probiyotikler, IBS tedavisinde önemli rol almaktadır ancak farklı suşların aynı etkiyi oluşturamayabileceğini de vurgulamak gerekmektedir. Sonuç olarak, bağırsak geçişini hızlandırma potansiyeline sahip belirli bir probiyotik IBS ile ilişkili şişkinlik problemini iyileştirmeye yardımcı olabileceği söylenebilir. *B. lactis* DN-173 010 suşunu içeren fermente bir süt ürününün şişkinlik, kolon geçiş hızı ve diğer IBS semptomlarının üzerindeki etkisini değerlendirmeyi amaçlayan bir çalışmada *B. lactis* DN-173 010 suşunu içeren fermente süt ürününün bağırsak geçişini hızlandırdığı ve IBS semptomlarını iyileştirdiği tespit edilmiştir (Agrawal ve ark., 2009).

Fermente süt ürünleri hem besin içeriği hem de biyoaktif içerikleri açısından büyük farklılıklar göstermektedir. Ekşi süt ürünleri, peynir ve yoğurt gibi fermente süt ürünlerinin tüketiminin; vücut kompozisyonu, kan lipid profili ve kardiyometabolik hastalık riski üzerinde olumlu etkilere sahip olduğu bildirilmektedir. Bu etkinin kısmen kısa zincirli yağ asitleri gibi mikrobiyota metabolitleriyle ilişkili olabileceği düşünülmektedir. Doymuş yağ içeriği ile ilgili endişelere rağmen ve fermente süt ürünlerinin az yağlı veya tam yağlı olmasına bakılmaksızın bu faydalı etkiler gözlenmektedir. Bir meta-analizde fermente süt ürünleri tüketiminin tüm nedenlere bağlı ölüm ve kardiyovasküler hastalık riski ile ters ilişkilerinin olduğu saptanmıştır.

Son yıllarda yapılan çalışmalar ışığında yaygın kabulün aksine kardiyometabolik hastalık riskini azaltmak için diyetle doymuş yağın kısıtlanması önerisi geçerliliğini yitirmeye başlamıştır. Hem bazı gözlemsel çalışmaların hem de randomize kontrollü çalışmaların son meta-analizlerinden elde edilen kanıtlar; tam yağlı süt ürünlerinin, kan lipid profili ve kan basıncı üzerinde daha önce tahmin edildiği gibi zararlı etkileri olmadığını hatta kardiyovasküler hastalık ve T2 diyabete karşı koruma sağlayabileceğini göstermektedir (Astrup ve ark., 2019).

Sonuç

Geleneksel fermente gıdalar birey ve toplum sağlığının korunması ve sürdürülebilir olması için genellikle nüfusun büyük çoğunluğu tarafından tüketilmektedir. Fermente ürünlerin pek çok yararlı besin ögesi bulundurmaları dolayısıyla sağlık için birçok faydasının olduğu kabul edilmiştir (Karaçıl ve Acar-Tek, 2013). Fermantasyonla üretilen metabolitlerin birçok zararlı mikroorganizmanın çoğalmasını önlediği veya yok ettiği düşünülmektedir. Bu nedenle bu besinler güvenli gıdalar olarak tanımlanabilmektedir (Marco ve ark., 2017). Kronik hastalıkların yaygınlaşmasıyla birlikte son yıllarda sağlıklı yaşamın önemi giderek artarken yaşayan mikroorganizmalardan zengin olan fermente süt ürünleri önemli ölçüde ilgi kazanmıştır (Demirgöl ve Sağdıç, 2018; Biçer, 2019). Bu ilgiye paralel olarak fermente ürünlerin tüm dünyada tüketimi artmaktadır. Fermantasyon yöntemiyle dünyada ve Türkiye’de birçok farklı yiyecek ve içecek üretilmektedir. Fermente içecekler sağlığı geliştirici etkilerinin yanı sıra ferahlatıcı özelliklerinden dolayı da sıklıkla tercih edilmektedir. Ülkemizde de kıymız, kefir, ayran gibi süt bazı içecekler yaygın olarak tüketilmektedir (Karaçıl ve Acar-Tek, 2013). Bu derlemede dünya genelinde yaygın olarak üretilen geleneksel süt bazlı fermente içecekler tanımlanmış ve Türkiye’de üretilen süt bazlı fermente içeceklerin fizyolojik ve mikrobiyolojik bazı özellikleri ve sağlık üzerindeki etkileri üzerinde durulmuştur. Fermente ürünlerle ilgili mikrobiyolojik araştırmaların ve standardizasyon çalışmalarının artırılması; aynı zamanda bu ürünlerin insan sağlığı ve hastalıklar üzerine etkilerinin daha detaylı çalışmalarla değerlendirilmesi gerektiği sonucuna varılmıştır.

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Utilisation of Dried Pitaya (Dragon Fruit) Slices in a Breakfast Cereal Formulation *

Fatma Atalay¹, Sedat Sayar¹

¹Department of Food Engineering, Faculty of Engineering, University of Mersin, Mersin, Turkey

Abstract

Pitaya or commonly known as Dragon Fruit, is a tropical fruit that belongs to the Cactaceae family and edible fruit. It principally grown in South America, Malaysia and other tropical regions of the World due to it belongs to Cactaceae family. Dragon fruit, which is rich in micronutrient, has many great health benefits such as improving digestion, lowering cholesterol, strengthening the immune system and preventing cancer and heart disease. However, the short shelf life of Pitaya severely limits the development of this fruit's industry. After harvest, both the quality of the fruit and its commercial value decrease rapidly during the storage period, mainly due to fungal diseases, yellowing and physiological disorders. In this regard, it is aimed to use dragon fruit slices in breakfast cereals that are frequently used in daily life by drying them with different methods in this study. In this context, Pitaya (*Hylocereus* spp.) fruit, obtained from the local markets of Mersin with the same degree of maturity, were dried by using tray drier and freeze drier. Both dried and raw samples were analyzed for moisture content, color, texture, phenolic content, antioxidant activity and finally sensorial properties. The results obtained from this study showed that there is a color difference between the dragon fruit dried by the tray drier method and the dragon fruit dried by the freeze drier method. In addition, dried dragon fruit with the tray drier method has an elastic structure than the other method, and dried dragon fruit with the freeze drier method has crunchier structure than the tray dried samples. Besides, it was determined by the findings that red dragon fruit is richer in phenolic and antioxidant substances than white dragon fruit. As a consequence, it is thought that the use of dragon fruit slices dried by different methods in breakfast cereals will not pose a problem in terms of the quality and shelf life of the product according to the findings obtained from the study.

Key Words: dragon fruit, breakfast cereals, drying, antioxidant, phenolic compounds

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Effect Of Salts Added To Soaking Water On Cooking Properties Of Legumes

Koray Yarım, Sedat Sayar

Department of Food Engineering, Mersin University, 33343 Mersin, Turkey

Abstract

In this study, we aimed to investigate the effects of these salts added to the soaking water on the cooking time and protein and starch properties by selecting chickpeas and white beans, which are the two most consumed legumes in our country. It is found that some of the salt solution used in this study shorten the cooking time of the all legumes samples studied. Studies on the effects of soaking in different salt solutions on starch and protein properties are ongoing

Introduction

Some studies in the literature show that adding various salts to the soaking water before cooking shortens the cooking time of legumes [1-2]. It is seen that this effect of salts is generally related to the legume microstructure. However, the relationship of this softening mechanism with starch structure and properties has not been investigated. At the same time, there is very limited information in the literature about the effects of this process on the protein/starch complex. It is thought that the consumption of chickpeas and beans, which are consumed a lot in our country and have high nutritional values, will increase if the soaking and cooking process is shorter. As a result of this study, it is thought that it will shed light on future studies.

Materials and Methods

Material

The most consumed legumes in Turkey are chickpea and white beans. Three different chickpea and three different types of white beans were used in this study. Chickpea samples were Russian, Mexican and a Local type (Figure 1).



7mm Russian chickpeas



12 mm Mexican chickpeas

Figure 1. Chickpea types used in the study.

Sıra and Çalı were selected for white beans (Figure 2). The selection of chickpea and white bean types was determined according to their consumption values.



10 mm Çalı beans



7 mm Sıra beans

Figure 2. White bean samples used in the study

Methods

Analysis of basic chemical compositions of legume samples.

Moisture, total protein (Nx6.25) and ash determination were conducted according to AACC-Method No. 44.01, AACC-Method No. 46.12, and AACC-Method No. 08.01, respectively [3].

Before the experiments, foreign materials, broken and cracked grains in the material were separated and sieved to eliminate the size effect.

Soaking process

Four different samples of 20 grams in a 300 ml beaker at room temperature (25°C) were kept in two different salt solutions and unsalted water for 8 hours, and then the cooking process was conducted.

Cooking process

The experiments were carried out after soaking. Soaked grains were boiled at atmospheric pressure until the white part in the middle of the grain disappears.

Results and Discussion

Moisture determination results of Russian chickpeas and Mexican chickpeas were found to be 10.01% and 9.22%, respectively. Ash content were also given in Table 1. The results agreed with the studies in the literature available for the similar samples.

Table 1. Moisture and ash content of the samples (% dm)

Sample	Moisture content	Ash content
Russian chickpeas	10.01	2.78
Mexican chickpeas	9.22	3.23
Domestic chickpeas	9.32	3.17
Sıra beans	11.65	3.83
Çalı beans	9.85	3.20
Domestic beans	12.10	3.75

Cooking times of the soaked samples were given in Table 2. It is obtained that the samples soaked in sodium bicarbonate solution has shorter cooking time than the ones soaked in distilled water. However, the samples soaked in calcium chloride has longer cooking time.

Table 2. Cooking times of legume samples soaked in different salt solutions.

Sample/min.	NaHCO ₃	CaCl ₂	Distilled water
Mexican chickpeas	23	87	54
Russian chickpeas	19	83	49
Domestic chickpeas	34	97	64
Sıra beans	20	84	50
Çalı beans	30	93	58
Domestic beans	45	103	68

According to the results obtained in this study, soaking in some salt solutions shortens the cooking time of legumes. However, the opposite is true (eg soaking in calcium chloride). In this study, it is aimed to reveal the effects of these obvious changes in cooking time on starch. Studies completed so far have shown that soaking in different salt solutions may also have partial effects on legume starches.

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Effects of different industrial cannabis (*Cannabis sativa* L.) genotype extracts on *Diuraphis noxia*, *Myzus persicae* and *Aphis fabae* (Hemiptera: Aphididae)

Şeyda Şimşek¹, Ali Kayahan¹ Gamze Pekbey¹ İsmail Karaca² Güngör Yılmaz³

¹Department of Plant Protection, Faculty of Agriculture, Yozgat Bozok University, Yozgat, Turkey

²Department of Plant Protection, Faculty of Agriculture, Süleyman Demirel University, Isparta, Turkey

³Department of Field Crops, Faculty of Agriculture, Yozgat Bozok University, Yozgat, Turkey

Abstract

In this study, the effect of methanol extracts of 3 different genotypes (Narlısaray, Kavacık, Maltepe) of *Cannabis sativa* L. on *Diuraphis noxia*, *Myzus persicae* ve *Aphis fabae* (Hemiptera: Aphididae) were investigated. In the first stage of the study, 10% concentrations of each cannabis extract were applied on the 2nd and 3rd nymphal stages of aphid species by spraying method. After the end of 24 - 48 and 72 hours of the applications, the alive and dead individuals were recorded and mortality rates were determined. In the second stage, the genotype with the highest effect was used in dose-death trials and LD₅₀ and LD₉₀ values at different doses (2.5%, 5%, 7.5% and 10%) were specified. In the census after 72 hours, Narlısaray genotype showed the highest mortality rate with 54.04% on *D. noxia*. While the effect of Kavacık genotype on *M. persicae* was found as 23.13%, the highest toxicity record of the same genotype was determined on *A. fabae* (as 91.76%). According to the dose measurement studies of Kavacık genotype on *A. fabae*, LD₅₀ and LD₉₀ values were calculated to be 0.33 and 0.110 (mg/individual), respectively. At the results of study, it has been observed that extracts of different genotypes of the industrial cannabis plant are found effective on aphid species and it is thought that they can be used in controlling of these pests.

Key Words: aphids, bio-pesticide, biological control, *Cannabis sativa*, essential oil, plant extract

Farklı Kenevir (*Cannabis sativa* L.) Genotip Ekstraktlarının *Diuraphis noxia*, *Myzus persicae* ve *Aphis fabae* (Hemiptera: Aphididae)'ye Etkileri

Özet

Bu çalışmada *Cannabis sativa*'nın 3 farklı genotipinden (Narlısaray, Kavacık, Maltepe) elde edilen metanol ekstraktlarının *Diuraphis noxia*, *Myzus persicae* ve *Aphis fabae* (Hemiptera: Aphididae) üzerindeki etkisi test edilmiştir. Çalışmanın ilk aşamasında farklı genotiplerden elde edilen ekstraktların %10'luk konsantrasyonları yaprak bitlerinin 2. ve 3. nimf dönemleri üzerine püskürtme yöntemi ile uygulanmıştır. Uygulamalardan 24, 48 ve 72 saat sonra canlı ve ölü bireyler kaydedilmiş ve ölüm oranları belirlenmiştir. Çalışmanın ikinci aşamasında en yüksek etkiyi gösteren genotip doz-etki denemelerinde kullanılmıştır. Bu aşamada farklı dozlarda (%2.5, %5, %7.5 ve %10) uygulanan etkili genotip ekstraktının LD₅₀ ve LD₉₀ değerleri belirlenmiştir. Elde edilen verilere göre 72 saat sonraki sayımda Narlısaray genotipi en yüksek ölüm oranını %54.04 ile *D. noxia* üzerinde göstermiştir. Kavacık genotipinin *M. persicae* üzerindeki etkisi %23.13 olurken; aynı genotipin *A. fabae* üzerindeki etkisinin oldukça yüksek olduğu (%91.76) gözlenmiştir. En yüksek toksisiteyi *A. fabae* üzerinde gösteren Kavacık genotipi ile doz ölüm çalışmaları yürütülmüştür. Buna bağlı olarak *A. fabae* üzerindeki LD₅₀ ve LD₉₀ değerlerinin sırasıyla 0.33 ve 0.110 (mg/birey) olduğu hesaplanmıştır. Çalışmada elde edilen sonuçlara göre Kenevir bitkisini farklı genotiplerinden elde edilen ekstraktların bazılarının yaprak bitleri üzerinde etkili olduğu gözlenmiş ve bu tip zararlılar ile mücadele çalışmalarında kullanılabileceği düşünülmektedir.

Anahtar Kelimeler: *Cannabis sativa*, biyo-pestisit, ekstrakt, kenevir, uçucu yağ

The effects of leaf applied zinc on quality parameters in different development periods in winter durum wheat

Gizem Coşkun¹, Bilge Bahar²

¹Department of Field Crops, Institute of Graduate Education, University of Gumushane, Turkey

²Department of Food Engineering, Faculty of Engineering and Natural Sciences, University of Gumushane, Turkey

Abstract

This study investigated the effects of zinc ($ZnSO_4 \cdot 7H_2O$) applied foliar at different stages of grain filling in durum wheat on the quality traits such as thousand-grain weight, protein, starch, cellulose, ash and moisture contents and color b value, wet gluten ratio, gluten index, sedimentation and delayed sedimentation, ADF (acid detergent fiber) and NDF (neutral detergent fiber) values. The study was carried out in randomized blocks according to the split plot design with three replications; Ç.1252, Eminbey, Kızıltan-91, Meram-2002 and Selçuklu-97 durum wheat cultivars were used as material. The zinc application period and cultivars changed in terms of only wet gluten ratio of the grain. Cultivars showed differentiation for gluten index and delayed sedimentation varieties. Also, NDF value showed significant changes in terms of zinc application period. On the other hand, it was revealed that quality characteristics such as thousand grain weight, protein, starch, cellulose, oil and moisture contents, color b, sedimentation and ADF values did not show significant differences in terms of sources of variation. Within the framework of these results, it was found that foliar application of zinc at different stages of grain filling in durum wheat had statistically significant effects on some quality criteria; however, it is understood that in future studies, more comprehensive results can be obtained by increasing the number of doses applied and the number of developmental periods.

Key Words: Durum wheat, Quality traits, Zinc application

Introduction

All along, wheat has consecrated because it is the most basic food source for Turkish people (Özberk et al., 2016). As a result of the excavations carried out in our country, it is reported that the historical formation of wheat existed 12000 years ago and it is located in the region called the fertile crescent, which includes the Southeastern Region of our country (Karagöz et al., 2010).

Wheats are classified in three groups (diploid, tetraploid, hexaploid) in terms of genome structures, and limited cultivation areas are among the reasons why diploid wheat is not economically important. Tetraploid and hexaploid (pasta and bread) wheats are the most cultivated cereals in our country together with their commercial importance. 51 percent of the cultivated lands of our country are wheat and 19 percent of them are tetraploid (pasta) wheat (Kızılaslan, 2004). Breeding studies on durum wheat include high yield, resistance to drought, heat, cold, lying and diseases in addition to gluten quality and yellow semolina color (Özberk et al., 2010).

Importance of Zinc (Zn) for microorganisms has been known for 125 years; whether it is important for poultry, rats, pigs, mice and higher plants was followed between 1920 and 1950. Although zinc is common in the environment, suspicion of element deficiency in humans persisted (Prasad, 1990).

Zn, which has an important role in enrichment of grain for protein and transportation of nitrogen to the grain, provides an increase in grain quality and reveals the positive relationship between these two elements (Öztürk et al., 2006).

A bluish-white metal, the twenty-third most common element and also a transition element in the periodic table, Zn, which makes up about 0.02% of the earth's crust. Due to its nature, it has particularly beneficial chemical properties in biological systems. In addition to its strong organic molecular structure, it creates flexible and easily changeable complexes, causing changes in the three-dimensional structure of proteins, cell membrane and nucleic acids, while many enzyme systems and intracellular signals affect catalytic properties. Zn, which is associated with more than 50 metalloenzymes; it is known that nucleic acids have various functions, including the synthesis of specific proteins such as hormones and their receptors (Ziegler and Filer, 1996).

Wheat grain contains 20-35 mg kg⁻¹ of Zn, and Zn is mostly found in embryo and aleuron, and least in endosperm. While Zn is of great importance for the grain in terms of genetic potential, the interaction of genotype×environment on the Zn accumulation in the grain also has an important place (Sramkova et al., 2009). The effects of Zn application to seeds, leaves and soil at definite rates on yield and grain were investigated by using one durum and three bread wheat varieties on sandy-limy land containing 0.24 ppm Zn in Egypt between 1996-98; in a study, the yield increase in bread wheat was determined as 10% and the grains with the highest Zn content were obtained from the applications made to the soil and seed (Attia and Ghallab, 1998).

With the adoption of modern and intensive production techniques, with the introduction of crops that react to the fertilizer thrown into the soil, the green revolution has emerged and a significant loss of Zn from the soil has been observed in this process (Çakmak, 2010).

By adding 10, 25 and 40 percent of $ZnSO_4 \cdot 7H_2O$ solution to wheat seeds before planting to Zn deficient soils, the grain yield was 48%, 69% and 52%, respectively, in the first year compared to the control; in the second year, it was observed that it increased by 7%, 17% and 21%, respectively (Taban et al., 1997).

In durum wheat quality breeding studies include thousand grain weight, hectoliter weight, gluten content, protein ratio, yellow color pigment and vitreous value (Arat, 1949; Seçkin, 1970; Atlı, 1999). In a study, the effects of Zn on yield and quality in durum wheat between 2013 and 2015 were tested; it has been determined that the wet gluten ratio varies between 23.9% and 27.5%, the sedimentation value is 16 to 17 mL, the protein ratio varies between 11.4% and 12.5%, and Zn applications positively affect the values of protein and sedimentation in both years (Aktaş, 2016).

This study was carried out to determine the effects of foliar Zn application on some quality criteria in two different grain filling periods such as milky and starchy periods in some winter durum wheat cultivars.

Materials and Methods

Material

It was obtained from five durum wheat cultivars (Meram-2002, Selçuklu-97, Kızıltan-91, Eminbey and Ç-1252) grown under field conditions in the 2013-2014 growing season and stored under storage conditions at a temperature of around 18 °C and a relative humidity of 50-60%. This grain material was obtained from the application of 0.2% Zn ($ZnSO_4 \cdot 7H_2O$) to the leaves during the periods of milky or starchy filling .

Method

400 grains were randomly counted and weighed in three repetitions; and then they were converted to thousand grain weight. Protein, cellulose, ADF and NDF analysis were made by the Unity SpectraStar XT NIR Analyzer device, samples were placed in the chamber in the device so that it fills the chamber and does not leak light, and after the chamber is placed in the device, readings were made at 2600 nm and this process was repeated three times. Starch analysis was performed according to the method of AACC 32-40.01. Oil determination and moisture analysis were applied according to AACC 30-25.01. AACC 08-01 method was used for grain ash content. Color b values were read in index unit with Konica Minolta Chroma Meter (CR-400/410). Gluten analyzes were determined according to the AACC 38-12.01. Gluten index values were determined by placing the wet gluten on the sieve of the centrifuge device and centrifuging at 6000 rpm for one minute, and then multiplying the ratio obtained by dividing the amount of gluten that did not pass under the sieve by the total amount. Sedimentation analyzes were performed according to the AACC 56-61.01.

The data obtained from the laboratory studies were arranged according to the randomized blocks split plot design, with three replications by the control and zinc application periods in the main plots and the cultivars in the sub plots. Statistical analyzes were made by the JMP statistical package program.

Results and Discussion

The mean squares obtained from the variance analyzes of the grain quality characteristics of Zn applications to the leaves during the milky filling or starchy filling periods of some winter durum wheat cultivars were given in Table 1; mean values were given in Table 2-15.

Thousand grain weight (TGW)

Foliar Zn application periods in durum wheat cultivars did not show a statistically significant difference in terms of TGW (Table 1 and Table 2). Although durum wheat cultivars did not statistically significantly differ for TGW (Table 1); TGW varied between 44.8 g (Eminbey) and 46.0 g (Meram-2002) according to the cultivars (Table 2). These data are similar to the findings of Aksoy (2012), who stated that TGW of durum wheat varies between 43.99 g and 45.58 g. The interaction of Zn×Cultivar did not statistically differ in thousand grain weight.

Protein content

Although protein content in durum wheat cultivars did not statistically show a significant difference in terms of foliar Zn application period (Table 1), a high value was observed at the starchy period (14.55%) (Table 3). Although durum wheat varieties did not statistically differed significant differences for protein content (Table 1), it ranged from 13.9% (Ç-1252) to 14.4% (Eminbey) (Table 3). These data show similarity with the results of Aydoğan et al. (2012). Zn×Cultivar interaction did not statistically show significant differences for grain protein content (Table 1 and Table 3).

Table 1. Mean squares and coefficients of variation of the effects of Zn application in milky or starchy filling periods on grain quality traits in durum wheat cultivars

Variation source	Df	Mean squares						
		Thousand grain weight	Protein	Starch	Fat	Ash	Moisture	Color b
Replication	2	6.588	0.762	0.548	1.259	0.012	0.235	6.063
Zn	2	5.966	1.985	0.693	0.106	0.056	0.549	0.772
Error 1	4	14.576	1.101	0.687	0.935	0.011	0.088	3.540
Cultivar	4	2.234	0.276	3.002	0.136	0.014**	0.059	0.932
Zn×Cultivar	8	2.964	0.208	2.649	0.068	0.008*	0.016	0.500
Error 2	24	7.596	0.258	2.612	0.112	0.001	0.041	0.971
CV (%)		6.1	3.59	2.68	20.63	3.89	2.29	3.53

Variation source	Df	Mean squares						
		Wet gluten	Gluten index	Sedimentation	Delayed sedimentation	Cellulose	ADF	NDF
Replication	2	49.84	85.12	44.82	4.85	0.44	0.02	1.07
Zn	2	496.51**	884.22	1.55	14.45	0.82	0.09	2.19**
Error 1	4	14.01	139.05	10.47	6.90	0.58	0.16	0.07
Cultivar	4	203.74**	2208.52**	4.85	12.19**	0.08	0.08	0.35
Zn×Cultivar	8	18.13	90.93	2.33	4.80	0.09	0.06	0.23
Error 2	24	32.86	216.71	2.90	2.49	0.09	0.04	0.17
CV (%)		18.89	12.55	10.74	16.64	7.25	10.72	

Df, degree of freedom; CV, coefficient of variation; * and ** significance levels at $p < 0.05$ and $p < 0.01$, respectively.

Table 2. Mean values for the content of thousand grain weight (g) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	46.237	45.167	46.040	45.815
Eminbey	45.760	44.260	44.347	44.789
Kızıltan-91	45.680	43.897	46.443	45.340
Meram-2002	46.003	46.680	45.400	46.028
Selçuklu-97	45.170	43.497	46.837	45.168
Mean	45.920	45.001	45.558	45.428
LSD _{Zn}	ns			
LSD _C	ns			
LSD _{Zn×C}	ns			

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Table 3. Mean values for the grain protein content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	13.77	13.84	14.07	13.89
Eminbey	14.30	13.68	15.11	14.36
Kızıltan-91	13.87	13.91	14.77	14.18
Meram-2002	13.92	13.92	14.30	14.05
Selçuklu-97	13.93	14.13	14.51	14.19
Mean	13.96	13.89	14.55	14.13
LSD _{Zn}	ns			
LSD _C	ns			
LSD _{Zn×C}	ns			

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Starch content

Grain starch content of durum wheat cultivars did not statistically show a significant difference in terms of foliar Zn application period (Table 1 and Table 4). Although there was no statistically significant difference for starch content of durum wheat cultivars (Table 1), it showed a narrow range like 59.6% (Eminbey) to 61.0% (Meram-2002) (Tables 1 and 4). Zn x Cultivar interaction did not statistically differ for starch content.

Table 4. Mean values for the starch content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	61.1	59.0	61.9	60.7
Eminbey	59.3	60.6	59.1	59.6
Kızıltan-91	59.6	60.0	59.9	59.9
Meram-2002	60.3	62.0	60.8	61.0
Selçuklu-97	60.0	60.6	60.5	60.4
Mean	60.1	60.4	60.4	60.3
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Fat content

There was no statistically significant difference in durum wheat cultivars and Zn application period (Tables 1 and 5). However, the fat content of the cultivars ranged between 1.42% (Ç.1252) and 1.73% (Kızıltan-91) (Table 5). Zn×Cultivar interaction also did not statistically differ in terms of fat content (Table 1 and Table 5).

Table 5. Mean values for the fat content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	1.39	1.56	1.32	1.42
Eminbey	1.47	1.75	1.74	1.66
Kızıltan-91	1.75	1.69	1.76	1.73
Meram-2002	1.79	1.70	1.33	1.61
Selçuklu-97	1.74	1.81	1.53	1.69
Mean	1.63	1.70	1.54	1.62
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Ash content

Although the grain ash content of durum wheat varieties did not statistically show significant differences in terms of foliar Zn application period (Table 1), the lowest ash content was obtained from the control application without Zn application (1.36%) (Table 6). Cultivars showed significant changes at $p<0.01$ level (Table 1); the highest ash content was obtained from Eminbey (1.50%), and the lowest value was obtained from Ç.1252 (1.39%) (Table 6). These data were similar to the findings of Budak and Karaaltın (1998), who stated that the ash content in durum wheat varies between 1.6% and 2.3%. addition, Zinc×Variety interaction showed significant differences ($p<0.05$) in terms of ash content (Table 1); Eminbey, Kızıltan-91 and Selçuklu-97 varieties of this interaction are statistically in the upper group in terms of grain ash content in milky and starchy filling periods of the grain; This is due to the subgroup of these cultivars in the control application without zinc application (Table 6).

Table 6. Mean values for the ash content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	1.38 d-g*	1.47 a-d	1.34 fg	1.39 b
Eminbey	1.42 b-f	1.54 a	1.53 a	1.50 a
Kızıltan-91	1.29 g	1.46 a-e	1.48 a-c	1.41 b
Meram-2002	1.37 e-g	1.41 c-f	1.51 b	1.43 b
Selçuklu-97	1.35 f-g	1.49 a-c	1.46 a-d	1.44 b
Mean	1.36	1.47	1.46	1.43
LSD _{Zn}		ns		
LSD _C		0.05		
LSD _{Zn×C}		0.09		

*: There is no difference at $p<0.05$ among the mean values with the same letter groups. LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference among the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Moisture Content

There was no statistically significant difference for foliar zinc application period in durum wheat cultivars in terms of moisture content (Table 1 and Table 7). Cultivars did not statistically show significant differences for moisture content; the grain moisture content means of the cultivars was determined as 8.8% (Table 7). Zn×Cultivar interaction did not also differ significantly in terms of grain moisture content (Tables 1 and 7).

Table 7. Mean values for the moisture content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	8.9	9.0	8.6	8.8
Eminbey	8.9	8.7	8.5	8.7
Kızıltan-91	9.0	9.0	8.7	8.9
Meram-2002	8.8	9.0	8.6	8.8
Selçuklu-97	8.9	9.1	8.6	8.9
Mean	8.9	9.0	8.6	8.8
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Color b* value

Color b value in durum wheat cultivars did not statistically show a significant changes in terms of foliar Zn application period (Table 1). Although there were no statistically significant difference in the color b value of durum wheat varieties (Table 1), mean of cultivars was determined as 26.21 index value (Table 8). Kendal et al. (2011), who stated that the color b value of durum wheat varied between 19.1 and 23.4. It has been understood that the Zn×Cultivar interaction does not differ in terms of color b value (Table 1 and Table 8).

Table 8. Mean values for the color b value (index) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	27.73	28.23	27.63	27.86
Eminbey	28.27	27.93	28.08	28.09
Kızıltan-91	28.25	26.75	27.23	27.78
Meram-2002	28.04	27.87	27.44	27.78
Selçuklu-97	28.27	28.52	27.90	28.23
Mean	28.11	27.86	27.66	26.21
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Wet gluten content

Although there are statistically significant differences in terms of wet gluten content and foliar zinc application periods in durum wheat varieties (Table 1); While the lowest wet gluten ratio was obtained from the milky stage application (38.5%), the highest value was obtained from the zinc application during the starchy filling period (49.3%) (Table 9). Varieties showed significant changes at $p < 0.01$ level (Table 1); The highest wet gluten content was obtained from Kızıltan-91 variety (48.4%), while the lowest value was obtained from Eminbey variety (38.9%) (Table 9). These data showed higher values than the findings of Budak and Karaaltın (1998), who stated that the wet gluten ratio in durum wheat varies between 26.9% and 30.6%. Zinc x Variety interaction did not show statistically significant differences in terms of wet gluten ratio (Table 1 and Table 9).

Gluten index

Although the gluten index value in durum wheat varieties does not statistically show significant differences for foliar application periods, it has been understood that the gluten index value increases with the zinc application to be made during the milky filling stage (Table 1), so an application to be made in this period would be more advantageous. Cultivars showed significant changes at $p < 0.01$ level (Table 1); The highest gluten index value was obtained from Ç.1252 (91.3%), Eminbey (87.9% and Meram-2002 (86.7%) varieties, and the lowest value was from Kızıltan-91 (54.3%) varieties (Table 10). Zn×Cultivar interaction did not statistically show significant differences in terms of gluten index value (Table 10).

Table 9. Mean values for the wet gluten content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	40.6	34.7	45.2	40.2 b*
Eminbey	34.4	33.9	48.3	38.9 b
Kızıltan-91	46.5	45.2	53.4	48.4 a
Meram-2002	38.4	32.9	45.8	39.0 b
Selçuklu-97	42.7	45.9	54.1	47.6 a
Mean	40.5 b	38.5 b	49.3 a	42.8
LSD _{Zn}		3.794		
LSD _C		5.577		
LSD _{Zn×C}		ns		

*: There is no difference at $p<0.05$ among the mean values with the same letter groups. LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference among the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Table 10. Mean values for the gluten index (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	88.7	96.3	88.7	91.3 a*
Eminbey	92.2	92.0	79.3	87.9 a
Kızıltan-91	49.3	66.9	46.8	54.3 c
Meram-2002	80.2	95.9	84.1	86.7 a
Selçuklu-97	73.5	79.4	55.5	69.5 b
Mean	76.8	86.1	70.9	77.9
LSD _{Zn}		ns		
LSD _C		14.3		
LSD _{Zn×C}		ns		

*: There is no difference at $p<0.05$ among the mean values with the same letter groups. LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference among the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Sedimentation value

In terms of sedimentation value in durum wheat cultivars, there were no statistically significant differences between foliar Zn application period (Table 1 and Table 11). Although there were no statistically significant differences for sedimentation value among durum wheat varieties (Table 1), this value were distributed between 12.4 mL (Ç.1252) and 14.4 mL (Selçuklu-97) (Table 11). It has been seen that these data were at the lower limit of the findings of Dogan and Cetiz (2015), who stated that the sedimentation value in durum wheat varied between 13.3 mL and 27.6 mL. Zn×Cultivar interaction was not found to be statistically effective on the sedimentation value (Table 1 and Table 11).

Table 11. Mean values for the sedimentation value (mL) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	12.7	12.3	12.3	12.4
Eminbey	14.8	12.7	13.7	13.7
Kızıltan-91	12.3	13.3	14.3	13.3
Meram-2002	13.8	14.3	13.7	13.9
Selçuklu-97	13.5	14.0	15.7	14.4
Mean	13.4	13.3	13.9	13.6
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Delayed sedimentation value

The delayed sedimentation value in durum wheat cultivars did not statistically show significant differences for foliar Zn application period (Table 1). Cultivars showed significant changes at $p<0.01$ level (Table 1); the highest delayed sedimentation value was obtained from Meram-2002 (16.2 mL), and the lowest value was obtained from Kızıltan-91 (13.0 mL) variety (Table 12). It has been understood from Tables 1 and 12 that the Zn×Cultivar interaction did not have an effect on the delayed sedimentation value.

Table 12. Mean values for the delayed sedimentation value (mL) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	14.7	13.0	16.3	14.7 b
Eminbey	17.0	14.3	14.0	15.1 ab
Kızıltan-91	13.7	11.7	13.7	13.0 c
Meram-2002	17.7	15.0	16.0	16.2 a
Selçuklu-97	13.3	13.8	16.3	14.5 bc
Mean	15.3	13.6	15.3	14.7
LSD _{Zn}		ns		
LSD _C		1.54		
LSD _{Zn×C}		ns		

*: There is no difference at $p<0.05$ among the mean values with the same letter groups. LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference among the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

Cellulose content

Cellulose content in durum wheat cultivars did not show statistically significant differences in terms of foliar Zn application period (Table 1); however, it was observed that Zn applied during the milky filling period slightly increased the cellulose content (Table 1 and Table 13). Although durum wheat cultivars did not statistically show significant differences for cellulose content (Table 1); it varied between 1.702% (Ç.1252) and 1.953% (Eminbey) (Table 13). Zn×Cultivar interaction was not found to be statistical effective on cellulose content (Table 1 and Table 13).

Table 13. Mean values for the cellulose content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	1.393	2.272	1.442	1.702
Eminbey	1.778	2.225	1.857	1.953
Kızıltan-91	1.600	1.997	1.880	1.826
Meram-2002	1.793	1.957	1.910	1.887
Selçuklu-97	1.623	2.027	1.838	1.829
Mean	1.638	2.095	1.785	1.839
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

ADF (acid detergent fiber) content

There were no statistically significant differences for the variation sources for ADF content (Table 1). Although there was no statistical significant differences among the cultivars (Table 1); it varied between 2.517% (Ç.1252) and 2.773% (Selçuklu-97) (Table 14). Zn×Cultivars interaction did not statistically differ for ADF (Table 1 and Table 14).

Table 14. Mean values for the ADF content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	2.487	2.692	2.372	2.517
Eminbey	2.820	2.743	2.491	2.685
Kızıltan-91	2.548	2.693	2.533	2.592
Meram-2002	2.712	2.543	2.755	2.670
Selçuklu-97	2.620	2.983	2.715	2.773
Mean	2.637	2.731	2.573	2.647
LSD _{Zn}		ns		
LSD _C		ns		
LSD _{Zn×C}		ns		

LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference between the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

NDF (neutral detergent fiber) content

Statistically significant differences ($p<0.01$) were found between Zn application periods (Table 1); thus, the lowest NDF ratio was obtained from the starchy filling stage (3.452%) and the highest value was obtained from the control (4.216%) without Zn application (Table 15). This showed that the Zn application negatively affected the NDF intake to the grain, in other words, Zn decreased the NDF value. Also, Zn application in the subsequent grain filling periods, NDF intake to the grain was gradually decreased. Although durum wheat cultivars did not show statistical significant differences in terms of NDF content (Table 1), NDF varied between 3.521% (Ç.1252) and 4.014% (Meram-2002) (Table 15). The Zn×cultivars interaction did not differ for NDF (Table 1 and Table 15).

Table 15. Mean values for the NDF content (%) by Zn application in milky or starchy filling period in durum wheat cultivars

Cultivars	Zn application period			Mean
	Control	Milky	Starchy	
Ç.1252	3.733	3.783	3.045	3.521
Eminbey	4.303	3.930	3.247	3.827
Kızıltan-91	4.402	3.848	3.348	3.866
Meram-2002	4.180	3.728	4.135	4.014
Selçuklu-97	4.462	4.042	3.487	3.997
Mean	4.216 a	3.866 b	3.452 c	3.845
LSD _{Zn}		0.273		
LSD _C		ns		
LSD _{Zn×C}		ns		

*: There is no difference at $p < 0.05$ among the mean values with the same letter groups. LSD_{Zn}, LSD_C, LSD_{Zn×C} show least significance difference among the mean values for Zn applications, cultivar and Zn×Cultivar interactions, respectively, and ns means non-significance.

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A Review: Activities Of Probiotic Bakteria In Honey Bees (*Apis Mellifera* L.)

Mustafa Güneşdoğdu^{1*}, Ahmet Şekeroğlu², Samet Okuyan³

¹Department of Animal and Technologies, Faculty of Applied Sciences, Muş Alparslan University, 49250, Muş, Turkey.

²Department of Animal and Technologies, Faculty of Agricultural Sciences and Technologies, Niğde Ömer Halisdemir University, 51240 Niğde, Turkey.

³Honey Bee Research Institute, 52000, Ordu, Turkey

Abstract

Honey bees (*Apis mellifera* L.) are vital creatures for the sustainability of plant production. Keeping honey bee colonies healthy throughout the year is one of the interests of both beekeepers and beekeeping researchers. Various negative factors cause the population of natural and wild bees to decrease. One of the reasons for the extinction of bee colonies is their diseases. Due to the organizational structure of bees, diseases spread rapidly within and between colonies due to food and excessive contact. Both the lack of food and pesticides have negative effects on the microorganisms in the stomach and intestinal tract of bees. Numerous bacterial species, including *Lactobacillus*, *Bacillus* and *Bifidobacterium* species, are defined in the stomach and intestines of bees. The use of probiotics for human and animal health is increasing day by day, especially in gastrointestinal diseases. Probiotics are known as the support of the host body. It is necessary to give more importance to studies on health protective nutrients, which are vital for improving the health of honey bees and sustainability. In recent years, the use of probiotic bacteria in supplements to increase health of honey bees has been increasing rapidly.

Key Words: *Apis mellifera*, *Bacteria*, *Effects*, *Feeding*, *Probiotic*

Introduction

In recent years, the global population of pollinator insects has decreased, causing concern all over the world (Smith et al., 2013). The honeybees (*Apis mellifera* L.) are the most significant ecological and economic contributors (Klein et al., 2007). The pollination made by honeybees is critical in agricultural production (Fontaine et al., 2006). In terms of sustainable agricultural production and food security, the health protection of the honeybee is very important (Güneşdoğdu et al., 2021). Although there are numerous causes of bee losses, pesticides, the amount, quality, and digestibility of nutrients, and climatic changes are the most significant ones taking the first place (Alaux et al., 2010; Di Pasquale et al., 2013). The beekeeper does have an impact on the health of honeybees. The maintenance and feeding of the beekeeper do change the intestinal microflora of the bees (Sperandio et al., 2019; Gilioli et al., 2019). In the intestine of bees, there are nine different types of bacterial communities that can change with age (Hroncova et al., 2015). The changing intestinal micro-flora alters the intestinal bacterial balance and might be cause of the spread of opportunistic diseases (Anderson et al., 2017). There is a growing interest on the impacts of intestinal microbial symbiotes on the health of vertebrate and invertebrate intestinal systems.

Approximately a century ago, the idea of suppressing harmful bacteria in the intestine with beneficial bacteria given orally and thus, improving microbial balance and health was put forward (Carre, 1987). A probiotic is defined as a living microbial nutritional supplement that beneficially affects the host organism by improving the intestinal microbial balance (Fuller, 1989). Probiotic microorganisms fight pathogenic microbes that attach to the intestinal epithelium of bees (Powell et al., 2014). Furthermore, it does also affect the growth, development, and life span (Maes et al., 2018). Probiotics impact other organs in addition to the intestinal flora by providing metabolites that regulate immunological parameters and intestinal permeability (Schrezenmeir, 2001). Probiotics can be given to living beings in a variety of ways. Probiotics are typically produced from *Lactobacillus*, *Streptococcus* and *Streptococcus* strains. The species currently used in probiotic preparations are listed as follows; *Lactobacillus* spp. (*L. bulgaricus*, *L. acidophilus*, *L. casei*, *L. helveticus*, *L. lactis*, *L. salivarius*, *L. plantarum*), *Streptococcus thermophilus*, *Enterococcus faecium*, *Ent. faecalis*, *Streptococcus* spp. (*B. longum*, *B. bifidum*, *B. infantis*, *B. animalis*) and *E. coli*. with exception, these are all intestinal strains. *L. bulgaricus* and *Strep. thermophilus* are exceptional ones and are obtained from yogurt (Fuller, 1989). All these are intestinal strains except for exceptions which are *L. bulgaricus* and *Strep. thermophilus* and they are made of yogurt (Fuller, 1989). A good probiotic should be resistant to stomach acid, bile salts, and intestinal pH, as well as have a proven beneficial effect on consumer health (Butel, 2014). The minimum amount for probiotic effect is generally reported to be 10^8 - 10^9 (De Vrese, 2003). Chemical use based on intensive agricultural activities, wastewater, and antibiotic use in bees are drivers having a negative impact on bee health. Nowadays, the awareness and understanding of the importance of nutrients on bee health and improvement has increased (Martinson et al., 2011). The honey stomach, digestive stomach, small intestine, and rectum are the primary digestive organs in adult honeybees. The digestive stomach accounts for 1-4 % of the total bacteria (Martinson et al., 2012). The variability of bacteria in the digestive system of honeybees depends on nutrient type, age, season, and geographical region (Royan, 2019). In the context of this research, the impacts of probiotic products used on bee health are compiled.

Bifidobacterium spp.

Moradi and Ownagh (2019) investigated the *Bifidobacterium bifidum* strain on the causative agent of *chalk brood* on honeybees and its antifungal effect on *Ascosphaera apis* and they reported that this strain did not prevent the disease from developing. In the research conducted by Alberoni et al., (2017), it was stated that the strains such as *Bifidobacterium asteroides* DSM 20431, *Bifidobacterium coryneforme* C155, and *Bifidobacterium indicum* C449 caused an increase in honey, pollen, and incubation areas when added to sugar syrup. Baffoni et al., (2016), carried out a laboratory study in which they fed adult worker bees with 2 % sugar syrup solutions (1:1) prepared with strains such as; *Bifidobacterium asteroides* DSM 20431, *B. coryneforme* C155, and *B. indicum* C449. Besides, they also pointed out that after 13 days passed since these worker bees tested were infected with *Nosema ceranae*, the 90 % of the worker bees were found out to be alive, and the rate of *Nosema ceranae* was low. In another study, Patruica and Mot (2012), discovered that when colony groups which were fed with sugar syrup (1:1) involving 1.25 and 2.5 (G/L) and *Bifidobacterium lactis* bi-04 strain compared with control group, there happened to be a decrease in the number of pathogenic bacteria in the intestine.

Lactobacillus spp.

The research performed by Daisley et al., (2020) in the field found out that the impact of the disease titled as American FoulBrood (*Paenibacillus larvae*) decreased in the bee colonies fed with bee cakes containing strains such as *Lactobacillus plantarum* Lp39, *Lactobacillus rhamnosus* GR-1 ve *Lactobacillus kunkeei* BR-1. Lorizzo et al., (2020) specified that 8 strains showed low antifungal impact followed by 54 strains performing middle antifungal impact and lastly 23 strains with high level of antifungal impact in the treatment of chalk brood (*Ascosphaera apis*) on honeybees. Moreover, they reported that 9 strains (*L. kunkeei* K7, K18, K34, K40, K41, K45, K55, K64 ve K112) with a high level of antifungal impact proved to be effective in the treatment of chalk brood (*Ascosphaera apis*) on honeybees. Moradi and Ownagh (2019) studied the effect of *Lactobacillus casei* and *Lactobacillus acidophilus* strains against chalk brood (*Ascosphaera apis*) in bees. They stated that these two strains could prevent the disease from developing at moderate level. Kačániová et al., (2018), studied the impact of the strains such as *Lactobacillus gasseri*, *L. amylovorus*, *L. kunkeei*, *L. Fructivorans* against American FoulBrood (*Paenibacillus larvae*). Further, they determined that the strongest strains were *Lactobacillus gasseri*, *L. Amylovorus* and the weakest strain was *L. Fructivorans*. Fanciottto et al., (2017) conducted a research in order to find out the honey yield of the bee colonies fed with sugar syrup added with 1×10^5 cfu/ml *Lactobacillus salivarius* A3iob. In addition, the researchers indicated that it was possible to obtain 6.5, 2.3 and 6.3 times more honey respectively in accordance with the control group in various locations in North-Western Argentina such as (Tilquiza, El Carmen and Yala) and these places were found to be appropriate for an economic beekeeping. According to Alberoni et al., (2017), the strains such as *Lactobacillus kunkeei* Dan39 (KP114141), *Lactobacillus plantarum* Dan91 (KP114145) and *Lactobacillus johnsonii* Dan92 (KP114146) applied on bee colonies as a spray by adding to sugar syrup increased incubation improvement, pollen, and honey yield respectively; 46.2 %, 53.4 %, 59.21 %. Baffoni et al., (2016) carried out a laboratory research on worker bees. The researchers found out that the rate of *Nosema ceranae* on bees which were fed with sugar syrup added *Lactobacillus kunkeei* Dan39, *Lactobacillus plantarum* Dan91 and *Lactobacillus. johnsonii* Dan92 was low. Ptaszyńska et al., (2016), investigated the impacts of *Nosema ceranae* sport by feeding the colonies with sugar syrup added with *Lactobacillus rhamnosus*. They unveiled that this strain did have a negative effect by increasing *N. ceranae* sport almost 25 times and the choice of a wrong strain would weaken the immune system in bees, increase bee deaths and nosema sport dramatically. Audisio (2015) tested the strain titled as *Lactobacillus johnsonii* CRL1647 isolated honeybee' stomach on bees. Finally, it was pointed out that it would decrease the two important bee diseases (Nosemosis ve varroosis) as well as increasing honey yield, number of queen bee egg laying and bee population. Patruica and Mot, (2012) performed a research and uncovered that the colonies fed with sugar syrup (1:1) including the strains such as 1.25 and 2.5 (g/L) *Lactobacillus acidophilus* LA-14 and *Lactobacillus casei* for three weeks showed a decline in the number of pathogenic bacteria in the intestine when compared with the control group.

Bacillus spp.

Audisio (2016) tested the strain titled *Bacillus subtilis subsp. subtilis* Mori2. isolated from honeybee' stomach on bees. Ultimately, it was discovered that it would reduce the two important bee diseases (Nosemosis ve varroosis) as well as raising honey yield, number of queen bee egg laying and bee population. According to Alquisira-Ramirez et al., (2014) the strain; *Bacillus thuringiensis* did not have any impact on the adult and larvae of honeybees, and it could be applied successfully. In addition, they stated that this strain would be lethal for *Varroa destructor* and it should be applied in accordance with biological control against mite. Wu et al., (2014) reported that the bacterium titled *Bacillus subtilis* Acja3 has a preventive effect on the disease of European FoulBrood (*Streptococcus Pluton*).

Commercial Probiotics

Commercial probiotics do have positive functions on nutrient absorption and immunity due to their protective effects/properties. The definition made by FAO and WHO; they are living microorganisms that, when consumed in sufficient quantities, have beneficial impacts on consumer health has been admitted (FAO/WHO, 2001). The use of probiotics in beekeeping industry has ever increased as well as showing the negative consequences on honeybees' health (Symbeotic, 2014). Gajger et al., (2020) claimed that there would be decrease in the number of *Nosema spp.* spore in bees' stomach and would increase colony population when sugar syrup added (1:1) 10 % or EM® (EM® PROBIOTIC FOR BEES) applied via spray method in the nutrition of bees under field conditions. Even though the length of the *hypopharyngeal glands* of the bees at the age of 11 days and taken from the experimental group with 5-10 % solution was bigger, it was reported that there was no difference between the bees at the age of 15 days and the control group. Andrearczyk et al., (2014) carried out a laboratory research and studied the impacts of the commercial product recommended for animals with the code aPL 0614002p on honeybees. The use of this product in both summer and winter months would increase the rate of *Nosema spp.* and they pointed out that special products should be produced for bee keeping. Another research conducted by Patruica and Mot (2012) uncovered that in the colonies fed with 1.2 and 2.4 (g/L) Enterolactis Plus commercial product sugar syrup (1:1) for three weeks, there was a decrease in the number of pathogenic bacteria in their intestine and an increase in the number of beneficial bacteria when compared to the control group. Szymaś et al., (2012), evaluated the histological changes in the intestine of bees fed with probiotics called Biogen-N and Trilac commercial added to the pollen substitute feeds of bees for 14 days, stated that merocrine secretion in their epithelium increased slightly, and the amount of peritrophic membranes increased, which contributed to better utilization of nutrients and better bee health.

Conclusion

The use of antibiotics in the treatment of bee diseases not only negatively affects bee health, but also raises concerns about the production of healthy products for humans. Antibiotics, long-term and uncontrolled use cause disease-causing pathogens to gain resistance. Since bee products are not washed and cleaned, their production and bee health is an issue that needs attention. Researchers have increased studies on the use of probiotics as an alternative to antibiotics in recent years. Studies have also reported that strains belonging to many *Lactobacillus spp.*, *Bifidobacterium spp.* and *Bacillus spp.* bacterial groups have an effect on improving bee health, reducing the effects of diseases and increasing the amount of bee products. In addition, it was emphasized that some strains have negative effects, that not every bacterial strain can be used in bees, and that the correct strain should be used. In the use of probiotic bacteria, the dose, number of strains, application time and amount can change the effectiveness of the treatments. Using the right probiotic bacteria on bee health will lead to the production of healthier products with healthier bees. Strong scientific studies are needed to minimize the risk in biological treatments to be applied with probiotics. This review, has been made to be a reference for future studies.

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Determination of The Effect of Concentration Methods on The Physicochemical Properties of Cherry Juice Using Multivariate Analysis

Hande Baltacıoğlu¹, Esra Üstünkaya¹

¹Food Engineering Department, Faculty of Engineering, Niğde Ömer Halisdemir University, Niğde, Turkey

Abstract

The concentration of fruit juices can be done using various methods. Today, quality and aroma losses occur as a result of exposure of fruit juice to high temperature with the evaporation process under atmospheric pressure, which is traditionally done. In recent years, new concentration techniques have gained importance in order to eliminate the problems that arise with the traditional concentration processes used in the processing of fruit juices into concentrate. Microwave vacuum evaporation is also among these techniques. In this study, the effect of microwave vacuum evaporation method on the titration acidity, pH, °Brix and color of sour cherry juice concentrate was determined and the quality properties of the obtained concentrate were compared with the quality properties of the product obtained by evaporation under vacuum. Cherry juice with °Brix value of 18.7 was concentrated to °Brix values of 65.73 (0.02 MPa), 64.15 (0.04 MPa), 64.55 (0.06 MPa) with microwave vacuum evaporation and 64.28 with rotary evaporation systems. Color values (L*, a*, b*) were better preserved in sour cherry concentrates obtained by microwave vacuum evaporation compared to the rotary evaporation technique. Principal component analysis (PCA) and hierarchical cluster analysis (HCA) were used as multivariate analysis to reveal the effect of concentration methods on the physicochemical properties of fruit juice concentrates. As a result, it was determined that the physicochemical properties of fruit juice concentrates can be differentiated according to the methods.

Key Words: Cherry Juice, Microwave Vacuum Evaporation, Multivariate Analysis, Physicochemical Properties, Principal Component Analysis,

Çoklu Değişken Analizi Kullanarak Konsantrasyon Yöntemlerinin Vişne Suyunun Fizikokimyasal Özelliklerine Etkisinin Belirlenmesi

Özet

Meyve sularının konsantrasyonu çeşitli yöntemler kullanılarak yapılabilmektedir. Günümüzde geleneksel olarak yapılan atmosferik basınç altında evaporasyon işlemi ile meyve suyunun yüksek sıcaklığa maruz kalması sonucunda kalite ve aroma kayıpları meydana gelmektedir. Meyve sularının konsantreye işlenmesinde kullanılan geleneksel konsantrasyon işlemleri ile ortaya çıkan olumsuzlukları gidermek için yeni konsantrasyon teknikleri son yıllarda önem kazanmıştır. Mikrodalga vakum evaporasyon da bu teknikler arasında bulunmaktadır. Bu çalışmada mikrodalga vakum evaporasyon yönteminin vişne suyu konsantresinin titrasyon asitliği, pH, °Briks ve renk üzerine etkisi belirlenmiş ve elde edilen konsantrenin kalite özellikleri vakum altında evaporasyon işlemi ile elde edilen ürünün kalite özellikleri ile karşılaştırılmıştır. °Briks değeri 18,7 olan vişne suyu, mikrodalga vakum evaporasyon ve döner evaporasyon sistemleriyle 65,73 (0,02 MPa), 64,15 (0,04 MPa), 64,55 (0,06 MPa) ve 64,28 (döner evaporasyon) °Briks'e konsantre edilmiştir. Mikrodalga vakum evaporasyon ile elde edilen vişne konsantrelerinde döner evaporasyon tekniğine göre renk değerleri (L*, a*, b*) daha iyi korunmuştur. Meyve suyu konsantrelerinin fizikokimyasal özellikleri üzerine konsantrasyon yöntemlerinin etkisini ortaya koymak için çoklu değişken analizi olarak temel bileşen analizi (PCA) ve hiyerarşik kümeleme analizi (HCA) kullanılmıştır. Sonuç olarak meyve suyu konsantrelerinin fizikokimyasal özelliklerinin yöntemlere göre farklılık gösterdiği tespit edilmiştir.

Anahtar Kelimeler: Çoklu Değişken Analizi, Fizikokimyasal Özellikler, Mikrodalga Vakum Evaporasyon, Temel Bileşen Analizi, Vişne Suyu.

Giriş

Gülğiller (*Rosaceae*) familyasından olan vişne, kiraza benzeyen ve tadı kiraza kıyasla ekşi olan bir meyve türüdür (Kaftanoğlu, 2013; Anonim, 2016). Vişnenin botanikteki latince ismi olan *Prunus cerasus* şimdiki Giresun'un eski adı olan Kerasus'tan gelmektedir (Önal, 2002). Vişne, sert çekirdekli bir meyve olup ekşi tadı nedeniyle nektar işlemeye çok uygun bir meyve türüdür. Aroması ve lezzeti nedeniyle çok sevilen, önemli bir antioksidan kaynağı olan vişne suyu ülkemizde en çok tüketilen meyve sularından biridir (Anonim, 2016; Damar ve Ekşi, 2012). 2017 yılında Türkiye 181.874 ton vişne üretimi ile Dünya vişne stoğunun %15'ini üretmiştir (Anonim, 2017).



Meyve suyu endüstrisinde, meyve suları veya nektarları üretim sonrasında konsantre edilerek depolanmakta böylece ürün mikrobiyolojik ve kimyasal açıdan stabil bir hal almaktadır. Böylece yıl boyu meyve suyu üretimi sağlanabilmekte olup ürün hacmi azalacağından depolama-taşıma giderleri de düşmektedir. Konsantre meyve suyu üretiminde yaygın olarak kullanılan yöntem evaporasyon yöntemidir. Evaporasyon işlemi atmosferik basınç altında yapıldığında, ürünün kalite özelliklerinde (renk vb.) istenmeyen değişimlere, biyoaktif bileşenlerinde kayıplara yol açıp, HMF vb. istenmeyen bileşiklerin oluşumuna sebep olmaktadır. Bundan dolayı, evaporasyon genel olarak vakum altında yapılmaktadır. Ancak meyve sularında artan konsantrasyon ile beraber viskozite artmakta ve kaynama noktası yükselmektedir. Bu durumda meyve suyundaki suyun uzaklaştırılması için gereken enerji ihtiyacı artmaktadır (Cemeroğlu ve Karadeniz, 2001). Bu sebeple son yıllarda, yeni konsantrasyon teknikleri önem kazanmıştır. Bunlardan biri de mikrodalga vakum evaporasyon tekniğidir. Vakum sisteminin ve mikrodalga ısıtmanın kombinasyonu olan bu sistemin kullanımı ile kısa sürede hızlı bir kütle ve enerji aktarımı sağlanmakta olup, bu sayede ürün kalitesi (renk, flavor ve besin değeri) iyileştirilirken enerji daha verimli kullanılmaktadır (Yousefi vd., 2012).

Literatürde yapılan birçok çalışmada mikrodalga vakum konsantrasyon işlemi, ananas, ahududu, karadut ve nar suyu konsantrasyonunda başarı ile kullanılmış ve elde edilen ürünün geleneksel yöntemle kıyasla renk, toplam fenolik, antosiyanin ve antioksidan aktivitelerinin daha iyi korunduğu belirlenmiştir (Assawarachan ve Noomhorm 2010; Yousefi vd., 2012; Fazaali vd., 2013; Yousefi vd., 2013). Buna karşılık literatürde vişne suyu konsantrasyonunda mikrodalga vakum yönteminin kullanıldığı bir çalışmaya rastlanılmamıştır. Vişne suyu konsantresi üretiminde farklı tekniklerin kalite özelliklerine etkisinin incelendiği çalışmalar bulunmasına karşın, bu çalışma mikrodalga vakum yönteminin vişne suyu konsantrasyonunda kullanıldığı ilk çalışmalardan biridir. Bu çalışmada mikrodalga vakum yöntemi kullanılarak vişne suyu konsantresinin temel kalite özelliklerinden olan titrasyon asitliği, pH, °Briks ve renk üzerine etkisi belirlenmiş ve mikrodalga vakum konsantrasyon yöntemi ile elde edilen konsantrenin kalite özellikleri vakum altında evaporasyon işlemi ile elde edilen ürünün kalite özellikleri ile karşılaştırılmıştır. Ayrıca meyve suyu konsantrelerinin fizikokimyasal özellikleri üzerine konsantrasyon yöntemlerinin etkisi çoklu değişken analizi olarak temel bileşen ve kümeleme analizleri kullanılarak ortaya konmuştur.

Materyal ve Yöntem

Materyal

Bu çalışmada kullanılan taze vişne yerel marketlerden (Niğde) sağlanmıştır. Vişneler, meyve suyu eldesinden önce 4°C sıcaklıkta depolanmıştır. Yıkanmış ve kurutulmuş vişnelerin sap ve çekirdekleri çıkarılmış ve blender (Arnica Orbital mix, Türkiye) ile parçalanmış meyveden presleme ve süzme işleminden sonra meyve suyu elde edilmiştir. Taze sıkılmış vişne suyu kontrol olarak ayrılmış ve analizlerin yapılması için hava almayacak şekilde ağzı sıkıca kapatılan bir şişe içinde -18°C sıcaklıkta analiz yapılana kadar depolanmıştır. Vişne suyundan mikrodalga vakum ve döner evaporasyon sistemi kullanılarak ik farklı konsantre elde edilmiştir.

Yöntem

Mikrodalga vakum evaporasyon işlemi için ev tipi mikrodalga fırın (MD 564, Arçelik, Türkiye) kullanılmıştır. Mikrodalgaın merkezine vakum pompasına (Isolab) bağlı hermetik bir erlen mayer (500 mL) içinde meyve suyu numunesi yerleştirilmiştir. Mikrodalga gücü 360 W olarak uygulanmış, vakum basıncı ise 0,02 MPa, 0,04 MPa ve 0,06 MPa olarak kullanılmıştır. Geleneksel ısıtma için döner evaporasyon (Heidolph, Hei-VAP Value, Almanya) yöntemi uygulanmıştır. Döner buharlaştırma için kullanılan basınç değeri 0,04 MPa ve sıcaklık değeri de 70,4 °C olarak uygulanmıştır.

pH tayini

Homojen olarak alınan 10 mL örneğin pH değeri pH metre (Hanna edge, İngiltere) ile ölçülmüştür.

Titrasyon asitliği tayini

Homojen olarak alınan 10 mL örnek 0,1 N NaOH ile 8,1 pH'ya gelene kadar titre edilmiş, titrasyonda harcanan NaOH kaydedilip sonuçlar AOAC (1990) cinsinden hesaplanmıştır. Sonuçlar % sitrik asit cinsinden ifade edilmiştir.

$$\text{Titrasyon asitliği} = \frac{(V \times f \times E \times 100)}{m}$$

V: Harcanan 0,1 N NaOH miktarı, mL

f: Titrasyon faktörü

E: 1 mL 0,1 N NaOH'ın eşdeğeri asit miktarı, g

m: Titre edilen örneğin gerçek miktarı, g

Suda çözünür kuru madde tayini

Suda çözünür kuru madde (SÇKM) tayini Abbe refraktometresi (A. Krüss Optronic GmbH, AR4, Almanya) kullanarak yapılmıştır. Sonuçlar °Briks olarak belirtilmiştir.

Renk tayini

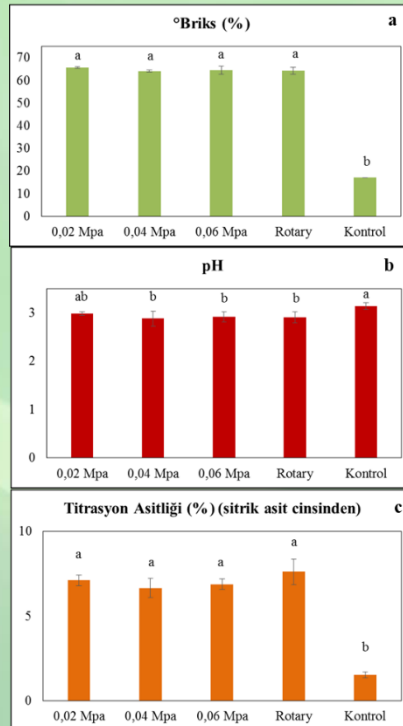
Renk tayini Konica-Minolta (Osaka, Japonya) marka CR400 renk tayini cihazı kullanılarak belirlenmiştir. Örnekler 10 mm ışık yollu cam küvetlere konularak cihaza verilmiş ve cihazdan L*, a* ve b* değerleri belirlenmiştir.

İstatistiksel Analizler

Çalışmada gerçekleştirilen fizikokimyasal analizlerin sonuçları Minitab 17 programı ile %95 güvenlik aralığında analiz edilmiş olup verilerin analizinde genel lineer model kullanılmıştır. Uygulamalar arasındaki farklılıkların tespiti için Tukey's çoklu karşılaştırma testi yapılmıştır. Her bir deney en az üç kez tekrarlanmıştır. Analizlerin sonuçları Excel programı ile grafiksel olarak gösterilmiştir. Fizikokimyasal analizlerinin sonuçları temel bileşen analizi (PCA) ve hiyerarşik kümeleme analizi (HCA) gibi kemometrik yöntemlerle Minitab 17 (Minitab Inc., State College, ABD) programı kullanılarak değerlendirilmiştir. HCA analizi öklit uzaklığı ve komple bağlantı algoritması kullanılarak gerçekleştirilmiştir.

Bulgular ve Tartışma

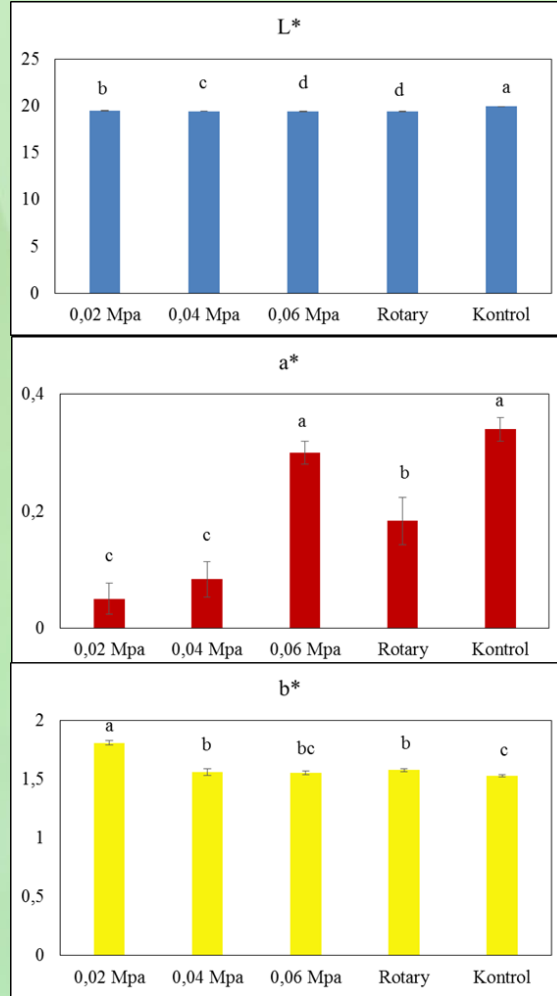
Bu çalışmada mikrodalga vakum evaporasyon ve döner evaporasyon işlemlerinin vişne suyu konsantrelerinin fizikokimyasal özellikler üzerindeki etkisi incelenmiştir. Konsantrasyon işlemi öncesi temin edilen vişne suyunun % SÇKM içeriği % 18,7 iken konsantrasyon sonucunda %65 kuru madde içeriğine sahip konsantre vişne suyu elde edildiği görülmektedir (Şekil 1a). Yapılan değerlendirme sonucunda hem mikrodalga vakum evaporasyon hem de döner evaporasyon işlemlerinde benzer toplam kuru madde içeriğine sahip konsantre vişne suyu elde edildiği belirlenmiştir. Sonuçlara bakıldığında konsantrasyon öncesi temin edilen ham madde vişne suyunun % SÇKM içeriği açısından literatür ile paralel sonuçlar elde edildiği görülmektedir (Damar ve Eksi 2012). Konsantrasyon işlemi sonucunda kontrol örneğine kıyasla pH değerlerinin azaldığı ($p<0,05$) (Şekil 1b), titrasyon asitliği değerlerinin arttığı ($p<0,05$) tespit edilmiştir (Şekil 1c). Çalışmada kullanılan vişne suyu ve konsantre örneklerine ait pH ve titrasyon asitliği değerlerinin daha önce yapılan çalışmalarda bulunan değerlerle uyum gösterdiği belirlenmiştir (Erceyes, 2014). Benzer çalışmalarda da konsantrasyon işlemi sonucunda pH değerlerinin azaldığı, titrasyon asitliği değerlerinin arttığı tespit edilmiştir (Erceyes, 2014).



Farklı harfler (a, b, c...), değerler arasında önemli bir fark ($p<0,05$) olduğunu göstermektedir.

Şekil 1. Vakumlu mikrodalga evaporasyon ve döner evaporasyon işlemleri uygulanarak konsantre edilen vişne sularının °Briks, pH ve titrasyon asitliği değerleri

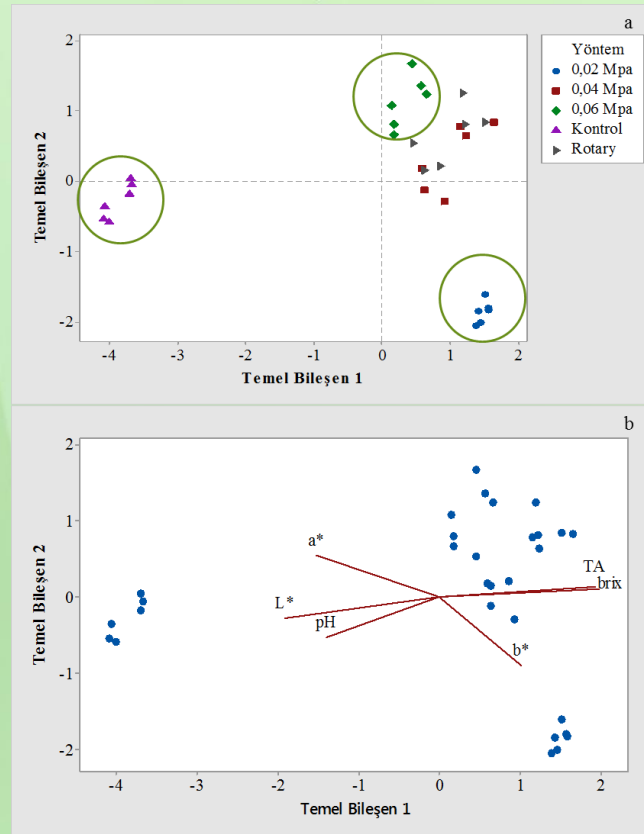
Sonuçlara bakıldığında vişne suyunun mikrodalga vakum ve döner evaporasyon işlemlerinde genel olarak kontrole göre L^* ve a^* değerlerinin azaldığı ($p<0,05$), b^* değerinin arttığı ($p<0,05$) gözlemlenmiştir (Şekil 2). L^* değerlerinin azalmasından dolayı meyve suyu örneklerin daha koyu renkli olduğu söylenebilmektedir. a^* değerlerinin azalması örneklerin kırmızılığını kaybettiğini, b^* değerinin artışı sarılığın arttığını göstermektedir. Bununla birlikte kontrol örneğine en yakın kırmızılık ve sarılık değeri 0,06 MPa mikrodalga vakum evaporasyon işlemine tabi tutulan örnekte belirlenmiştir. Döner evaporasyon işlemi gören konsantrelerde renkte kayıplar meydana gelmiştir. Mikrodalga vakumlu evaporasyon yönteminin (0,06 MPa) döner evaporasyon işlemine kıyasla daha az renk kaybına neden olduğu söylenebilmektedir. Benzer şekilde nar suyunda farklı evaporasyon işlemleri ile L^* ve a^* değerlerinin azaldığı mikrodalga vakum evaporasyon işlemi ile döner evaporasyon işlemine kıyasla daha az renk kaybı gözlemlendiği rapor edilmiştir (Maskan 2006).



Farklı harfler (a, b, c...), değerler arasında önemli bir fark ($p<0,05$) olduğunu göstermektedir.

Şekil 2. Vakumlu mikrodalga evaporasyon ve döner evaporasyon işlemleri uygulanarak konsantre edilen vişne sularının renk değerleri

Fizikokimyasal analizler sonucunda elde edilen veriler çoklu değişken analiz yöntemlerinden temel bileşen analizi (PCA) kullanılarak analiz edilmiştir. Konsantrasyon işleminin fizikokimyasal analizler üzerine etkisi PCA skor (Şekil 3a) ve yükleme grafikleri (Şekil 3b) kullanılarak değerlendirilmiştir. PCA skor grafiği incelendiğinde vişne suyu örneklerinin konsantrasyon işlemine göre konsantrasyon işlemi görmüş ve görmemiş örnekler olarak gruplandığı gözlemlenmiştir. Grafiğe göre kontrol örneği ile konsantre meyve sularının temel bileşen 1' e göre farklılaştığı görülmüştür. PCA yükleme grafiği incelendiğinde kontrol örneği L^* , a^* ve pH ile karakterize olurken, briks değerleri, titrasyon asitliği ve b^* değeri sonuçlarının konsantrasyon işlemi uygulanmış örnekleri karakterize ettiği görülmektedir.



Şekil 3. Vişne suyu örneklerinin fizikokimyasal analiz sonuçlarına göre PCA ile elde edilen a) skor grafiği b) yüklenme grafiği

PCA analizi sonucu vişne suyu fizikokimyasal özelliklerinin eigenvalue, varyans ve kümülatif varyans değerleri Çizelge 1’ de gösterilmektedir.

Çizelge 1. PCA analizi sonucu vişne suyu fizikokimyasal özelliklerinin eigenvalue, varyans ve kümülatif varyans değerleri

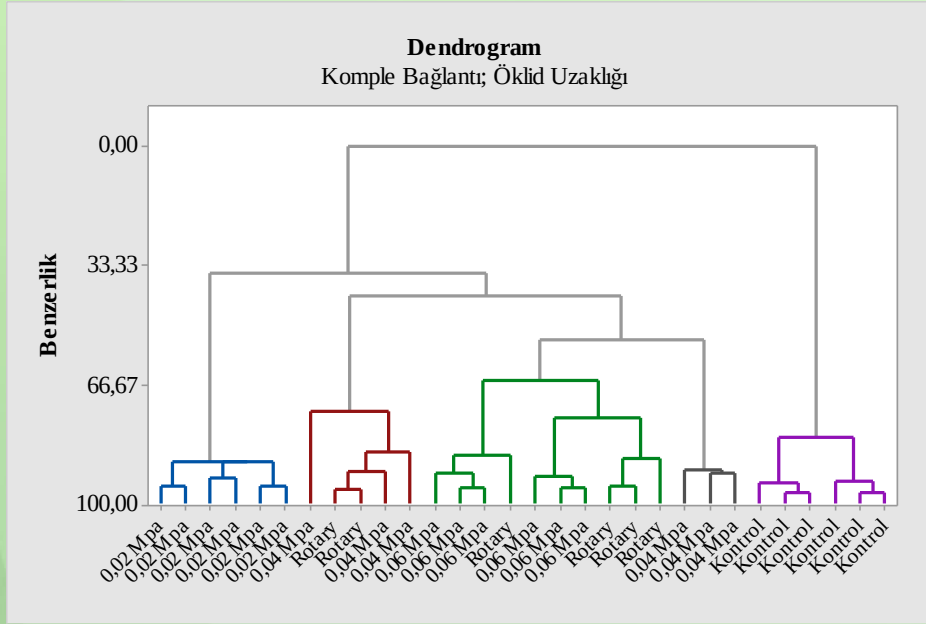
	Eigenvalue	Varyans (%)	Kümülatif varyans (%)
Temel Bileşen 1 (PC1)	4,0723	67,90	67,90
Temel Bileşen 2 (PC2)	1,2145	20,20	88,10

Buna göre, PCA grafiği toplam varyansın %88,1’ini oluşturan iki temel bileşen üzerinde örneklerin dağılımını göstermektedir. Birinci temel bileşen toplam varyansın %67,9’unu, ikinci temel bileşen toplam varyansın %20,2’sini açıklamaktadır. Temel bileşenler ile meyve suyu fizikokimyasal özellikleri (değişkenler) arasındaki korelasyon katsayısı değerleri Çizelge 2’ de gösterilmektedir.

Çizelge 2. Temel bileşenler ile meyve suyu fizikokimyasal özellikleri (değişkenler) arasındaki korelasyon katsayısı değerleri

Değişkenler	Temel Bileşen 1 (PC1)	Temel Bileşen 2 (PC2)
pH	-0,344	-0,431
brix	0,485	0,093
L*	-0,469	-0,221
a*	-0,374	0,451
b*	0,247	-0,735
TA	0,475	0,111

Çizelgede temel bileşenleri açıklamada diğer faktörlere göre daha etkin olanlar koyu renkle yazılmıştır. Buna göre temel bileşen 1’de analiz edilen parametrelerden brix ve titrasyon asitliği ile pozitif korelasyon, L* değeri ile ise negatif korelasyon göstermiştir. Temel bileşen 2 ile ise a* değeri pozitif, b* ve pH değeri ile negatif bir korelasyon göstermiştir. Vişne suyu örneklerinin fizikokimyasal özelliklerine göre Hiyerarşik kümeleme analizi (HCA) grafiği Şekil 4’ de gösterilmiştir.



Şekil 4. Vişne suyu örneklerinin fizikokimyasal özelliklerine göre Hiyerarşik kümeleme analizi (HCA) grafiği

Hiyerarşik kümeleme analizi dendrogram grafiğine göre beş farklı grup oluşmuştur. Birinci grup 6 örnekten oluşmakta olup, bu grupta 0.02 MPa vakum altında mikrodalga evaporasyon yöntemi ile konsantre edilen vişne suları yer almaktadır. 0.02 MPa vakum altında mikrodalga evaporasyon yöntemi ile konsantre edilen vişne suları aynı grup altında toplanmıştır. İkinci grup 5 örnekten oluşmakta, bu grupta 0.04 MPa vakum altında mikrodalga evaporasyon yöntemi ve rotary evaporasyon yöntemi ile konsantre edilen vişne suyu örnekleri bulunmaktadır. Üçüncü grup 10 örnekten oluşmakta, 0.06 MPa vakum altında mikrodalga evaporasyon yöntemi ve rotary evaporasyon yöntemi ile konsantre edilen vişne suyu örnekleri bu grupta yer almaktadır. Dördüncü grup 3 örnekten oluşmakta, 0.04 MPa vakum altında mikrodalga evaporasyon yöntemi ile konsantre edilen vişne suyu örnekleri bu grupta yer almaktadır. Beşinci grup 6 örnekten oluşmakta olup, bu grupta kontrol vişne suları yer almaktadır. Kontrol vişne suları aynı grup altında toplanmıştır. Benzer şekilde pastörizasyon ve saklama koşullarının şalgam sularının mikrobiyolojik kalitesi ve aroma profili üzerindeki etkisi kemometrik yöntemlerle belirlenmiştir (Kırlangıç vd., 2021).

Sonuç olarak, konsantrasyon işlemi ile pH değerleri düşmüş, asitlik değerleri artmıştır. Renk değerleri incelendiğinde vakumlu mikrodalga evaporatörde (0,06 MPa) döner evaporatöre göre renk değerlerinin daha iyi korunduğu bulunmuştur. Kontrol örneği ile konsantre meyve sularının temel bileşen analizi ile ayrıştırıldığı görülmüştür. Hiyerarşik kümeleme analizine göre beş farklı grup oluşmuştur. Çoklu değişken analizine göre örnekler fizikokimyasal özellikler yönünden birbirinden konsantrasyon yöntemlerine göre iyi bir şekilde ayrılmıştır.

Teşekkür

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Yield and Quality Studies in Advanced Chickpea Genotypes

Gözde Nur Peker¹, Ömer Sözen¹

¹Department of Feild Crops, Faculty of Agriculture, University of Kırşehir Ahi Evran, Kırşehir, Turkey

Abstract

The study was carried out in Kırşehir ecological conditions in order to determine the yield and quality features of 60 genotypes, advanced 55 chickpea genotypes and 5 chickpea varieties, which were collected from the towns and villages of Kırşehir city center and its districts in 2013 within the scope of the BAP project (PYO-ZRT.4001.13.010). The study, which was carried out in the Agricultural and Research Application Field of Kırşehir Ahi Evran University in 2021, was established in Augmented trial design with 4 replications. During the study, the data of 21 characteristics of chickpea genotypes, 3 phenological, 10 agronomic and 8 quality characteristics, were revealed. As a result of the study, the highest grain yield was obtained from the genotype N-23 collected from Tatık village of Kaman district with 5.25 g plant⁻¹, While the lowest grain yield was obtained from the genotype N-38 collected from Avanoğlu village of Akçakent district with 1.07 g plant⁻¹. In addition, when chickpea genotypes were evaluated in terms of protein content, the genotype N-21 took the first place with a protein value of 25.15%, while the genotype N-36 took the last place with a protein value of 19.04%. Among the chickpea genotypes included in the study, it was predicted that the genotypes that stand out in terms of both agronomic and quality characteristics may be candidates for registration within the scope of breeding studies.

Key Words: Kırşehir, Chickpea, Genotype, Yield, Quality

İleri Düzey Nohut Genotiplerinde Verim ve Kalite Çalışmaları

Özet

Yürütülen çalışma, PYO-ZRT.4001.13.010 nolu BAP projesi kapsamında 2013 yılında Kırşehir il merkezi ve ilçelerine bağlı belde ve köylerden toplanarak seleksiyon sonucu ileri düzeye kadar getirilmiş 55 adet nohut genotipi ile 5 adet nohut çeşidi olmak üzere 60 adet genotipin verim ve kalite öğelerinin belirlenmesi amacıyla Kırşehir ekolojik koşullarında yürütülmüştür. 2021 yılında Kırşehir Ahi Evran Üniversitesine bağlı Tarımsal ve Araştırmalar Uygulama Arazisinde yürütülen çalışma Augmented deneme deseninde 4 tekerrürlü olarak kurulmuş olup çalışma süresince nohut genotiplerine ait 3'ü fenolojik, 10'u agronomik ve 8'i kalite özelliği olmak üzere 21 adet özelliğin verileri ortaya konulmuştur. Çalışma sonucunda en yüksek bitkide tane verimi, 5.25 g/bitki ile Kaman ilçesinin Tatık köyünden toplanan N-23 nolu genotipten elde edilirken en düşük bitkide tane verimi ise 1.07 g/bitki ile Akçakent ilçesinin Avanoğlu köyünden toplanan N-38 nolu genotipten elde edilmiştir. Bunun yanında protein içerikleri bakımından nohut genotipleri değerlendirildiğinde N-21 nolu genotip %25.15 protein değeri ile ilk sırayı alırken N-36 nolu genotip %19.04 protein değeri ile son sırada yer almıştır. Çalışmada yer alan nohut genotipleri içinden gerek agronomik gerekse kalite özellikleri bakımından öne çıkan genotiplerin ıslah çalışmaları kapsamında tescile aday olabilecek genotipler olabileceği ön görülmüştür.

Anahtar Kelimeler: Kırşehir, Nohut, Genotip, Verim, Kalite

Obtaining antibacterial composite materials of polypropylene

N.Sh. Rasulzade, N.Sh. Rasulov, K.K. Badalova

Azerbaijan Medical University, General and toxicological chemistry department, AZ 1022 Baku, A.Gasimzade, 14, Azerbaijan

Abstract

It is important that the polymeric materials used in various fields are harmless to the human body, as well as resistant to the effects of widespread bacteria and micro-fungi. The development of technology for the production of such antimicrobial polymeric materials (APM) is carried out in several directions, one of which is the inclusion of natural and synthetic antimicrobial additives (APA) in the processing of polymeric materials. In previous studies, copolymerization reactions of vinyl and allyl salicylates (VASP and Alasp) containing methyl methacrylate containing biologically active salicyl groups were obtained, and their physicomechanical and antimicrobial properties were studied. The main goal of this work is to obtain isotactic composite materials PP based on copolymers containing a salicylic group, synthesized as a continuation of previous studies, to study their physicomechanical and antibacterial properties. For the production of PP composite materials, PP-KM containing 30% $Mg(OH)_2$ was used, and MMA copolymers containing a salicyl group in various compositions and proportions were added to the biocide during extrusion (molding). Antibacterial composites were prepared in a laboratory single-screw extruder from a mixture of 90-95% PP-KM and -5-10% MMA- Vasp polymers (90:10) in a PP alloy at high pressure and high shear stress. Physical and mechanical properties of modified PP-KM were studied, such as elongation, ultimate strength, alloy flow rate, heat resistance. With the addition of biologically active polymers, partial changes in the physical and mechanical properties of PP-KM were observed within the normal range. Tests have been carried out for resistance against the bacterial and micro-fungal effects of the new KM.

Key words: phenilhydrozone, antimicrobial, *Candida*, gramm-positive

Turkey's Bulgur Durum Wheat Production Potential

Neslihan Doruk Kahraman

¹Tarla Bitkileri, Ziraat Fakültesi, Selçuk Üniversitesi, Konya, Türkiye (Turkey)

Abstract

Bulgur is a traditional food widely consumed in Turkey. Annual bulgur production has reached one million tons together with the production at home. The fact that bulgur can stay intact for a long time and is a nutritious, cheap and healthy food item is one of the primary reasons for the increase in its production. Bulgur is mostly produced from durum wheat around the world. Although it is among the important producer countries with an annual production amount of three million tons of durum wheat, durum wheat is imported in Turkey. The most important reason for this situation is that durum wheat varieties suitable for bulgur production have not been registered, and varieties that are not suitable for pasta production are used in bulgur production. Thus, the quality value of the product produced cannot be at the desired level. Bulgur quality varies according to the end product, producer, bulgur industry, selection of suitable varieties and consumers. In order to realize the production of preferred quality bulgur and to come to a better place among other producer countries in bulgur production, which has a very important place for Turkey for centuries, bulgur durum wheat variety that will make the best use of the climatic and soil conditions of the region and respond well to the cultivation techniques applied development should be given importance.

Key Words: Bulgur, Nutrition, Quality, Durum Wheat

Türkiye'nin Bulgurluk Durum Buğday Üretim Potansiyeli

Özet

Bulgur, Türkiye'de yaygın olarak tüketilen geleneksel bir gıdadır. Bulgurun uzun süre bozulmadan kalabilmesi, besleyici, ucuz ve sağlıklı bir gıda maddesi olması tüketiminin her geçen yıl artmasını sağlamıştır. Dünya genelinde bulgur çoğunlukla durum buğdayından üretilmektedir. Yıllık yaklaşık üç milyon ton durum buğday üretim miktarı ile önemli üretici ülkeler arasında yer almasına rağmen Türkiye de durum buğdayı ithal etmektedir. Bulgur kalitesinin, son ürüne, üreticiye, bulgur üretim sanayisine, uygun çeşit seçimine ve tüketiciye göre değişmekte olduğu bilinmektedir. Bu nedenle Türkiye'nin kaliteli bulgur üretimini gerçekleştirebilmesi ve bulgur üretiminde, diğer üretici ülkeler arasında daha iyi bir yere gelebilmesi için, bölgenin iklim ve toprak koşullarını en iyi şekilde değerlendirecek ve uygulanan yetiştirme tekniklerine iyi cevap verebilecek bulgurluk durum buğday çeşit geliştirme çalışmalarına önem verilmesi gerekmektedir.

Anahtar Kelimeler: Bulgur, Beslenme, Kalite, Makarnalık Buğday

Giriş

Dünya genelinde Türkçe ismiyle bilinen bulgurun, işlenen ilk gıda maddelerinden biri oluşu ve Türkiye için geleneksel bir ürün niteliği taşıdığı bilinmektedir. İçerdiği besinsel lif, vitaminler ve mineral maddeler nedeniyle bulgurun, Amerikan Bilim Merkezi tarafından en besleyici besin maddelerinin başında yer aldığı bildirilmiştir (Anonim, 2005a). Anadolu'nun temel gıda maddelerinden birisi olması nedeniyle Türkiye'de yaygın olarak kullanılan bulgurun, yıllık üretimi evlerdeki üretimle beraber bir milyon tona ulaşmıştır (Yousif ve ark., 2018). Türkiye'de yıllık bulgur tüketimi kişi başına 12 kg olup, bu miktar doğu bölgelerinde 23 kg'ı bulurken, batı bölgelerinde ise 7 kg civarında olduğu ifade edilmektedir (Bayram ve Öner 2002). Bulgurun karbonhidrat kaynaklı bileşenlerine daha fazla vurgu yapılması ve bileşenlerin sağlık üzerine katkılarının daha ayrıntılı olarak ele alınması ile gelecekte bulgurun daha fazla öne çıkacağı düşünülmektedir (Tacer 2008).

Günümüzde fazla hızlı artışı ile her geçen gün doğaya verilen zarar artmakta ve bu da beraberinde birçok sağlık probleminin ortaya çıkmasına yol açmaktadır. Bu durumun en güncel örneği 2019 yılının Aralık ayında ilk olarak Çin'in Wuhan kentinde ortaya çıkan ve Dünya Sağlık Örgütü (WHO) tarafından koronavirüs (COVID-19) olarak adlandırılan pandemidir (World Health Organization, 2020). Koronavirüs'ün yayılımını azaltmak amacıyla Türkiye'de karantina kararı alınmıştır. Nitekim karantina süreci, bireylerin duygu durumlarını ve duygu durumlarıyla bağlantılı olarak da beslenme alışkanlıklarını etkilemiştir (Eskici,2020). Bununla beraber evde kalınan süre içerisinde bazı bireylerde yeme isteğinin artması, istenmeyen kilo artışlarına zemin hazırlamıştır.

Uzmanlar ağırlık kontrolünü sağlamanın yanında bağışıklık sisteminin de iyileştirilmesinin sağlıklı beslenme ile sağlanabileceğini ifade etmektedirler (Akpınar ve Türköz, 2019; Eskici, 2020; Ahmadpoor ve Rostaing, 2020). Köyden kente taşınan göçün beraberinde getirdiği hareketsiz yaşam, fazla kilo artışının önemli nedenlerinden biri olmuş ve sağlık problemlerinin zeminini oluşturmuştur. Öte yandan yaşam şartlarının iyileşmesi ve eğitim seviyesinin yükselmesi ile sağlıklı beslenmeye olan ilgi günden güne artmaktadır. Karantina sürecinin sağlıklı yaşama olan ilgiyi daha da artırmış olduğu görülmektedir. Nitekim çoğu ailede genellikle dışarıdan temin edilen yiyeceklerin evde yapılmaya başlanması, hem sağlıklı beslenmeye atılan bir adım olmuş, hem de aile bireylerinin birlikte yaptığı güzel bir aktivite haline gelmiştir.

Sağlıklı beslenmeye olan ilginin artması ile tüketiciler gıdaları sadece temel beslenme aracı olarak değil, aynı zamanda sağlık üzerinde faydalı etkileri bulunan maddeler olarak da görmeye başlamışlardır. Nitekim karabuğday, keten tohumu, chia tohumu gibi fonksiyonel gıdalar tüketiciler tarafından tanınmaya başlamış ve piyasada bu gıdalar kullanılarak ürün çeşitliliği artırılmıştır. FAO fonksiyonel gıdaları konvansiyonel gıdaların temel besleyici fonksiyonlarının yanında; biyolojik olarak aktif ve kronik hastalıkların riskini azaltma potansiyeli bulunan ve günlük beslenmenin bir parçası olarak tüketilebilen gıdalar olarak tanımlanmaktadır (Çakmak, 2018). Bulgurun oldukça sağlıklı bir karbonhidrat kaynağı olduğu ve oluşturduğu düşük glisemik tepkiler ile hiperglisemi ve obezite başta olmak üzere pek çok hastalığa karşı üzerinde durulması gereken bir ürün olduğu ifade edilmektedir. Bu sonuçlar dâhilinde, bulgurun fonksiyonel bir gıda olduğu ve tüketilmesinin sağlık açısından faydalı olacağı açıkça görülmüştür (Tacer 2008).

Günümüzde ekmek, makarna, bisküvi gibi ürünlerin fonksiyonel gıdalardan yapılan çeşitleri mevcuttur ancak bu ürünler yüksek fiyatlarla tüketiciye sunulmaktadır. Oysa enerji kaynağının maliyeti yüksek olan gıdalardan ziyade bulgurdan karşılanması hem kilo almayı azaltacak hem de kandaki kolesterolün seviyesini düşürecektir (Elgün, 2008). Nitekim bulgur, 1992 yılında Amerikan Bilim Merkezi tarafından yapılan bir araştırmada lif yönünden arpa ve yulaftan sonra üçüncü sırayı almıştır (Anonim, 2005b). Bununla beraber Özkaya (1997), bulgurun aynı tüketim sınıfında yer alan makarna ve pirinç ile kıyaslandığında, hem daha ucuz hem de daha besleyici olduğunu; bu nedenle düşük gelir seviyesindeki tüketiciler için iyi bir beslenme kaynağı olup, pirinç tüketiminin fazla olduğu ülkeler için önerilmesi gereken bir gıda maddesi olduğunu ifade etmektedir.

Türkiye’deki işletme sayısı ve üretim kapasitesi dikkate alındığında, bulgurun ülke için önemli ihracat potansiyeline sahip bir ürün olduğu görülmektedir. Bu potansiyelin kullanılabilmesi için kaliteli bulgur üretiminin gerçekleştirilmesi gerekmektedir (Köksel ve ark. 2010). Uzun zamandan beri devam eden makarnalık buğday çeşit geliştirme çalışmalarına ek olarak bulgurluk çeşit geliştirme araştırmalarına bir an önce başlanılmalıdır. Bulgurluk çeşit geliştirmede esas alınacak parametreler belirlendikten sonra, mevcut genetik kaynaklar kaliteli bulgur üretimine uygunluk yönünden taranarak kaliteli bulgurluk çeşitler geliştirilmelidir (Dönmez ve ark. 2004). Bütün bunların yanında Türkiye için geleneksel bir gıda olan bulgurun tanıtımının yapılması da önem arz etmektedir.

Türkiye’nin Buğday Ve Buğday Mamülleri Üretim Potansiyeli

Türkiye’de 2019-2020 yetiştirme sezonunda buğday ekim alanı 6.9 milyon hektar olup, üretim ise 20.5 milyon ton olarak gerçekleşmiştir (TÜİK, 2020). Türkiye’de buğday ekim alanları içerisinde durum buğdayı ekim alanı %16,7’lik paya sahip olup, en fazla durum buğdayı ekim alanına sahip iller sırasıyla Şanlıurfa ve Konya’dır (Geçit, 2016). Bu durumun başlıca nedeni ilgili bölgelerin ekolojilerinin durum buğdayı üretimine oldukça uygun olmasıdır. Güncel verilere bakıldığında 2020 yılında Türkiye’de 1.27 bin ton makarna, 262 bin ton bulgur ihraç edildiği görülmekte olup, toplam buğday ve mamul madde karşılığı ihracat değeri 974 milyon dolar, ithalat değeri ise 869 milyon dolar olarak gerçekleşmiştir (Buğday bülteni, 2020).

Yukarıda verilen bilgilere bakıldığında Türkiye’nin durum buğday üretim potansiyelinin yüksek, bunun yanında makarna ve bulgur ihracatında önemli bir paya sahip olduğu görülmektedir. Bulgurun Türkiye için geleneksel bir gıda olmasına rağmen makarna ihracatının bulgur ihracatından daha iyi olmasının nedeninin, araştırılması gerekmektedir. Ayrıca Türkiye’de buğday ve buğday mamülleri ithalat değerinin yüksek olduğu da bilinmektedir (Buğday bülteni, 2020). Durum buğdayın anavatanı olan ve ekolojik açıdan durum buğdayın üretimine oldukça uygun olan bir ülke için bu durumun önemli bir sorun olduğu düşünülmektedir.

Buğday mamülleri içerisinde yer alan bulgurun Türkiye için milli bir ürün niteliği taşıdığı ve dünya bulgur üretim ve tüketiminde Türkiye’nin en büyük pazar konumunda olduğu bilinmektedir. Bu nedenle bulgurun dış piyasada tanıtımına dikkat çekilmesi gerekmektedir (BSR 2012). Nitekim bulgurun besleyici değerinin makarnaya göre daha fazla olması nedeniyle bulgur üretimi tüm dünyada artmaktadır. Bu durumu Türkiye avantajına dönüştürebilir ancak yüksek kalite özelliklerine sahip bulgurluk durum buğday çeşitleri konusunda yetersiz kaldığından (TMSD 2008), bulgur sanayinin isteklerini karşılayamamaktadır.

Durum Buğdayında Kalite

Buğdayda kaliteyi belirlemenin kolay olduğu söylenemez. Çünkü durum buğdayında kalite; genetik yapı, ekolojik şartlar, yetiştirme tekniği ve bilhassa kullanılan azotlu gübre miktarı ve diğer kültürel uygulamalar ile yakından ilişkilidir. Bu nedenle özellikle bazı yıllarda görülen uygun olmayan iklim koşulları kaliteyi olumsuz etkilemektedir.

Buğdayda kalite son ürüne uygunluk derecesi olup durum buğdayın kalitesini belirleyen temel ölçüt, makarna üretimine uygunluk derecesi yani makarnalık kalitesidir (Ateş Sönmezoğlu, 2010). Kaliteli makarna üretimi ancak uygun bir makarnalık buğday ürünü ve işleme teknolojisi ile mümkündür. Makarnalık buğdayın kalitesi; hektolitreye ağırlığı, tanenin sertlik ve camsılık oranı, ırmık rengi, protein miktarı ve kalitesi gibi faktörlerle belirlenmektedir. Özellikle tanenin protein miktarı ile sarı renk içeriği oldukça önemlidir.

Sarı renk içeriği, son yıllarda makarna ve bulgur sanayinin üzerinde en fazla durduğu kalite özelliklerinden birisi haline gelmiştir (Fortmann ve Joiner, 1978). Yüksek sarı renk içeriğine sahip olan durum buğdayı çeşitleri, üstün özellikleri ile karakterize edilerek, renk değerinin makarnalık buğdayın ticari, besleme ve teknolojik kalite değerlendirmesinde çok önemli olduğu bilinmekle beraber önemli bir besin kaynağı olarak kabul edildiği ifade edilmektedir (Banach ve ark. 2021). Camsılık oranı, makarnalık buğdaylarda çevreden en fazla etkilenen kalite kriterlerinden biri olmakla birlikte, çeşide bağlı bir özelliktir (Bushuk, 1998). Yüksek camsı tane oranına sahip olan genotiplerin daha yüksek ham protein oranına sahip oldukları bilinmektedir (Porceddu ve ark., 1973; Aydın ve ark., 1999). Yüksek protein kalitesi ve hektolitreye ağırlığına ilave olarak, görünüm olarak daha yuvarlak taneli, kepek oranı daha az, daha yüksek iri bulgur oranı verip, sarı rengini işleme ve pilav yapma sürecinde koruyan, pişirilince taneleri lapalaşmayan ve B vitaminince zengin hatlara bulgurluk çeşit geliştirmede öncelik verilebilir (Dönmez ve ark., 2004).

öz konusu kalite unsurları çevre faktörleri ve yetiştirme koşullarından etkilenmekle birlikte, daha çok çeşidin genetik yapısı tarafından kontrol edilmektedir (Aalami ve ark., 2007). Son yıllarda durum buğdaylarında eski çeşitler, tanelerin daha yüksek oranda protein içermeleri (Giunta ve ark., 2019), fakir topraklara uyum sağlamaları (Mefleh ve ark., 2020), tane doldurma oranlarının yüksek olması (Royo ve ark., 2020), adaptasyon yetenekleri ve düşük girdi ihtiyaçları nedeniyle tarımsal sistemlerde yeniden önem kazanmışlardır (Giunta ve ark., 2021). Eski çeşitlerin verim ve kalite özelliklerinin değerlendirilmesi çalışmalarına başlanması uygun olacaktır. Çünkü dünyadaki birçok ülkeye göre kaliteli durum buğdayı üretimine oldukça uygun olan Türkiye'nin hangi bölgelerinde verim ve kalite bakımından iyi sonuç alınabileceğinin tespit edilmesi ve ayrıca, bu bölgelere uygun çeşitlerin geliştirilmesi konusunda ıslah ve agronomi çalışmalarına da ağırlık verilmesi oldukça önemlidir (Pehlivan ve İkincikarakaya, 2017). Bunun yanında en uygun bitki üretim tekniğinin geliştirilmesi ve verim ve kaliteyi artıracak üretim tekniklerinin de belirlenmesi önem arz etmektedir (Gökmen ve Ateş, 2005).

Bulgurluk Çeşit Geliştirme

Durum buğdayından ekmek, bulgur, makarna, kuskus gibi farklı ürünler üretilmektedir. Bununla birlikte kalite parametreleri açısından bu ürünler farklılık göstermektedirler. Çoğunlukla benzer analizler yapılmasına karşın, iyi kaliteli ürün elde etmek için gerekli olan kalite özellikleri aynı seviyede değildir (Atlı ve ark. 2014). Bazı ölçütler makarna ve bulgur için ortak özellikler gösterse de, bu konudaki çalışmalar yetersiz olup, bulgur kalitesini belirleyen özelliklerin henüz tam olarak tespit edilememiş olmasından dolayı genellikle makarna kalite özellikleri dikkate alınmaktadır.

Bulgur pek çok farklı buğdaydan üretilmekte ancak renk, sertlik, su emilimi ve pişme gibi üstün özellikleri nedeniyle çoğunlukla durum buğdayı kullanılmaktadır (Singh ve ark., 2010). Buna karşılık, özellikle bulgur yapımı için tescil edilmiş bir çeşit bulunmamaktadır. Bulgur üretimi için uygun kalite ve özellikte durum buğdayı çeşitlerinin belirlenmesi çalışmalarının yetersiz olduğu bilinmektedir. Türkiye'de bulgur üretim kapasitesi ve işletme sayısının oldukça yüksek olduğu dikkate alındığında, kaliteli bulgur üretiminin kaçınılmaz olduğu görülmektedir (Köksel ve ark. 2010).

Bu durumda, bulgur sanayisinin ihtiyaç duyduğu bulgurluk kalitesi yüksek genotiplerin tespit edilmesi ve bu genotiplerin ıslah programlarında kullanılması gerekmektedir. Makarnalık buğday çeşit geliştirme çalışmalarına ek olarak bulgurluk çeşit geliştirme araştırmalarına da başlanarak bulgurluk durum buğdayı kalite unsurlarının belirlenmesini takiben, mevcut genetik kaynakların kaliteli bulgur üretimine uygunluk yönünden taranarak kaliteli bulgurluk çeşitler geliştirilmelidir (Dönmez ve ark. 2004). Türkiye'de uzun zamandır sürdürülmekte olan makarnalık buğday hat ve çeşitlerinin makarna kalitesi açısından değerlendirilmesi çalışmaları ile birlikte, makarna üretiminin yaklaşık üç katı daha fazla üretime sahip olan bulgur üretiminde kullanılmak üzere bulgurluk durum buğday ıslah programlarına da başlanmalıdır. Makarnalık özelliği taşımayan tüm çeşitlerin bulgur yapımında kullanılması durumunun değiştirilmesi gerekmektedir. Islah programları başlatıldıktan sonra durum buğdayı kalite unsurlarının makarna ve bulgur kalitesi açısından farklı olduğu görülebilir. Ayrıca bu kalite unsurlarının yetiştirme teknikleri ve çevre koşulları ile etkileşimleri de üzerinde durulması gereken önemli bir konudur.

Sonuç Ve Öneriler

Türkiye'nin, ekolojik açıdan durum buğdayı yetiştiriciliğine oldukça uygun olduğu ve bulgurun, Türkiye için milli bir ürün niteliği taşıdığı bilinmektedir. Buna rağmen Türkiye hâlihazırda bulgur ithal etmekte olup, bunun nedenleri araştırılmalıdır. Diğer ülkelerle makarnalık buğday ve bulgur ihracatında rekabet edebilmek için üretilen

durum buğdayların kalitesinin ıslah programları ile artırılması ve bulgurluk kalitesi açısından değerlendirilmesi gerekmektedir. Geleneksel bir ürünümüz olan bulgur her yönüyle daha fazla araştırılarak, gelecek kuşaklara ve farklı kültürlerle tanıtılmalıdır. Bu amaçla, öncelikle bulgurluk durum buğday kalite unsurları belirlenmeli ve ülkemizin genetik zenginliği hızlı ve sistemli bir biçimde değerlendirilerek daha kaliteli bulgurluk çeşitler geliştirilmelidir.

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Köpük Kurutma Yöntemi İle Üretilen Havuç Tozlarının Kalite Ve Biyoaktif Özellikleri

Nimet Çakıroğlu, Bilge Ertekin Filiz

Süleyman Demirel Üniversitesi, Mühendislik Fakültesi, Gıda Mühendisliği Bölümü, Isparta

Özet

Hazır ve kolay tüketilebilir gıdaların talebi paralelinde sağlıklı beslenmenin de ön planda olduğu günümüzde değişen tüketici istekleri göz önüne alınarak, gıda sanayi son yıllar içerisinde hazır toz gıda ürünleri üzerinde inovatif çalışmalar gerçekleştirmektedir. Toz ürünlerin üretilmesinde kurutma işlemi farklı yöntemler ile gerçekleştirilebilmektedir. Köpük kurutma tekniği gıdaların köpük haline getirilerek kurutma yüzey alanının önemli ölçüde artırılmasını ve kuruma süresinin kısaltılmasını sağlayan bir teknik olarak son yıllarda artan bir ilgi görmektedir. Bu çalışmada dünyada ve ülkemizde yaygın olarak üretilen, besleyici özelliği yüksek ve içerdiği β -karoten sebebiyle dikkat çekici renge sahip bir sebze olan havuçtan köpük kurutma yöntemi ile elde edilen havuç tozlarının kalite ve biyoaktif özelliklerinin belirlenmesi amaçlanmıştır. Yapılan ön denemeler sonunda köpük analizleri yapılarak köpürtme ajanı olarak %10 maltodekstrin (MD) ve %1 yumurta akı tozu (YA) kullanımının uygun olduğu belirlenmiştir. Belirtilen oranlarda MD ve YA havuç sularına ilave edilmiştir. El tipi karıştırıcı kullanılarak elde edilen köpükler farklı sıcaklıklarda (55, 60 ve 65°C) kurutulmuştur. Elde edilen havuç tozlarının nem içeriği, su aktivitesi, pH, toplam çözünür kuru madde, yığın ve sıkıştırılmış yoğunluk, higroskopisite değerleri; rehidrasyon oranı, renk değerleri ve biyoaktif özellikleri (toplam fenolik madde, antioksidan aktivite ve toplam karoten miktarı) belirlenmiştir. Havuç tozlarının toz analizinde, sıcaklık artışının su aktivitesini ve nem içeriğini önemli ölçüde azalttığı, ancak tozların higroskopikliği arasında önemli bir fark bulunmadığı tespit edilmiştir. 55°C sıcaklıkta yapılan kurutma sonunda renk değerleri yüksek kurutulmuş havuç tozu elde edilmiştir. Elde edilen tozların pH değerleri arasında önemli bir fark bulunmadığı tespit edilmiştir. Örneklerde kurutma sıcaklığı arttıkça toplam fenolik madde miktarı ve antioksidan aktivitesi yüksek kurutulmuş havuç tozu elde edilmiştir. 60°C sıcaklıkta yapılan kurutma sonunda yüksek karoten içeren toz ürünler elde edilmiştir. Bu çalışmanın sonucunda elde edilen bulgular ışığında, kolay uygulanabilir ve ekonomik bir yöntem olan köpük kurutma teknolojisi ile üretilen, kalite ve biyoaktif özellikleri yüksek havuç tozları, gıda endüstrisinde ara ürün olarak ya da tüketici için alternatif doğal katkı maddesi olarak kullanımının mümkün olabileceği düşünülmektedir.

Anahtar Kelimeler: Havuç, Köpük kurutma, sebze tozu, toz özellikleri, renk, antioksidan özellikler, toplam karoten

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Different Cooking Techniques Used in Seafood

Pınar Oğuzhan Yıldız¹, Pakize Çalış Erümit²

¹Department of Fisheries and Seafood Processing Technology, Faculty of Fisheries, Ataturk University, Erzurum, Turkey

Abstract

Consumption of seafood has an important place in nutrition. Aquaculture is important for a healthy life and a balanced diet. Seafood is a food that is both nutritious and easy to digest, and it is a basic food that should be found in every table especially in terms of nutrition. It is also very beneficial for human health in terms of the nutritional components it contains. Fish is an extremely rich source of protein. 100 grams of oily fish contains much more protein than meat in terms of protein. Apart from that, it is much richer than red meat in terms of minerals and vitamins it contains. Since fish meat has weaker connective tissue than red meat and chicken, it is cooked faster than these products. Therefore, the cooking time of the fish meat is shorter, and the fish should not be cooked longer than the required time. Otherwise, flavor losses occur and a bland taste emerges in the fish. The cooking method to be applied in cooking fish varies according to the type, shape and consumption habits of the fish. Some taste better when fried, some boiled, and some cooked dry or wet. In addition, the cooking methods to be applied to the fish may vary according to the fish types in line with the demands and eating habits of the consumers. Therefore, it is very important to use the right cooking technique for the fish at the right time. In this review, different cooking techniques used in seafood will be discussed.

Key Words: Seafood, nutrition, cooking, flavor, tüketim

Su Ürünlerinde Kullanılan Farklı Pişirme Teknikleri

Özet

Beslenmede su ürünleri tüketimi önemli bir yere sahiptir. Sağlıklı bir yaşam ve dengeli beslenme için su ürünleri önem taşımaktadır. Su ürünleri hem besleyici hem de sindirimi oldukça kolay bir gıda olup, özellikle besleyiciliği açısından her sofrada bulunması gereken temel bir besindir. İçerdiği besin bileşenleri bakımından insan sağlığı açısından da oldukça faydalıdır. Balık eti özellikle protein açısından oldukça zengin bir besin kaynağıdır. 100 gram yağlı balık protein açısından kırmızı etten çok daha fazla protein içerir. Bunun dışında içerdiği mineral ve vitamin açısından da kırmızı etten çok daha zengindir. Balık eti, kırmızı et ve tavuğa göre daha zayıf bağ dokusuna sahip olması nedeniyle bu ürünlere göre daha çabuk pişmektedir. Dolayısıyla da balık etinin pişirilme süresi daha kısa olmakta, balıklar gerekli süreden daha uzun süre pişirilmemelidir. Aksi halde lezzet kayıpları meydana gelmekte ve balıkta yavan bir lezzet ortaya çıkmaktadır. Balık pişirmede uygulanacak pişirme yöntemi balığın cinsine, şekline, tüketim alışkanlığına göre farklılıklar arz etmektedir. Bazıları kızartıldığında bazıları haşlandığında bazıları kuru veya yağ şeklinde pişirildiğinde daha lezzetli olabilmektedir. Ayrıca tüketicilerin istekleri ve yeme alışkanlıkları doğrultusunda balık çeşitlerine göre balıklara uygulanacak pişirme yöntemleri değişiklik gösterebilmektedir. Bu nedenle balığa doğru zamanda doğru pişirme tekniğini kullanmak oldukça önemlidir. Bu derleme ile su ürünlerinde kullanılan farklı pişirme tekniklerine değinilecektir.

Anahtar Kelimeler: Su ürünleri, beslenme, pişirme, lezzet, consumption

Giriş

Ülkemiz üç tarafı denizlerle çevrili bir yarımada konumunda olup, göller ve akarsularca da oldukça zengindir. Turizm açısından değerlendirildiğinde insan gereksinimlerinin karşılanması oldukça önem arz temektedir. Deniz ve her çeşit su ürünlerinin bolca bulunduğu ülkemizde su ürünleri beslenme açısından önemli bir yere sahiptir (Anonim 2011). Balık eti hem besleyici değeri yüksek hem de sindirimi oldukça kolay bir besindir. Özellikle besleyiciliği açısından her sofrada bulunması önem taşımaktadır. İçerdiği protein, mineraller, yağ asitleri ve yağ içeriği bakımından insan sağlığına oldukça faydalı bir gıda maddesidir.

Son dönemlerde özellikle balık, sofraların en fazla tercih edilen besinlerinden birisi olmaya başlamıştır. Özellikle koronavirüs salgını ile bağışıklık sisteminin öneminin anlaşılması ve uzmanların Omega-3, D vitamini ve minerallerin beslenmemizde değerli olduğunun altını sık sık çizmesi balığı her zamankinden daha fazla tüketilir hale getirmiştir. (Anonim 2021 a). Bağışıklık sisteminden kalp sağlığına, kemik ve kas gelişiminden zihinsel fonksiyonlara vücudumuza birçok yararı bir arada sağlayan balıkları en yüksek besin değeriyle tüketmek için

doğru şekilde pişirmek oldukça önemlidir. Balık türlerine göre doğru pişirme yöntemlerinin uygulanması ile daha lezzetli balıklar tüketilebilir (Anonim 2021b).

Balıklar nadiren çiğ olarak tüketilirler. Genellikle çeşitli yöntemlerle pişirilebilirler. Ancak balığın pişirme süresi diğer gıda maddelerinden farklıdır. Pişirme yöntemleri; bir besin maddesinin yenilebilir hale getirilmesi bakımından çok önemlidir. Balık eti bağ dokusunun zayıflığından dolayı daha çabuk pişmektedir. Bu yüzden balık eti gereğinden fazla pişirilmemelidir. Hem kuru ısıda, hem de nemli ısıda pişirilebilmektedir. En iyi lezzeti ve görünümü sağlamak için balık eti kısa süre pişirilmelidir. Fırında kızartma, fırında nemli ısıda pişirme, ızgara, az veya çok yağda kızartma gibi yöntemlerinin hepsi balıklara rahatlıkla uygulanabilir. Kişilerin istekleri ve yeme alışkanlıkları doğrultusunda balık çeşitlerine göre balıklara uygulanacak pişirme yöntemleri de değişiklik gösterebilmektedir. (Anonim 2011; Başhan 2019).

Balık çeşitleri, menüye zenginlik kazandırır. Eskiden beri özellikle denize kıyısı olan ülkeler su ürünlerinden yeterince yararlanmakta ve bu sayede daha ucuz beslenme imkânı bulmaktadırlar (Anonim 2021 c).

Türk mutfağında su ürünleri kültürünün yaygınlaştırılması bu bağlamda oldukça önem arz etmektedir. Bu derleme ile su ürünlerinde kullanılan farklı pişirme teknikleri hakkında bilgiler verilecektir.

Su Ürünleri Pişirme Yöntemleri

Balık pişirmede pişirme yöntemi balığın cinsine, şekline, tüketme alışkanlığına göre farklılık göstermektedir. Bazıları kızartıldığında bazıları haşlandığında bazıları kuru veya yağ şeklinde pişirildiğinde daha lezzetli olmaktadır. Balığa doğru zamanda doğru pişirme tekniğini kullanmak oldukça önemlidir. Su ürünlerine uygulanan pişirme teknikleri şu şekildedir (Başhan 2019):

1. Tütsüleme (Füme)
 - a) Soğuk Tütsüleme
 - b) Sıcak Tütsüleme
 - c) Sıvı Tütsüleme
2. Suda pişirme yöntemi (Boiling)
 - a) Buğulama Yapmak (Steaming)
 - b) Haşlama (Poche)
3. Yağda kızartma yöntemi (Frying)
 - a) Az Yağda Kızartma yöntemi (Sote)
 - b) Orta Yağda Pişirme (frying medium oil)
 - c) Bol Yağda Kızartma (deep frying)
4. Kuru Isıda Pişirme Yöntemi
 - a) Fırında Pişirme (In oven)
 - b) Izgarada Pişirme (Grilling)
5. Mikrodalgayla Pişirme Yöntemi (Mikrowave)
6. Sous-Vide Pişirme Tekniği

1. Tütsüleme

Tütsüleme belirli yöntemlerle tuzlanmış taze balıkların duman içerisinde elde edilen ürünlerdir. Tütsüleme işleminde değişik yöntemler uygulanmaktadır. Bu yöntemler geleneksel tütsüleme (sıcak ve soğuk tütsüleme), elektrostatik tütsüleme ve sıvı tütsülemedir (Oğuzhan ve Yangılar 2013).

a) Sıcak Tütsüleme: Sıcak tütsüleme odun talaşının yanması sonucu ortaya çıkan sıcak dumanın etkisinde ürünün pişirilmesi işlemidir. Bu yöntemde balık 50-80°C arasındaki yüksek sıcaklıkta 3-8 saat arasında pişirilmektedir. Tuz oranı az, su oranı fazla olduğu için ortaya çıkan ürün daha lezzetlidir (Kolsarıcı ve Özkaya, 1998; Alçiçek 2010).

b) Soğuk Tütsüleme: Bu teknik sıcak tütsüleme ile benzer aşamalara sahip olup, sıcaklık 20-30°C arasında gerçekleştirilmekte ve uygulamada hiçbir zaman sıcaklık 30°C'yi aşmamaktadır. Bu yöntemde tütsüleme süresi birkaç saatten birkaç güne kadar değişebilmektedir (Kolsarıcı ve Özkaya, 1998).

c) Sıvı Tütsüleme: Sıvı tütsüleme işleminde, sıvı tütsü maddesi ürüne daldırma ve püskürtme yollarıyla verilerek ürünün pişirilmesi esaslarına dayanmaktadır. Sıvı tütsüleme maddesi su ile sirke veya sitrik asitle seyreltilmektedir. Genellikle %20-30 sıvı tütsü maddesi, %5 sirke veya sitrik asit, %65-75 su karıştırılarak elde edilir (Kundakçı 1979).

d) Elektrostatik Tütsüleme: Elektrostatik tütsüleme işleminde tütsü çöktürücünden geçtikten sonra elektrikle yüklü bir ortamdan geçerek (-) yükle yüklenmekte ve (+) yükle yüklenmiş balık eti tarafından tutulmaktadır (Alçiçek 2010).

2. Suda Pişirme Yöntemi

a) Buğulama: Balığın sıcak suya temas ettirilmeden sadece kaynayan suyun buharına maruz bırakılarak pişirildiği yöntemdir. Bu teknikle pişen balıklar sularını çok fazla kaybetmezler ve aynı zamanda besin değerlerini de en fazla korudukları pişirme tekniğidir (Başhan 2019).

b) Haşlama (Poche): Kaynamaya yakın derecede ama kaynamayan suda balıkların pişirilmesi tekniğidir. Bu teknikle sert etli balıklar kolayca pişirilir yumuşak etli balıklar ise sıcak suda çabuk dağılma eğilimleri sebebiyle bu yöntemle pişirmeye uygun değildir. Özellikle az yağlı ve yağsız balıklar tercih edilir. Çok yağlı balıklar bu teknikle pişirildiği takdirde ağır ve hoş olmayan bir lezzete sahip olmaktadır. Çeşitli salatalarda, soğuk ordövrlerin hazırlanması işlemlerinde (balık kokteyl ve çeşitli karışık deniz mahsülleri kokteyli) ve uygun sos ve garnitürler kullanarak farklı balık yemeklerinin hazırlanmasında kullanmak amaçlarıyla haşlama yöntemi tercih edilmektedir (Anonim 2011; Dilmec 2021).

3. Yağda Kızartma

a) Az Yağda Kızartma: Izgarada pişirmeye bir alternatif olarak ortaya çıkmış bir pişirme yöntemidir. Bu yöntemle balıklar çok az yağ konulmuş kızgın tavada kızartılmaktadır. Bu yöntemle özellikle Karadeniz bölgesinde balıklar mısır ununa bulanmak suretiyle tavaya dizilir ve az yağda kızgın tavada kızartma yapılır. Bu teknikle pişmeye uygun bazı balıklar; sardalya, hamsi, mezgıt, palamut, çinekop, istavrit, barbun vb.

b) Bol Yağda Kızartma (deep frying): Fritöz veya evlerimizde kızartma tenceresi içerisinde derin yağda pişirme yaptığımız bir kızartma işlemidir. Genellikle yağsız balıkların pişirilmesi için uygun bir yöntemdir. Böylelikle pişen balıklar ağır olmaz ve sindirimi daha kolay olur. Yağlı balıklarda yağsız oldukları dönemde bu teknikle pişirmeye uygundur. Balıklar tuzlanıp pane yapılarak veya Poelle yönteminde olduğu gibi kaplanarak da kızartılabilir. Yağda kızartma işleminde kullanılan yağ tekrardan kullanıma uygun değildir. Bu teknikle pişirilen balıklar piştiklerinde altın sarısı renkte olmalıdır, fazla pişmeleri halinde ağır bir yağ tadı oluşur ve sindirimi zorlaşır. Hamsi kızartma, hamsi dolması, hamsi kuşu, istavrit vb. balıklar bu yöntemle pişirilmeye uygundur (Anonim 2011; Başhan 2019).

4. Kuru Isıda Pişirme

a) Fırında Pişirme (In oven): Bu teknikle pişen balıklar kendi suyuyla, yanında sebze gibi ek bir malzemeye pişirilirler. Ortalama 160-180 °C’de yaklaşık 2-5 dakika arasında orta kalınlıktaki bir balık yeterli derecede pişmektedir. Tabi ki bu durum balığın büyüklüğüne ve fırının durumuna bağlı olarak değişir. Bu işlem yağda kızartmaya göre daha hafif olur ve besin içeriğini daha fazla korur. Levrek, palamut, çipura gibi büyük balıklar ve hamsi buğulama şeklinde pişirme yapılmaktadır.

b) Izgarada Pişirme (Grilling): İçten içe yanan kömür üzerinde ızgaraya dizilmiş ürünün pişirilmesi tekniğidir. Kömür olarak genelde meşe kömürü kullanılır. Bunu başlıca sebepleri; kolayca kor haline gelmesi, uzun süre kor halinde kalabilmesi, enerjisinin yüksek olması ve pişirilen ürünler üzerinde bıraktığı hoş lezzet ve kokudur. Bu yöntemle pişen ürünler çok fazla kurutulmamalı ve yanmamasına özen gösterilmelidir, bekletilmeden servis edilmelidir. Genelde yağlı balıklar ve yağsızlarda olmak üzere birçok balığın en lezzetli servise sunulduğu pişirme şeklidir. Büyük balıklar deri ve kemikten ayrıldıktan sonra küçük balıklar ise genel olarak kılıçından ayrılarak pişirme yapılmalıdır. Balıklar ızgaraya atılmadan önce marine edilebilir ve bu marinasyon işlemi balığa olumlu özellikler kazandırmaktadır. Balıkların pişeceği ızgara kızgın olmalıdır aksi halde balıklar ızgaraya yapışabilir. Kırmızı ete göre pişmesi balık etinin daha gevşek olması sebebiyle daha hızlıdır. Kılıç balığı, çinekop, lüfer, palamut ızgarası en meşhur ve lezzetli balıklardır. Pisi balığı gibi balıkların fileto ızgaralarında oldukça lezzetlidir (Babür ve Gürbüz 2015).

5. Mikrodalgada Pişirme (Mikrowave)

Mikrodalga fırınlar; pişirme, kurutma, ısıtma, pastörizasyon, sterilizasyon, buz çözme, temperleme gibi amaçlar doğrultusunda çokça tercih edilmektedir. Daha çok ön pişirme amacıyla kullanılmaktadır. Üründe kabuk oluşumu ve yüzey esmerleşmesi konusunda yetersiz olması sebebiyle ön pişirme için daha uygundur (Konak vd. 2009).

6. Sous-Vide Pişirme Tekniği

Sous-vide tekniği ilk olarak Fransa’da geliştirilmiş olup “vakum altında” anlamına gelmektedir. Bir ürünün ısıya dayanıklı poşetler içerisinde vakum ambalajlanarak kontrollü sıcaklık ve zaman altında bir su banyosu içerisinde pastörize edilerek pişirilmesi tekniğidir. Bu teknikle gıdalar daha uzun süre ve kaliteli bir şekilde yenilecek zamana kadar muhafaza edilmektedir. Pişirmek istenen gıda ürünü, yan ürünleri ve baharatları ile birlikte ısıya dayanıklı vakum poşet içerisinde birlikte düşük sıcaklıkta uzun süre pişirilir. Bu şekilde pişirilen ürün iki şekilde tüketilir; Vakum ambalajlanarak pastörize edilen ürün servise hazırlanır ve servis edilir. Ürün vakum ambalajlanır, pastörize edilir, hızlıca soğutulur, buzdolabında veya derin dondurucuda muhafaza ve daha sonra servis edileceği esnada ısıtılarak servis edilir. Bu tekniğin uzun raf ömrü sağlama ve pratik olması hazır yemek endüstrisinde çokça kullanılmasının önünü açmaktadır (Baltalı 2019; Yıldız ve Yılmaz 2020).

Kabuklu ve Kabuksuz Su Ürünlerinde Pişirme Teknikleri

Bu ürünler doğru pişirme tekniği uygulandığı takdirde hem damak zevkine hem de göz zevkine hitap eden ürünlerdir. Daha çok zengin davet sofralarında yer almaları bu ürünlerin fiyat açısından balıklara nazaran daha fazla olduğunu gösterir. Bu ürünlerde aynı balıklar gibi yüksek besin değerine sahiplerdir ve balıklar da olduğu gibi aynı besin elementlerinin hepsini içerirler. Protein ve mineral madde bakımından oldukça zengin ürünlerdir. Besleyicilik açısından zengin bu ürünleri taze olarak temin etmek ve tüketmek gerekmektedir. Kabuklu ve kabuksuz su ürünleri mutfakların ve menülerin en gözde ve görkemli yiyecek gruplarını oluşturmaktadırlar. Protein, mineral madde, yağlarla ve vitaminlerce zengin ürünlerdir. Soğuk, sıcak, ana yemek, kokteyl, meze ve salataların hazırlanmasında kullanılırlar. Haşlama ve buharda pişirme ile diyet yemeklerine alternatiftir (Anonim 2011).

Haşlama (Boiling): Kabuklu su ürünleri, ahtapot ve su ürünlerinin yanında servis edilen garnitürlerin hazırlanmasında kullanılır.

Poelle Pişirme: Izgaranın olmadığı durumlarda ıstakoz, böcek, kerevit gibi kabuklu ürünlerin pişirilmesinde kullanılır.

Poche Pişirme: Kaynama hareketinin ürünün şeklini bozacağı düşünüldüğü ürünler kaynamaya yakın ama kaynamayan su içerinden pişirilir.

Soute Pişirme: Az yağ konulmuş kızgın tavada hızlı şekilde pişirme tekniğidir. Tavaya konulan yağın sıcaklığı 150-200 °C olmalıdır, daha düşük ve yüksek sıcaklıklarda istenilen sonuç alınmaz. Haşlama işleminden sonra ürün bu şekilde pişirilmeye devam edilebilir. İstiridye ve tarak natürel olarak servis edilmeyecekse bu yöntemle pişirilebilir. Bu teknik güveçte pişirme için bir ön pişirme olarak da düşünülebilir. Karides, ıstakoz gibi ürünler güvece hazırlık aşamasında bu yöntemle hazırlanabilirler.

Buğulama (Etuve Vapeur): Daha çok diyet yemeklerin pişirilmesinde kullanılır buharda pişirme tekniğidir. İç midye hazırlanmasında, ıstiridye, tarak gibi ürünlerin pişirilmesinde, ıstakoz, böcek gibi ürünlerin hazırlanmasında ve salatada kullanılacak ürünlerin hazırlanmasında tercih edilebilir.

Kendi Suyunda Pişirme (Etuve): Ürünlerin kendi suları içerisinde pişirilmesi işlemidir. Yağ, tuz, baharat vb. ürünlerinde eklenmesiyle ocakta veya fırında pişirilmesi işlemidir.

Fırında Kuru Isıda Pişirme: Ürünler bu yöntemde daha önceden ısıtılmış fırınlarda pişirilirler. Bu yöntemde fırının ısısı pişirilecek ürüne özgü olmalıdır. ıstakoz, böcek ve yengeçlerin pişirilmesinde bu yöntem kullanılmaktadır.

Izgarada Pişirme (Grille): Bu teknikle kabuklu ve kabuksuz su ürünlerinin çoğu pişirilebilmektedir.

Bol Yağda Kızartma (Frit): Kalamar, ahtapot ve midye panelleri gibi yiyeceklerin pişirilmesi için uygundur.

Gratine: Diğer pişirme teknikleri ile hazırlanmış ürünlerin son olarak diğer garnitürleri ile tekrar fırına sürülüp kızartılması işlemidir (Anonim 2021d).

Sonuç olarak; balığın protein ve yağ asidi oranını azaltmamak için pişirme yöntemlerine dikkat edilmesi gerekmektedir. Balıktan istenilen verimin ve lezzetin alınması için en uygun pişirme yönteminin uygulanması önemlidir. Çeşitli yöntemlerle balık eti pişirilebilir. Ancak balığın pişirme süresi diğer gıdalardan farklı olduğu için gereğinden fazla pişirmemelidir. Aksi takdirde lezzeti kaçmakta ve yavan bir tat oluşmaktadır. Balığa doğru zamanda doğru pişirme tekniğinin uygulanması gerekmektedir. Ayrıca balık çeşitleri, menüye zenginlik kazandırması açısından da önemlidir. Özellikle denize kıyısı olan ülkeler su ürünlerinden yeterince yararlanmakta ve bu sayede daha ucuz beslenme imkânı bulmaktadırlar. Türk mutfağında su ürünleri kültürünün yaygınlaştırılması bu bağlamda oldukça önem arz etmektedir.

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Good Agricultural Practices in Beekeeping

Nuray Şahinler ¹, Nesibe Özge Toy²

¹Uşak University Faculty of Agriculture and Natural Sciences, Department of Animal Science

²Uşak University Graduate Education Institute / Department of Animal Science

Abstract

Environmental and chemical pollution, which has increased in recent years, makes it difficult for people to obtain clean and safe food for a healthy diet. Especially with the effect of the global epidemic surrounding the whole world, it has been understood that it is extremely important for individuals to eat healthily as well as nutrition. With the effect of changing conditions, reliable and clean practices have been implemented in order to prevent the pollution experienced in agricultural production. The Good Agricultural Practice, which includes the stages from the field to the table, is one of the projects implemented. It is important for all livestock branches to consume healthy foods. However, one of the most important features that distinguishes beekeeping from other livestock branches is that it is a livestock branch that is carried out depending on nature, and beekeeping is carried out in araxi conditions. For this reason, bee products face many risk factors from the hive to the table. It is directly or indirectly exposed to many factors such as heavy metals, antibiotics, microbiological contamination, and peptide residues. It is possible to prevent such problems with good agricultural practices in beekeeping. In good agricultural practices in beekeeping, there are many applications such as choosing the beekeeping site, working with bee breeds suitable for the region, having received beekeeping education, having sufficient knowledge and experience, reducing the use of pesticides, knowing the times of peptide spraying in the region. It is important that bee products, which have many benefits for natural and human health, are produced under good agricultural practices. In this study, good agricultural practices in beekeeping are mentioned.

KeyWords: Food, Beekeeping, Quality

Introduction

The increase in the world population has made it necessary to make more production in the agriculture and livestock sector to meet the needs of people. With the increasing population from year to year, there has been a trend towards mechanization in agriculture by showing development in industry. In order to meet the requirements, the use of chemical inputs such as fertilizers and pesticides has increased in order to increase production in agriculture quickly and without losses (Hasdemir, 2011).

The intensive use of chemical inputs started to harm natural resources after a while. Especially in the 1970s, natural resources were overloaded. In this case, it has brought environmental problems. However, these problems have been ignored for many years. Especially after the Second World War period, the main subject of all countries was unemployment, accelerating economic development, controlling inflation were among the priority issues in the states. Therefore, weight has been shown to increase production (Dulupçu, 2000). Disruption of the neglected human-nature balance against nature has revealed intensive agricultural activities. Because environmental problems that will occur will bring along many social and economic problems such as decrease in production in agriculture, increase in foreign dependency in production, increase in migration from rural areas to cities and population imbalances. Later, people turned to practices such as organic agriculture and good agricultural practices to reduce these risks (Dişbudak, 2008). In the application called Good Agricultural practices, it is defined as a system that will be beneficial for the development of the rural area, sustainable and where the agricultural production and marketing stages can be monitored (Anonymous, 2019). Good agricultural practices are the management of the relationship between agriculture and the environment in a way that is carried out in a balanced way and that it can be used in the future in its natural resources. In addition, it is the production of farmers' products with reliable methods for the market, that is, for the consumer (Pongvinyoo, 2015, Eryılmaz and Kılıç, 2018).

Food reliability, which has become increasingly important all over the world, is ensured by practices such as good agricultural practices. While increasing the product yield by considering future generations in all sectors, the use of systems that do not harm humans, plants, animals and the environment is an important step for the future of humanity (Doğan, 2017).

Beekeeping and Good agricultural practices

Beekeeping is a branch of agriculture that is completely dependent on nature and provides economic gain with less capital and labor. The history of beekeeping goes back many years. Many products are produced by beekeeping. The most important and most consumed honey is one of them. Apart from this, many products such as beeswax, pollen, propolis, royal jelly, bee venom are produced by beekeeping. With the developing technology, chemical

industry, and increasing world population in recent years, food safety has become important in the beekeeping sector. Food safety is of great importance in the beekeeping sector, as the residue problem, especially in honey production, has a negative impact on both economic exports and human health.

Bee products are not products that can be washed, cleaned or sorted like agricultural products like other livestock products. For these reasons, the purity and cleanliness of the products obtained from beekeeping is one of the issues that should be emphasized (Doğaroğlu, 2012).

In this branch, which is completely dependent on nature, beekeeping activities are faced with security threats. Agricultural pesticides, heavy metals and biologicals are under many threats. Again, there are threats such as drugs used against diseases and pests in the colony caused by beekeepers, honey-like products (fake honey) originating from non-benevolent producers, and beeswax additive in honey (Çukur et al., 2016).

Good beekeeping practices are an application carried out to ensure sustainability and traceability and food safety in beekeeping with a production method that does not harm nature, the environment and human health (Şahinler and Yücel, 2017).

Within the scope of the regulation published by the Ministry of Agriculture and Forestry within the scope of Good Agricultural Practices, the points to be considered for Good Agricultural Practices in Beekeeping have been compiled. According to this;

1. Before applying Good Agricultural Practices in beekeeping, authorized institutions should be consulted.
2. After applying to the authorized institution for Good Agricultural Practices, the production process must be recorded.
3. The operations performed during production should be recorded by the beekeepers and kept for later controls. These records should contain information such as the type of beekeeping product, the geographical region where the product is produced, the time of drug application, the reason for application, the trade name of the drug used, the amount and method of application, the number of days after the application, the feeding method and the amount.
4. Bee breeds to be used within the scope of good agricultural practices should be resistant to diseases, if possible, strong colonies should be used in production,
5. Care should be taken to have a healthy and reliable water source near bee colonies. If it carries a risk, the water source should be analyzed by the relevant institutions.
6. In the fight against diseases and pests, first of all, mechanical control, biological control or biotechnical methods should be applied in line with integrated control techniques, and chemical control should be applied as a last resort. However, chemical control should be done before the production season or after the harvest.
7. Records should be kept of all pesticides applied and all drugs used. Pesticide residue analyzes should be done and necessary precautions should be taken since the maximum residue limit has been reached.
8. Harvest should be done under hygienic conditions. It is necessary to produce, store and market beekeeping products in accordance with the technique.
9. Beekeeping products produced in this way should be certified by the institutions authorized by the Ministry of Food, Agriculture and Livestock with a good agricultural product certificate.

Appropriate care and feeding methods are required to protect against diseases and pests, which are an important part of good agricultural practices in beekeeping. In other words, the hive combs should be renewed regularly, the queen bee should be renewed from strong disease-resistant hives, the tools and equipment to be used should be disinfected before and after each use, the hives should not be fed with spores-contaminated honey and pollen, and the hives should be placed close to water sources and in a suitable environment.

It is recommended to use aromatic vegetable oils (cinnamon, lemon, thyme or their mixtures) against American foulbrood diseases, which are also among bee diseases. Organic acids (formic acid, oxalic acid and lactic acid), oils obtained from plants and maintenance-management techniques are used in the control of Varroa, which is one of the important pests of beekeeping. Because the applications made with organic acids do not create residues in honey and beeswax and do not have a negative effect on the queen bee, adult bee and brood population.

Another important point is that pesticide applications used against plant diseases and pests cause great harm to bees. Especially in recent years, there are products that are defined as bee-friendly and can be used within good beekeeping practices. These products are effective against diseases and pests of plants, and they do not threaten the lives of honey bees and leave no residue. It is important to use bee-friendly drugs if we have apiary at the points where plant production is made within the scope of Good Agricultural practices in beekeeping (Şahinler and Yücel, 2017).

Results and Discussion

It is important to produce reliable products for human health in all products obtained from agriculture and livestock. Many factors such as developing technologies in the world, changing living conditions, increase in human capital and the development of consumption awareness have been important factors in increasing the demand for food products. As a result of the increasing demand for food with the increasing population, production has been increased and good agricultural practices have been implemented, which are beneficial for human health and have no harmful effects on the environment and nature, taking into account the environmental damage of the products produced by convection agriculture. Good agricultural practices provide people with safe food consumption opportunities by recording every stage of production. Beekeeping, which is one of the branches of agriculture, produces nutrients that are beneficial for human health, and 90% of the foods we consume are natural pollinators. For this reason, Good Agricultural Practices are very important for both food and agricultural products and beekeeping. With the widespread use of pesticides in the fields, the lives of many bee colonies in the world come to an end. It is among the important things to be taken that the drugs used in Good Agricultural Practices are bee-friendly and this practice should be disseminated. Again, with Good Agricultural practices in beekeeping, many food products such as royal jelly, bee venom, honey and propolis, which are important for human health, can be produced without any residue problem. The dissemination of Good Agricultural Practices in beekeeping for the increasing population and increasing food demand and competitive production will provide positive benefits to both human health, the country's economy and our beekeepers.

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Arbuscular mycorrhizal fungi in the presence of composted rock phosphate fed dung improve the growth and phosphorus uptake of mung bean plants

Fazli Wahid

Department of Agriculture, University of Swabi, Pakistan

Abstract

Inoculation effect of arbuscular mycorrhizal fungi (AMF) on phosphorus (P) transfer from composted dung of cattle with a diet supplemented with powdered rock phosphate (RP) and their successive uptake by mung bean plants was assessed in alkaline soil. The efficacy of composted RP fed dung alone or/and in combination with AMF inoculums containing six different species were compared with SSP in six replicates per treatment in pots. The results showed that the association of AMF with composted RP fed dung had a positive effect on mung bean shoot (3.04 g) and root (2.62 g) biomass, chlorophyll (a, b), carotenoid contents and N (58.38 mg plant⁻¹) and P (4.61 mg plant⁻¹) uptake. Similarly, the percent roots colonization (56%) and nodulation of mung bean plant roots and their post-harvest soil properties were also improved by the inoculation of AMF together with composted RP fed dung. It is concluded that the combined application of AMF with composted RP fed dung has almost the same effect as SSP for improving mung bean plants growth and their nutrients uptake. Moreover, AMF inoculants can be used as a suitable biofertilizer in combination with locally available organic sources of fertilizers for improving P status and growth of plants in alkaline soils.

Key Words:

Adsorptive Removal Of Methylene Blue Aqueous Solution Using

Saeed Ullah Jan

Department of Chemistry, Chakdara Lower Dir, 18800, University of Malakand, Pakistan

Abstract

In the present study, modified sawdust was used for the removal of an azo dye Methylene Blue (MB) from aqueous solutions. The study was carried out in batch mode. Effects of various important parameters such as pH, concentration, temperature, dose and agitation speed on the removal of the dye were investigated for optimization of the process. It was observed that the maximum removal of 99.5 % was achieved at the lowest dye concentration of 75PPM. The process of removal was found to be endothermic in nature. Adsorption of Methylene Blue on modified sawdust was rapid and in accordance with pseudo-2nd -order kinetics. The Langmuir isotherm model agrees well with the sorption isotherm data and also confirms that adsorption took place on the homogenous surface of modified sawdust. The adsorption capacity (Q_{max}) was determined from Langmuir isotherm and was found to be 5.464 mg g⁻¹. The thermodynamics parameters like ΔG , ΔH , ΔS are found to be 30.057 kJmol⁻¹, 44.089 kJ mol⁻¹ and 0.0514 kJmol⁻¹K⁻¹ respectively, revealing that the adsorption process is spontaneous, endothermic and feasible. Therefore, the study recommends that modified sawdust is a promising candidate for the efficient removal of dye-contaminated wastewater.

Key Words:

Oxidative Stress Associated With Exercise And Nutrition

Alamgir Khan Qureshi, Muhammad Zafar Iqbal

Punjab University, Pakistan

Abstract

This study aimed to examine oxidative stress associated with exercise and nutrition. 60 participants were randomly selected by using international physical activity questionnaire (IPAQ) and thus the participant were categorized as low intensity exercise performers (EG-I=20), High intensity exercise performers (EG-II=20) and subjects performing no exercise (CG=20). 5ml blood was collected from all subjects. Ferric reducing assay protocols (FRAP) was performed for the assessment of oxidative stress associated with exercise and food. The data obtained through FRAP assay were processed through statistical package for social sciences (SPSS) version 23 and thus different statistical tools i.e. mean, standard deviation and T-score were used for the analysis of data. On the basis of findings the researcher concluded that low-intensity exercise without nutritional supplementation cause acute oxidative stress. Likewise high intensity exercise without nutritional supplementation cause chronic oxidative stress which adversely affect the whole body functions.

Key Words: Exercise, Nutrition, Health

Study on cheese storage conditions and survival of bifidus in time temperature conditions

Usman M. Khan^{*1}, Aysha Sameen¹, Hafiz.Muhammad Arslan Amin², Zeliha Selamoglu³, Mehwish Arshad¹, Saba Anwar¹

¹Faculty of Food, Nutrition & Home Sciences, National Institute of Food Science and Technology, Faisalabad, Pakistan.

²Department of Dairy Technology, University of Veterinary and Animal Sciences, Lahore, Pakistan.

³Department of Medical Biology, Faculty of Medicine, Nigde Omer Halisdemir University, Turkey.

Abstract

The goal of the study was to see how different ripening temperatures (4 and 8°C) affected the survival of probiotic microorganisms after 24 weeks of ripening. *Lactobacillus casei*, *Lactobacillus acidophilus*, and *Bifidobacterium animalis* subsp. *lactis* were utilised as adjuncts in the manufacturing of Cheddar cheeses from buffalo milk. The cheeses were then aged for 24 weeks at 4 and 8 degrees Celsius. The effects of ripening temperatures on the survival of starter lactococci and probiotic bacteria, cheese pH and composition, and organic acid generation were investigated. At 24 weeks, the counts of starter lactococci in *B. animalis*, *Lb. casei*, or *Lb. acidophilus* cheeses matured at 8 °C were considerably lower than those ripened at 4 °C (P 0.05). Increasing the ripening temperature from 4 to 8 degrees Celsius had no effect on the probiotic microbes' survivability, as well as the salt, fat, and protein content of the cheeses after 24 weeks of ripening. This study demonstrates that having Cheddar cheese with high nutritional content for health benefits necessitates careful selection of probiotic bacteria.

Key words: Cheddar cheese, bifido-bacterium, survival, Nutritional Value.

Investigation of Antimicrobial Effects of Some Extracts

Eda Kılıç Kanak^{1*}, Suzan Öztürk Yılmaz¹, Mekiye Yavuz¹

¹Sakarya University, Faculty of Engineering, Department of Food Engineering, Sakarya, Turkey

Abstract

Plants are the producers of various effective secondary metabolites which are the active ingredients of herbal medicines. There are plenty of reports in the literature about the antibacterial activity of plant extracts. Plant-derived substances have been used from decades owing to their versatile applications in vector borne diseases, fungal infection, diabetes and many more life threatening ailments. The purpose of this study is to investigate the antimicrobial effects of some extracts on the market, such as foodborne pathogenic bacteria and yeast such as *Candida albicans*, *Saccharomyces cerevisiae*. In this study, the antimicrobial effects of 8 different extract (cinnamon extract, fig extract, flos tiliae extract, vanilla extract, ginger extract, mulberry extract, bourbon vanilla extract, licorice extract) on 8 different microorganisms (*Salmonella enteritidis*, *S. typhi*, *Listeria monocytogenes*, *Escherichia coli*, *Staphylococcus aureus*, *Cronobacter sakazakii*, *Candida albicans*, *Saccharomyces cerevisiae*) were examined. In study, antimicrobial effect was investigated by Disk Diffusion Method. The concentration of bacteria (10^6 - 10^8 cfu / g) was set with DEN-1B. As a result of the experiments, it was observed that the extracts showed antimicrobial effect at different rates on some bacteria and yeast. Cinnamon extract, fig extract, flos tiliae extract, vanilla extract, ginger extract and mulberry extract were effective antimicrobial activity on *S. enteredis* at zone diameters ranging from 16 to 19 mm. Ginger extract, fig extract and bourbon vanilla extract showed antimicrobial activity on *S. typhi* with 12 mm, 14 mm and 14 mm zone diameters, respectively. Cinnamon extract showed antimicrobial activity on *C. sakazakii* with 13 mm zone diameters and vanilla extract were observed antimicrobial activity on *E. coli* with 15 mm. Licorice extract has no effect on any microorganism. As a result; it has been determined that extracts with good antimicrobial activity may be beneficial in terms of reducing or preventing pathogens in these foods. It has been determined that they can be used as an alternative to the use of a synthetic additive.

Key Words: Antimicrobial activity, disc diffusion method, extracts, pathogens

The effects of vermicompost applications on some yield and quality of San Andreas (*Fragaria x ananassa* Duch) strawberry variety

Erdem Asaf Develi¹, Ayşegül Yavuz¹, Ümmügülsüm Erdoğan²

¹Department of Organic Agricultural Management, Faculty of Applied Sciences, Bayburt University, Bayburt, Turkey

²Department of Food Engineering, Faculty of Engineering, Bayburt University, Bayburt, Turkey

Abstract

In this study, in which the effects of different applications of vermicompost on the yield and quality of San Andreas strawberry variety were investigated, 15, 30, 45, 60 g vermicompost was applied per plant. First flowering, first and last harvest dates, number of fruits per plant, yield per plant (g/plant), fruit weight (g), fruit flavor, macro and micro nutrient content, organic acid amounts were examined. The results showed that the differences between treatments in yield per plant were statistically significant. The highest total yield per plant was obtained from V45 and V30 applications with 972.8 g and 878.9 g, respectively, and the lowest yield was obtained from the control application with 384.2 g per plant. The largest fruits were obtained from the V60 (19.5 g) application. It was determined that nitrogen, phosphorus, potassium, magnesium, sulfur, manganese, iron, zinc and boron concentrations in the leaves of strawberry plants fertilized with vermicompost were higher than the control. The highest values in organic acid values were determined in oxalic, propionic, malonic, lactic, fumaric and succinic acids in V60 application (5.62, 11.16, 49.00, 104.98 µg/100 g, respectively). It seems that the application of vermicompost fertilizer in strawberry cultivation has a positive effect on yield and quality characteristics.

Key Words: Vermicompost, Yield, Organic acid, Mineral matter, Strawberry, San Andreas

Vermikompost uygulamalarının San Andreas (*Fragaria x ananassa* Duch) çilek çeşidinin bazı verim ve kalite değerlerine etkisi

Özet

Farklı oranda vermikompost uygulamalarının San Andreas çilek çeşidinin verim ve kalitesine etkilerinin araştırıldığı bu çalışmada, bitki başına 15, 30, 45, 60 g vermikompost uygulanmıştır. İlk çiçeklenme, ilk ve son derim tarihleri, bitki başına meyve sayısı, bitki başına verim (g/bitki), meyve ağırlığı (g), meyve tadı, makro ve mikro besin element içerikleri, organik asit miktarları incelenmiştir. Sonuçlar, bitki başına verimde uygulamalar arasındaki farklılıkların istatistiksel olarak önemli olduğunu göstermiştir. Bitki başına en yüksek toplam verim sırasıyla 972,8 g ve 878,9 g ile V45 ve V30 uygulamalarından, en düşük verim ise bitki başına 384,2 g ile kontrol uygulamasından elde edilmiştir. En iri meyveler V60 (19,5 g) uygulamasından elde edilmiştir. Vermikompost ile gübrelenen çilek bitkilerinin yapraklarında azot, fosfor, potasyum, magnezyum, kükürt, mangan, demir, çinko ve bor konsantrasyonlarının kontrole göre daha yüksek olduğu tespit edilmiştir. Organik asit değerlerinde en yüksek değerler okzalik, propionic, malonic, laktik, fumarik ve süksinik asitde V60 uygulamasında (sırası ile 5.62, 11.16, 49.00, 104,98 µg/100 g), belirlenmiştir. Çilek yetiştiriciliğinde vermikompost gübresi uygulamanın verim ve kalite özellikleri üzerine olumlu etkisi olduğu görülmektedir.

Anahtar Kelimeler: Vermikompost, Verim, Organik asit, Mineral madde, çilek, San Andreas

The Developmental Characteristics of *Bombus terrestris* L. (Hymenoptera: Apidae) Population in Ordu Province

Salim Aktürk¹, Ayhan Gösterit², Gökhan Akdeniz¹, Samet Okuyan¹, Ahmet Emir Şahin¹

¹Apiculture Research Institute, Ministry of Agriculture and Forestry, Ordu, Turkey

²Animal Science Department, Faculty of Agriculture, Isparta University of Applied Sciences, Isparta, Turkey

Abstract

Bumblebees constitute the most important group after honey bees in pollination. They are social creatures with interesting in-hive behavior. Determining the life cycle and the interactions between individuals is valuable for both preservation of the native bumblebee population and rearing under controlled conditions. In this study, two generations of queens belonging to a natural *Bombus terrestris* population that preserves its genetic purity in the Central Black Sea Region were reared under laboratory conditions to examine their developmental characteristics and suitability for mass production. The starting generation was formed by 100 *Bombus terrestris* queens. In the starting generation colonies, the queen and drones produced at the end of the life cycle were mated by being selected from different colonies. Queens mated were placed in a refrigerated incubator so that they could pass their diapause period. After diapause period queens were raised under equal conditions. Thus colonies belonging to the first generation were obtained. Characters studied; egg-laying time, timing of switch point, timing of competition point, and total numbers of individuals produced in colonies of the starting and first generation populations were determined. In these characteristics, difference between generations in the total number of workers and the averages of the total number of queens was found to be statistically significant ($p < 0.05$).

Key Words: *Bombus terrestris*, natural population, life cycle, mass production, diapause

Ordu İli Doğal *Bombus terrestris* L. (Hymenoptera: Apidae) Populasyonlarının Koloni Gelişim Özellikleri

Özet

Bombus arıları bal arılarından sonra doğada ve bitkisel üretimde tozlaşma görevini üstlenen en önemli böcek grubunu oluştururlar. Aynı zamanda yaban arısı formu olan ve doğal faunada yaşamını sürdüren *bombus* arılarının doğal populasyonlarına ait yaşam kalıpları ve koloni özelliklerinin belirlenmesi bir taraftan doğal populasyonların korunması açısından katkı sağlarken diğer taraftan bu arıların kontrollü koşullarda yetiştiriciliğinin sürdürülebilirliği açısından da değerlidir. Bu çalışmada Orta Karadeniz Bölgesi'nde genetik saflığını koruyan doğal bir *Bombus terrestris* populasyonuna ait ana arılar ile laboratuvar koşullarında iki generasyon yetiştiricilik yapılarak populasyona ait gelişim özellikleri ve kitlesel üretime uygunlukları incelenmiştir. Başlangıç generasyonunu Ordu İli doğal faunasından yakalanan 100 adet *Bombus terrestris* ana arısı oluşturmuştur. Başlangıç generasyonu kolonilerinde yaşam döngüsü sonunda üretilen ana ve erkek arılar farklı kolonilerden seçilmek suretiyle çiftleştirilmiştir. Diyapoz dönemi sonunda ana arılar benzer yetiştirme koşullarında yetiştirilerek birinci generasyona ait koloniler elde edilmiştir. Çalışma sonunda; başlangıç ve birinci generasyona ait kolonilerin ilk yumurtlama zamanı, dönüşüm noktası, rekabet noktası, toplam işçi, erkek ve ana arı sayıları belirlenmiştir. Belirlenen özelliklerden sadece toplam işçi sayısı ve toplam ana arı sayısı ortalamaları arasında generasyonlar arası farklılık istatistik olarak önemli bulunmuştur ($p < 0,05$).

Anahtar Kelimeler: *Bombus terrestris*, doğal populasyon, yaşam döngüsü, kitlesel üretim, diyapoz

Porous nanoplatforms in sustainable agriculture; promising tools for controlling pesticide delivery

Ali Zarrabi

Department of Biomedical Engineering, Faculty of Engineering and Natural Sciences, Istinye University, 34485 Istanbul, Turkey

Abstract

The abundant use of pesticides used in conventional agriculture leads to several adverse effects on both agricultural products and ecosystems (including living organisms and environment). Thus, it is critical to replace the conventional methods by a novel one in which the lowest dose of pesticides with the highest effect is delivered. It should be a low cost, ecofriendly and high performance method that could protect various agricultural species. In this context, nanotechnology could introduce effective methods for producing such systems via using nanomaterials as pesticides' carriers. Nanomaterials could also be engineered so that they control the release of the pesticides during a certain time at a certain amount leading to a sustainable agriculture. So far, several researches are conducted in this context and different types of nanocarriers are introduced. The aim of this presentation is to introduce different types of porous nanoplatforms (including mesoporous silica nanoparticles, meal organic framework (MOF), graphene based nanomaterials, and hybrid nanostructures) for controlled delivery of pesticides to crops, to describe their advantages over other types of carriers and to highlight their probable side effects.

Keywords: Sustainable agriculture, Pesticides, Porous nanostructure, Nanocarrier, controlled released

Genome-wide association studies (GWAS) revealed genetic basis associated with floral traits in potato germplasm

Abu Bakar Zia¹, Ufuk Demirel², Muhammad Azhar Nadeem³, Fawad Ali⁴, Mehmet Emin Caliskan⁵

¹Bahauddin Zakariya University, Bahadur Sub Campus, LAYYAH

²Nigde Omer Halisdemir University, Nigde, Turkey

³Faculty of Agricultural Sciences and Technologies, Sivas University of Science and Technology, Sivas 58140, Turkey

⁴Department of Plant Sciences, Quaid-I-Azam University, Islamabad 45320, Pakistan

⁵Nigde Omer Halisdemir University, Nigde Turkey

Abstract

Potato the major no cereal crop serves as a source of food around the globe. Recently, genome-wide association study (GWAS) analysis has become a handy tool to reveal different genetic basis of important plant traits by uncovering substantial association with trait of interest. Present study aimed to explore the phenotypic diversity and to identify the genetic basis associated with important floral traits. A total of 237 tetraploid potato genotypes were used as plant material and field experiments were conducted according to augmented block design for two consecutive years (2016, 2017). Analysis of variance for the studied floral traits reflected highly significant genotypic effects. Mean data for both years resulted significant variation for pistil length (5.53 to 9.92 mm), stamen length (6.04 to 9.26 mm), and pistil length above stamen (1.31 to 4.47 mm). Pearson's correlation analysis reflected highly significant and positive correlation of pistil length with stamen length ($r=0.42$) and pistil length above stamen ($r=0.28$). Principal component analysis was performed and the first two PCs were considered that accounted a total of 81.2% variation. Constellation plot divided the studied potato panel into two main populations on the basis of stamen and pistil length. A total of 12,720SNP markers were used for the marker-trait association and a total of 15 markers were found significantly associated with studied traits across both years. Identifying same markers across both years helped in the validation of the obtained marker-trait associations. The identified significant markers reflected some of the putative candidate genes that might be beneficial in potato breeding programs. Up to the best of our knowledge, this is first study identifying the genetic basis of important floral traits and might be helpful to the scientific community interested in potato marker assisted breeding in these traits.

Keywords:

Relative evaluation of diverse supplementary diets on managed honey bee (*Apis mellifera*) health and colony performance

Khalid Ali Khan

King Khalid University Abha Saudi Arabia

Abstract

The vigorous and healthy honey bees are fundamental to the beekeeping industry and the sustainability of the ecosystem. Supplemental diet of high quality influences the development and strength of bee colony, particularly during the pollen dearth period in adjacent environment. Nevertheless, the level to which pollen substitute protein feeding affects honey bee colony parameters is not totally recognized. We investigated the impact of numerous supplemental diets on foraging activity, pollen load, capped brood area, population density, and honey yield. The treatment groups were provided by patties of pollen substitute diets, while sugar syrup was given to the control group. The outcomes of the study implied that honey bees consumed a appreciably higher amount of Diet 1 (45 g soybean flour + 15 g Brewer's yeast + 75 g powdered sugar + 7.5 g skimmed milk + 7.5 g date palm pollen + 200 mL sugar syrup supplement with Vitamin C) trailed by others supplemented diets. Additionally, pollen load, worker-sealed brood area, population strength, and honey yield varied considerably when Diet 1 was consumed in its place of other supplemental diets. The fraction of biological parameters was less in the control group related to other treatments. This analysis features the possible of supplemental diets to advance the bee's health and colony development in pollen dearth period.

Keywords:

Ice cream cold chain management, reviews and challenges in urban areas of Lahore city of Pakistan

Mesut Selamoglu¹, Usman Mir Khan^{*2}, Zeliha Selamoglu³, Ali Murad Khan⁴, Umar Murad Khan⁵, Hatice Sadiye Gezgin⁶

¹Osmaniye Korkut Ata University, Bahce Vocational School, Department of Management and Organization, Logistics Programme, Bahce, Osmaniye, Turkey

²Faculty of Food, Nutrition & Home Sciences, National Institute of Food Science and Technology, Faisalabad, Pakistan.

³Department of Medical Biology, Faculty of Medicine, Nigde Omer Halisdemir University, Turkey

⁴Department of Anatomy & Histology, Faculty of Veterinary Medicine, University of Veterinary and Animal Sciences, Lahore, Pakistan

⁵Faculty of Veterinary Medicine, Riphah International University, Islamabad, Pakistan.

⁶Department of Animal Nutrition and Nutritional Disorders, Selcuk University, Konya, Turkey.

Abstract

Nowadays, worldwide free food trade, the idea of food safety has been upgraded to a new step. HACCP system as a part of food proffering and shipping around the globe has become a necessity. The phrase "food trade" refers to all post-production processes, such as storage, transportation, and distribution, as well as export and import. The aim of this assessment was to evaluate the condition of food trade by controlling the cold chain in Lahore city. The study was found on two hypotheses: the first prediction was, we presumed that a cold chain in retail is disrupted, and in the second, we assumed that food handling in retail shifts. The products were examined by two standards: by the "best before" date and the temperature of storage. The conditions of product in the scanned storage containers judiciously labeled. Most of the cases the temperature fluctuation was up to 10°C comparing to required temperature. The most significant differences between temperatures were found on cooling devices. In retail foundation there was no available records for food storage conditions. And also, there was no system to organize the cold chain. Outcome of results, proves that retailers are not qualified enough to maintaining a cold chain. Point is that, highly perishable foods may spoil in short period of time than normal, and their safety for consumers might be questionable.

Key Words: *Ice cream, Quality, Cold chain, Safety.*

Ice cream is a goluptious, wholesome, enrich frozen dairy food. Compulsory methods of ice cream production are not usually followed by unprofessional ice cream producing facilities like local markets. Contaminated ingredients which are used for the purpose of pasteurization or due to insufficient sanitation of appliances and surrounding environment can increase microbial load of ice cream. Microbiological quality of ice cream shows hygienic practice in manufacturing and it is an index of food safety (Rivas et al., 2003). There was a huge quality difference between produced ice cream in Lahore city locally.

There is worldwide free trade of food, the view of food safety has recently taken on a new discussion. Accorporating a HACCP system into food manufacturing and delivery has become an essential part of it. The word "food commerce" refers to all output production of processing, such as storage, transportation, and delivery, besides import and export. Our mean from this survey was to evaluate the controlled food trade by mean of cold chain circumstances In Lahore city. The study was relied on two hypotheses: In the first, we presumed that a cold chain in retail is affected, and in the second, we conclude that food managing in retail changes (Harrigan and McCance, 2016).

Food safety has lately gained significance come out of globalization and free commerce of food. In the past food retail had been always adapted to new social conditions quickly in a short span of time, and it is one of the oldest and crucial human initiative. Using HACCP systems in food manufacturing and delivery empowers food monitorability and guarantees that food is safe and eligible for sanitary standards. Keeping the cold chain in retail is the largest issue for producers and retailers (Rahman, 2007). According to the law (Rulesb, 1993), retailers are divided into three categories based on their sales areas: traditional stores (above 12m²), self-service stores (above 40m²), and supermarkets (above 1000m²). The law in Lahore city assures the safety of food and food products that may come into contact with food as by Punjab Food Authority (Act 2000, 2002).

Pakistan is fourth largest milk producing country. Consumption of dairy products is remarkably increasing day by day. The most produced product of the dairy industry these days is ice cream which is continue dominating the interest of heigh portion of living population. Ice cream should be microbiologically safe as its consumers are children which are vulnerable to microbes. It is very hard to reveal whether the ice cream produced in Lahore is hygienically safe and without any public health risk. Therefore, the recent study was based on determine the microbial quality of ice cream sold at local shops in Lahore, Punjab (Hossain et al., 2012).

This study was conducted during the period from September 2003 to March 2004, in the Laboratory of Dairy Production, Faculty of Animal Production University of Khartoum to compare the chemical, microbial and sensory characteristics of different types of ice cream. Hundred samples were collected, 60 were from ice cream machines and 40 were from Looli factory in Khartoum State (ME-Elahi et al., 2012). The data revealed a highly considerable

diversity ($P < 0.001$) in all chemical components except protein and sucrose. Also, the results showed non-significant differences ($P > 0.05$) in all chemical components due to flavor except total solids. There were non-significant differences ($P > 0.05$) between machines and Looli ice cream according to type of flavor in all chemical components except total solids. The microbiological inspection showed non-significant differences ($P > 0.05$) in yeast count, coliform and psychrotropic bacterial counts in both machines and Looli ice cream except total bacterial counts. Yeast count, coliform and psychrotropic count were highest in Looli samples, while total bacterial count was highest in machine samples (El Khair et al., 2007). Due to different type of flavor used there was highly significant differences ($P < 0.01$) between coliform and yeast count. But there were non-significant differences ($P > 0.05$) in total bacterial and psychrotrophic counts. There were non-significant differences among the results collected by Looli factory based on flavor ($P > 0.05$) in all microbiological tests except in total bacterial counts. As regard the panel tests results for sensory evaluation, all machines and Looli samples showed highly remarkable differences ($P < 0.001$) in texture, flavor, taste and overall acceptability, on the other hand color presented non-significant differences ($P > 0.05$) (El Owni and Khater, 2009). The sensory features of flavor postulated non-significant differences ($P > 0.05$) in all sensory tests except in flavor. The difference in results of machines and Looli made by flavor indicated non-significant differences ($P > 0.05$) in color, taste and detailed relevancy, though texture and flavor showed significant differences (Khalil Omer 2015).

Another study made for illuminate the adversity bacteria contaminants among 30 samples amateurly produced ice cream and professionally produced ice cream. Bacteria count were shifted to the different samples by means of pour plate method. Isolates were found using standard procedure. Distinctive types of bacteria separated include *Bacillus cereus*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli* and *Salmonella typhi*. Per ml of the locally produced ice cream contain bacterial count range from 1.4 – 3.0 and the total bacteria count per ml of the industrially produced ice cream sample range between 3.0 3 - 8.8 3cfu/ml. The mean count of locally produced and industrially produced ice cream was 2.0 4 and 5.3 3 respectively, therefore industrially produced ice cream is more hygienic than locally produced ice cream. (Mohamed and Al-Ashinawy, 2008). The presence of possible pathogenic organisms in the analyzed ice-cream sample should be viewed with concern by the consumers, producing company and the Government since food poisoning by *Staphylococcus* sp, *Bacillus* sp and *Salmonella* sp is possible through consumption of contaminated ice-cream (Yusuf et al. 2013).

Conclusions

Food safety is a scientific procedure defines management and arrangement which prevents the food borne diseases in the stored food. It contains various ways that must be followed to prohibit potentially severe health hazards. The point of this idea is the safety between the market and consumer with the fast phase of life also the consumption of fast food is going to enhance gradually in Lahore. It is an obligation that preparation of food at good hygienic conditions due to its perishability. The subject which matters is that food must be safe in the market and it should be delivered safely and its preparation for the consumer.

Food can carry diseases flit from person to person beside it serve as growth medium for bacteria that might lead to food poisoning. In the developed countries there are standards for food, while in undeveloped countries the main matter is the accessibility of safe water supply which is one of the vital items. Consumption of contaminated food which contains bacteria, viruses, or parasites, natural toxins result to foodborne illness.

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Molecular mechanism underlying bee propolis mediated protection of thymus and lymph node in streptozotocin-induced diabetic mice

Gamal Badr

Immunology - Vice Dean for Graduate Studies and Research Faculty of Science - Assiut University Egypt

Abstract

Diabetes mellitus (DM) causes severe complications in several tissues due to redox imbalances caused by the uncontrolled cellular levels of reactive oxygen species (ROS). The effect of bee propolis against DM mediated oxidative stress which, in turn, impaired immune system by damaging the architecture of lymphoid organs has not yet been studied. Therefore, the present study aimed to investigate the dietary effect of propolis supplementation on the architecture of lymph node in streptozotocin (STZ)-induced type 1 diabetic mouse model. We used three groups of animals: non-diabetic control (Cont.); diabetic (Diab.); and propolis-treated diabetic (Diab.+propolis) mice. Induction of diabetes by STZ was associated with reduction of body weight and increase blood glucose level; increased ROS and IL-6; decreased levels of T cell surviving cytokines (IL-2 and IL-7) and B cell activation cytokine (IL-4); decreased levels of GSH and activities of antioxidant enzymes such as GSH peroxidase (GSH Px), manganese superoxide dismutase (MnSOD) and catalase in plasma. Additionally, diabetic mice showed perturbed alteration in the expression of autophagy markers (LC3, Beclin-1 and P62) and apoptosis markers (Bcl-2 and Bax) in the lymph node. Most importantly, the phosphorylation level of AKT (promoter of cell survival) was significantly decreased in the lymph node of diabetic mice as compared to control animals. Interestingly, treatment of diabetic mice with propolis restored the levels of ROS, IL-6, IL-2, IL-4, IL-7, and GSH and the activities of antioxidant enzymes. Treatment of diabetic mice with BG significantly rescued the lymphoid organs from apoptosis and autophagy by restoring the expression levels of LC3, Beclin-1, P62, Bcl-2 and Bax, and promoting cell survival through enhancing the phosphorylation of AKT. Our data revealed, for the first time, the beneficial impacts of propolis supplementation on the immune system and architectures of lymphoid organs during T1D.

Key Words:

Doxorubicin loaded methoxy poly (ethylene glycol) *block*-poly (glutamic acid) [DOX/mPEG-*b*-PLG] nanoparticles against human breast cancer cell lines

Zaheer Ahmad^{1,2}, Zeliha Selamoğlu³

¹Higher Education Archives and Libraries Department Khyber Pukhtoonkhwa

²Department of Chemistry, Quaid-I-Azam University, Islamabad 45320, Pakistan

³Department of Medical Biology, Faculty of Medicine, Nigde Ömer Halisdemir University, Campus, 51240, Nigde, Turkey

Abstract

pH responsive block copolymers consist of mPEG and glutamic acid units were synthesized in different formulations. The synthesized polymers were structurally investigated. Doxorubicin Hydrochloride (DOX-HCl) as a chemotherapy medication for the treatment of cancer was selected. DOX-HCl was loaded and their drug loading content and drug loading efficiency were determined. The nanocarriers were obtained in small size, well-shaped and slightly negative surface charge. The release study was carried out both at pH 7.4 and 5.5 and it was revealed that the release was sustained and in controlled manner and there was no initial burst release. The *in vitro* release study was further carried out for different formulations with different glutamic acid moieties. Time dependent cell proliferation inhibition of the free drug and drug loaded nanoparticles against human breast cancer cell lines MCF-7 and Zr-75-30 was observed. Cellular uptakes and endocytosis were investigated by confocal laser scanning microscopy (CLSM) and flow cytometry. The biocompatibility, optimum size, shape and surface charge of the developed nanoparticles make the nanoparticles an efficient drug delivery carrier.

Keywords: Doxorubicin, glutamic acid, cell proliferation inhibition, breast cancer cell

Turkey's Situation in the World in the Temperate Zone Fruit Species: A Case of Apple, Pear, Cherry, Apricot, and Peach-Nectarine

Alamettin Bayav

Isparta University of Applied Sciences, Faculty of Agriculture, Department of Agricultural Economics, Isparta, Turkey

Abstract

This study aimed to lay out the course of apple, pear, cherry, apricot, and peach-nectarine, temperate zone fruit species, in Turkey over the years and their ranks in the world. For this purpose, the changes in production, area harvested, and yield was examined using the TURKSTATs and FAOs data. In addition, Turkey's rank in world trade was evaluated with the data obtained from the FAO and ITC databases. Fresh fruit and vegetables are one of the food sectors that are constantly on the agenda with a continuous increase in demand and productivity problems in production. Although it changes from year to year, approximately 2.01 billion tons of fresh fruits and vegetables were produced in the world in 2019. Vegetables constituted 56.08%, and fruits constituted 43.92% of this production. Due to its ecological advantages, Turkey, an important place, met approximately 2.42% of the world's fresh fruit and vegetable production. In Turkey, production was carried out in 23.10 million hectares in 2019. This area was 3.91% of vegetable and 14.54% fruit areas (including vineyard and olive areas). As of 2019, approximately 19 million tons of fruit were produced in Turkey. The share of fruit in the plant production in Turkey in 2019 was 10.62%. The most produced temperate zone fruit species is the grape. Grape is followed by apple, apricot, peach-nectarine, cherry, and pear. When the data of the last 15 years are evaluated, it has been determined that there was an increase in area, production, and productivity in apple, pear, cherry, apricot, and peach-nectarines. In addition, the leading countries in trade in these species and the ranks of Turkey were determined. The results showed that although Turkey is an important country in the world in terms of production in the evaluated species, it cannot use this advantage in trade. In order to be a leader in trade, varieties for consumer preference in the specified species should be grown, and quality and standard products should be obtained. In addition to protecting the existing markets, the search for new markets should be continued.

Keywords: Fruit sector, Production, Export, Import, Turkey

GWAS in safflower: A case study to identify the genetic basis associated with selected yield traits

Fawad Ali^{1*}, Muhammad Azhar Nadeem², Faheem Shehzad Baloch²

¹Department of Plant Sciences, Faculty of Biological Sciences, Quaid-I-Azam University, Islamabad, Pakistan

²Faculty of Agricultural Sciences and Technologies, Sivas University of Science and Technology, Sivas, Turkey

Abstract

Safflower (*Carthamus tinctorius* L.) is an underutilized crop that received less advance genomic exploration compared to other oilseed crops like soybean and sunflower. Exploring the genetic basis associated with yield traits is crucial for marker-assisted breeding of safflower. A genome-wide association study was conducted using a total of 12,232 DArTseq markers to identify the marker-trait association for selected yield traits in an international safflower panel derived from 26 different geographical countries of the world. The field experiments were conducted at Pakistan (Islamabad) and Turkey (Bolu) during 2016-17 and 2018 respectively, implementing augmented block design to observe the phenotypic yield traits. Statistically significant genotypic effects ($p < 0.05$) was observed across mean data of both locations (Pakistan and Turkey). Studied material showed higher mean performance for all traits except seeds per capitulum in Pakistan compared to Turkey. Phenotypic diversity for selected yield traits was illustrated; plant height (60.08 to 121.48 cm), capitula per plant (8.7 to 80.4), seeds per capitulum (15 to 42.05), and seed yield per plant (4.85 to 51.02 g). Seed yield per plant showed highly significant and positive correlation with capitula per plant (0.4985***). Constellation plot analysis resulted into four groups i.e., A, B, C, and D. Genotyping by sequencing resulted 12,232 DArTseq markers were used for the investigation of marker-trait association through mixed linear model (Q + K) approach. DArT-38077549 showed significant association with capitula per plant, while two markers (DArT-22763576, DArT-22763253) were associated with plant height. A total of two markers (DArT-38079422, DArT-100043360) were associated with seeds per capitulum. A total of five DArTseq markers showed significant association with seed yield per plant and maximum variation was resulted by DArT-100004992. The results of this study provide a new insight to understand the genetic basis associated with selected yield traits in safflower. We assume that significant markers identified through this investigation can be validate and use in future safflower marker-assisted breeding programs.

Key Words: Oilseed crop, *Carthamus tinctorius*, DArTseq, Yield traits, Marker-assisted breeding

Effect of Christmas Melon (*Laganaria Breviflorus*) extract on toxigenic Mycoflora Isolated from Stored Unpolished Rice sold in major Markets in Abeokuta, Nigeria.

Amina Badmos¹ and Yetunde Mamood¹

¹Department of Micobiology, College of Bioscience, Federal University of Agriculture, Abeokuta, Nigeria

Abstract

Study on toxigenic mycoflora and potential mitigation effect of Christmas Melon (*Laganaria Breviflorus*) extract in unpolished rice sold in Abeokuta Ogun state of Nigeria was carried out. Unpolished rice gotten from markets in Abeokuta were aseptically transported to the laboratory, serial dilution to reduce the fungal load was carried out and were plated on Potato Dextrose Agar (PDA) and Methyl Red Dessicated Coconut Agar (MRDCA) respectively. Microscopy, macroscopy, toxigenicity test and inhibition studies with the peeled and unpeeled fruit of *Laganaria breviflorus* fermented for seven days was carried out. Results reveal the predominance of *Aspergillus* as the major genera, specifically, *A. niger*, *A. flavus*, *A. parasiticus*, *A. fumigatus*, *A. terreus*, *A. nidulans*. Other fungi genera isolated include *Penicillium*, *Fusarium*, *Mucor*, *Alternaria* and *Rhizopus*. Of the 11 fungi genera isolated, 9 were toxigenic of which the zones of inhibition of unpeeled whole fruit extract of *Laganaria breviflorus* range from (3 - 28mm) where *A. nidulans* shows the highest susceptibility to the whole fruit extract of *Laganaria breviflorus* while the zone of inhibition of peeled fruit extract of *Laganaria breviflorus* ranges from (3 - 22mm) where *A. parasiticus*, *Fusarium* specie and *P. chrysogenum* showed the highest susceptibility. As the day progresses the zone of inhibition becomes wider. Unpeeled LB extract exhibited more zones of inhibition than the peeled LB extract. *Laganaria breviflorus* fruit extracts in the study demonstrates a potential in reducing toxigenic fungi, consequently a means to reducing mycotoxins in staple foods in Nigeria.

Key Words: Christmas Melon, Mycotoxins, Plant Extracts, Mycoflora, Food Safety.

Do cooking oils have a frying potential?

Anbesse Girma Shewa*¹, Daniel Alemu Gobena², Mikiyas Kebede Ali²

¹Haramaya University, Food Science and Postharvest Technology Department

² Haramaya Universities, Food Technology and Process Engineering Department

Abstract

Consumptions of frying products are increasing over time due to their characteristic odor, color, flavor, and ease of preparation. In developing countries, such as Ethiopia, it is common to observe individuals frying on the side road using different oil types. This research was designed to investigate the frying potential of different oils typically used for frying. Three oil brands that were commonly used in the study area were used. Potatoes (for potato fries) and wheat flour (for sanbusa preparation: local name for sandwich product with lentils inside) were fried. Sequential frying was performed and at each cycle, a small amount of oil was collected for further analysis. Free fatty acid (FFA), peroxide value (PV), acid value (AV), and viscosity at each frying cycle were performed to analyze the degree of degradation of the oil. As a result, all quality parameters such as FFA, PV, AV, and viscosity increased significantly with the frying cycle for both products. But the rate of degradation was slightly higher during sanbusa frying compared to potato fries, indicating liberation of fatty acid from the oil and production of peroxide compounds. Similarly, the viscosity of the oils increased significantly with the frying cycle showing the polymerization of degraded compounds such as oxidized fatty acid to produce high molecular weight compounds. In general, among the three oil types, Hayat oil was slightly better than the Liba but much better than Vera oils as it showed the least degradation in the quality parameters such as peroxide value and viscosity.

Keywords: Frying cycle, Fatty acid, Peroxide value, Viscosity.

Introduction

The frying process, characterized by immersing the food product in hot oil, is a fast and convenient method of food preparation, widely used in homes and widely used by commercial establishments. This process develops characteristics of odor, flavor, color and texture that make food more appealing for consumption [1]. The consumption of fried food has increased in recent years all over the world including Ethiopia which is common to observe individuals frying potato chips on the side road. Consumption of such foods leads to higher intake of fats and oils after being subjected to elevated temperatures in the frying process. It appears that this fact has been influenced by social, economic and technical reasons, as people have less time to prepare their food and thus the frying process provides an alternative quick preparation, besides attributing pleasant sensory characteristics to fried food [2].

However, upon heating the oil in the frying process, a complex series of reactions produce a number of degradation compounds. In the course of the reactions, functional, sensory and nutritional qualities are modified and may reach levels where it is no longer possible to produce quality food [3]. To reduce the expenses of frying oil, individuals observed while using frying oil repeatedly for longer period of time. When heated repeatedly, changes in physical appearance of the oil will occur such as increased viscosity and darkening in color, which may alter the fatty acid composition of the oil. Oxidation, hydrolysis and thermal polymerization are the chemical reactions occurring as a result of repeated heating of cooking oil which have high health impact [4].

Repeated heating of the oil accelerates oxidative degradation of lipids, forming hazardous reactive oxygen species and depleting the natural antioxidant contents of the cooking oil. Free radicals (formed during reusing of frying oil, oxidation) tend to combine with each other and other fatty acids, and tend to form long and lineal compounds, or cyclic compounds. The cyclization of fatty acid molecules is one of the main reactions produced due to the intense heat in frying process [5].

The oil is used in a large number of times with minimum replacement, for cost minimization, which may result in high levels of chemical change. However, countries like Ethiopia do not yet have rules for monitoring and disposal of frying oils. These facts demonstrate the importance of studies to get to know the behavior of oil in frying processes and their degree of change [6]. Now days people are enjoying in consuming fried products and this long-term ingestion of food (prepared using recycled oil) could severely diminishes human's antioxidant defense network leading to disorders such as hypertension, diabetes and vascular inflammation [7].

Therefore, this project is aims at assessing the frying potentials of selected oil types in the nearby cities, degree of reuse and recommending the minimum frying recycle period which provides the minimum oil degradation.

Materials and Methods

Materials Used in the Study

Three oil brands (Vera, Liba and Hayat oils) that commonly used in the area by vendors were purchased from the local grocery store. Potatoes (for potato fries) and wheat flour (for sanbusa preparation) were also collected from the local market.

Frying Process

A quarter kg of potato was taken, washed, sliced, air dried (~4 hours) and then fried in three liter of each of the above mentioned cooking oils in separate stainless steel frying pan. After the completion of frying, the remaining oil was then cooled overnight and again fresh potatoes were taken, sliced, air dried and then fried. The leftover oil again cooled overnight. The same process was repeated for eight times for potato fries. The above procedure was repeated using wheat flour for sandwich preparation (lentils in the middle, locally named as 'sanbusa') and repeated for five times [3,7]. Small amount of oil each time (each frying cycle) was collected for further analysis. The sample quantity was proportionately adjusted with the amount of cooking oil left. No fresh oil was added in between the frying processes to make up for the loss due to uptake by the frying materials for both potato and sanbusa preparation.

Physical and Chemical Analysis of Fried Oil

All oil quality parameters were performed according to American Oil Chemists' Society (AOCS) Official Methods For peroxide analysis, 5 g of the oil sample was taken into a 250 mL conical flask then 30 mL of acetic acid-chloroform (3:2) added in it. The flask then swirled and then 0.5 mL of saturated potassium iodide was added. Then, the solution mixed again for 1 minute and few drops of starch solution (10%) was added. The solution then titrated against previously standardized 0.01 N sodium thiosulphate solution (Na₂S₂O₃), until the blue colour disappeared. The peroxide value then expressed in miliequivalents of peroxide per kg of the sample calculated as:

$$\text{Peroxide value (meq/kg)} = \frac{[(V_a - V_b)N \times 1000]}{W}$$

Where;

V_a = volume of sodium thiosulphate solution (mL)

V_b = volume of sodium thiosulphate solution (mL) used for the blank

N = normality of sodium thiosulphate W = weight of the test portion (g)

The oil 1.0 g in weight introduced into a 250 ml conical flask, and then 3 drop phenolphthalein followed by 20 ml ethanol were added. The mixture then titrated with 0.1 M NaOH solution until a pink color developed. Free fatty acid is calculated, thus as;

$$\text{Free fatty acid} = \frac{(T \times M \times 56.1 \text{ mg KOH} / \text{g})}{W (\text{g})}$$

Where

T = Titre value

M = Molarity of the titrant

W = Weight of oil

56.1 = Acid constant

The number of mg of KOH required to neutralize the free acids in 1 g of the oil was determined by placing 0.5 g of sample in conical flask containing mixture of ether and ethanol (50 mL; 95% v/v). The resulting solution then titrated with 0.1 N KOH solution using phenolphthalein as indicator.

The acid value was expressed as mgKOH g⁻¹ and calculated as follows:

$$\text{Acid value} = \frac{(V_b - V_s)}{5.61 W}$$

Where;

V_b = Titre for blank

V_s = Titre for sample

W = Weight of sample in grams

A viscometer as described by Nzikouet al. (2007) was used to measure the viscosity. By this procedure, about 35 mL of oil was placed in apparatus beaker and the viscosity then determined by immersing the spindle into the oil up to the mark using Sine-Wave Vibro Viscometer (Model: SV-10, 2011, Australia). The reading was then taken at room temperature.

Data Analysis

Descriptive statistics were used to describe simple data analysis using excel sheet. R-studio (Product of SAS, Version 3.5.3) was used to check the existence of statistical variation between the treatments. When statistical variation observed, LCD was used for mean separation.

Results and Discussions

Three brands of oils which are commonly used by vendors were identified to assess their potential for frying purpose. Those oils used under this investigation are Hayat, Vera and Liba oils brands. The main fried products produced by vendors were potato fries and sanbussa (fried wheat dough sandwiched with lentils).

Free Fatty Acid

Free fatty acids (FFA) are usually used to assess the quality of frying oils and its degree of un-saturation also the first factor that influences the oxidative stability of the frying oils [8]. The free fatty acid content of oil at each frying cycle, after frying of potato fries and sanbussa, for all brands of oil were investigated (Figure 1.) The change in FFA at each frying cycle for both potato fries and sanbussa increased significantly ($P \leq 0.05$).

The rate of change in FFA while using the Vera oil for frying is mainly higher compared to the remaining oil brands. Unlike the type of products, the FFA change between the oil brands was found less affected ($P \geq 0.05$). The percentage of fresh liba oil was 0.07% and rose to 0.6% at the end of 8th frying cycle while frying potato fries. Similarly, for fresh Liba and Hayat oils, the %FFA changed from 0.1 and 0.2% to 0.55 and 0.58% respectively. While frying sanbussa, due to the development of dark brown color, it was not possible to go beyond the 5th cycle.

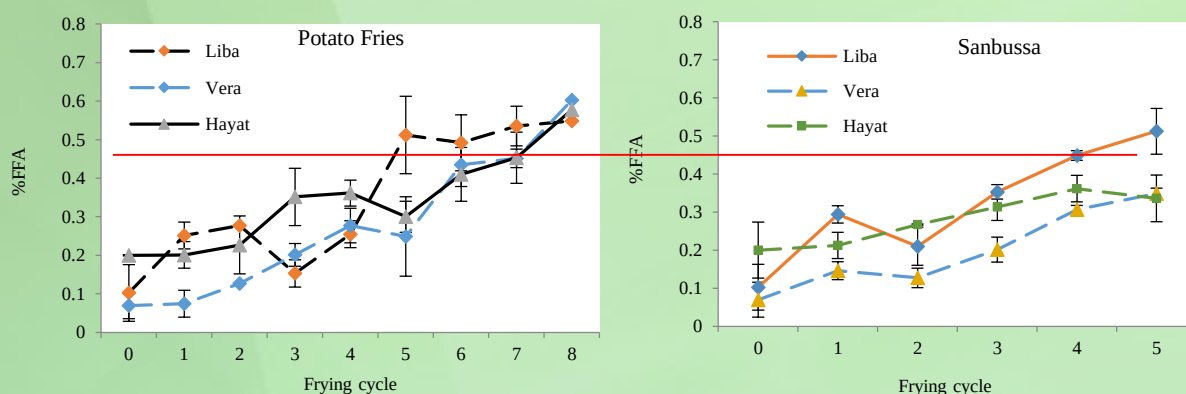


Figure 1. Change in free fatty acid at each frying cycle for all oil types under each products. Values: Mean $\pm$ SE, $n=3$.

FFA content is known to be an acceptable indicator for the decomposition of frying oil. The formation of FFA is partially the result of hydrolysis, but FFA is also the end product of oxidation. In this result, the FFA value showed an increment as increasing the number of cycles of frying. This rise in FFA is due to the cleavage and oxidation of double bonds to form various carbonyl compounds and low molecular fatty acids during frequent frying cycle [9].

The result clearly showed that degradation of oil is higher in *sanbussa* preparation than the potato fries (Figure 2). The variation comes from due to difference in physicochemical properties between potato and *sanbussa*. Since those two products are different in composition, such as moisture content, the degree of free fatty acid hydrolysis from the triacylglyceride molecules is different. Many studies supports that hydrolysis is stimulated by moisture from fried foods which is because water can facilitate the hydrolysis of triacylglycerol to produce a mixture of mono, diacylglycerol, glycerol and free fatty acids [10].

Some scholars explained that the increase in %FFA might not be a reliable evidence for degradation of frying oils because the change in FFA comes from both oxidation and hydrolysis. In addition, still some low molecular FFA may be lost through volatilization [11]. Hence, additional oil parameters required to be assessed.

Peroxide Value

The peroxides are the most initial evidence of reaction products in fats and oils degradation. It gives a measure of the degree to which a primary oxidation product has occurred in the oil sample during, processing, cooking, frying and storage [12].

In this research, a significant rise in peroxide value (PV) was observed for all brands of oils used under both products of *sanbussa* and potato fries ($P \leq 0.05$). It showed a gradual increase in each frying cycle for all oil types (Figure 3). In both products, the rise in peroxide value was high after the third frying cycle (33.09 mEqO₂/kg) for Vera oil compared to the remaining Liba and Hayat oils. But, both Liba and Hayat oils are rising with the similar rate in each frying cycle for both products.

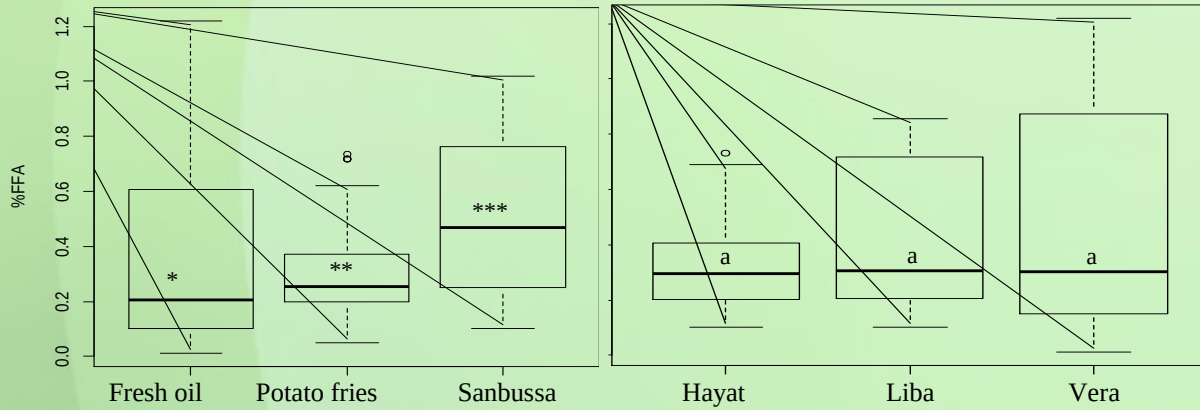


Figure 2. Effect of product variation and frying oil types on the percentage of free fatty acid at the end of frying process. Values: Mean $\pm$ SE, n=24. Plots with different number of asterisk (*) and letters are significantly different ($P \leq 0.05$).

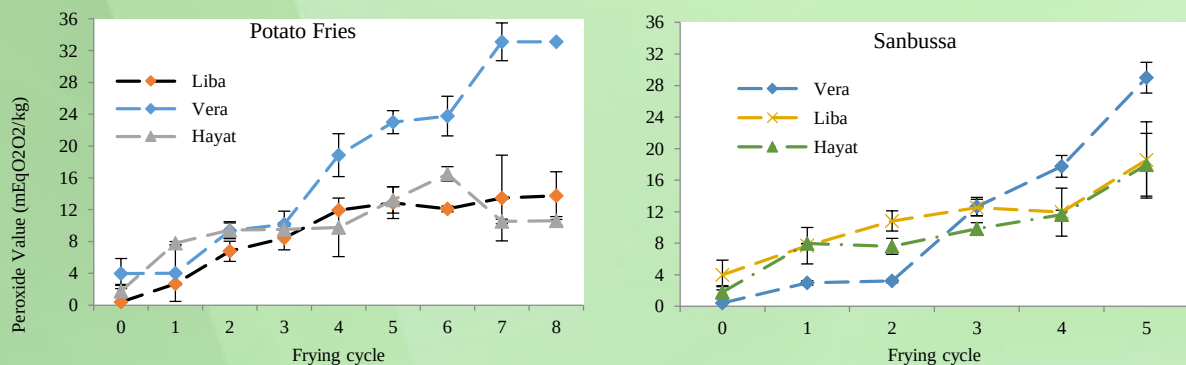


Figure 3. Change in Peroxide value at each frying cycle for all oil types (Hayat, Vera and Liba oil brands) and products. Values: Mean $\pm$ SE, n=3.

PV is used as an indicator of the degree to which rancidity reactions occurred during frying and may be used as an example of the consistency and stability of oils [13]. Accordingly, in this frying process, the Hayat and Liba oils showed a good stability and consistency for frying purpose. The peroxide value increases with the frying frequency, temperature, and air interaction of the oil samples. The primary products of lipid oxidation are hydroperoxides, which are generally referred to as peroxides compounds formed from triglycerides [14].

From the figure 4, it can be clearly observed that Hayat and Liba oils are more resistant for oxidative degradation than Vera oil. In addition, the product that is being fried determines the rate of oil degradation. Significantly higher oil degradation was found while frying *sanbussa* than frying the potato fries.

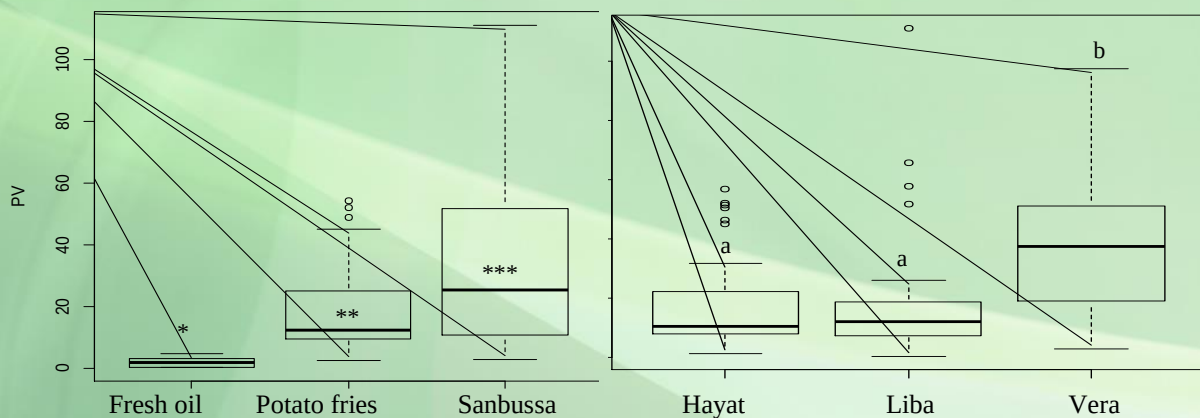


Figure 4. Effect of products and frying oil types (Hayat, Vera and Liba oil brands) on the peroxide value. Values: Mean $\pm$ SE, n=24. Plots with different number of asterisk (*) and letters are significantly different ($P \leq 0.05$).

Viscosity

The viscosity of the oil at each frying cycle showed a significant increment ($P \leq 0.05$) between the oil types and the two products (Figure 5). Viscosity is one of the measures used to determine the physical changes in edible oil [15]. It depends on density, molecular weight, melting point, degree of unsaturation, and temperature. In this research, the rise in viscosity in the consecutive frying cycle is may be due to polymerization of degraded compounds such as oxidized fatty acid to produce high molecular weight compounds. The higher temperature in the frying, frying cycle and the oxygen are directly related to formation of polymeric compounds leading to increased viscosity [10,15].

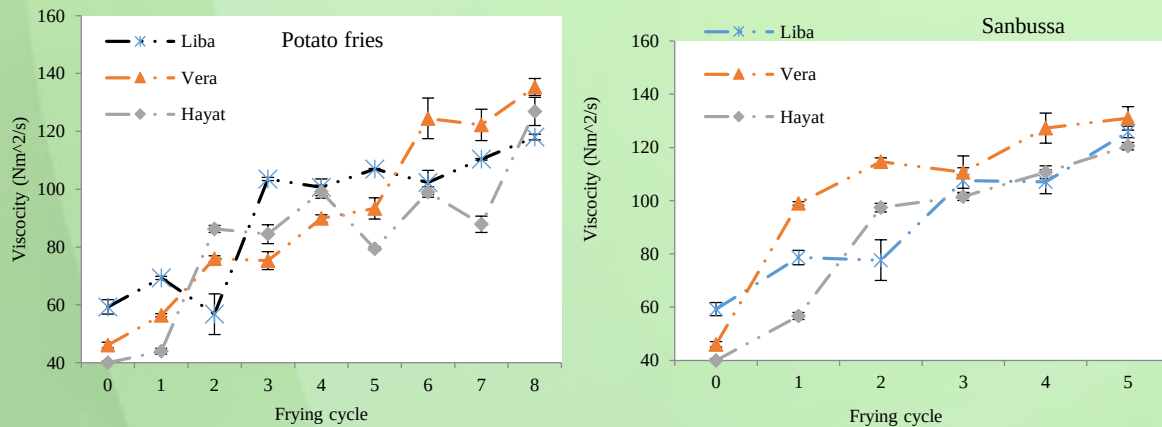


Figure 5. Effect of Frying cycle, oil and product types on the viscosity of remaining oil. Values: Mean $\pm$ SE, n=3.

The discarded oil at the end of frying process, the viscosity of the oil was showing that both the product and oil type increased the viscosity significantly (Figure 6). Oil obtained after frying sanbussa has higher viscosity compared to potato fries. Similarly, among the three oil types, discarded oil from Liba oil has highest viscosity.

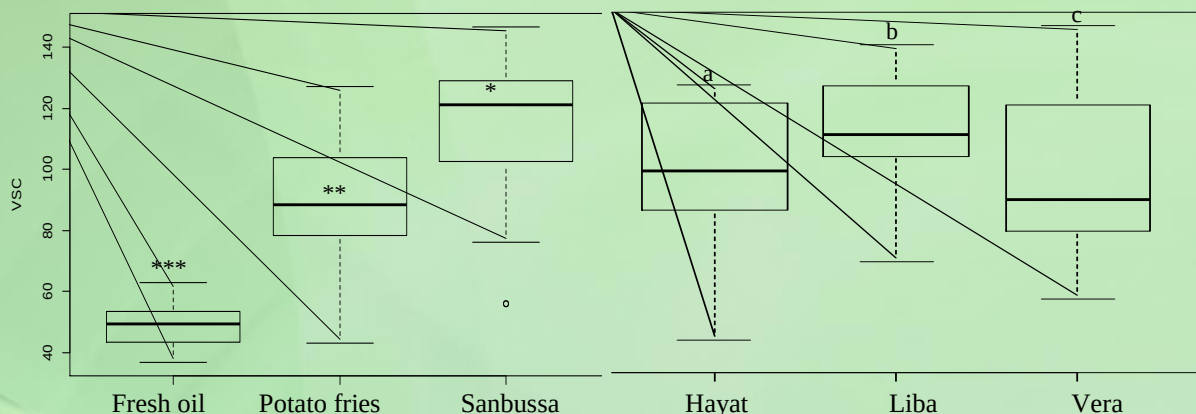


Figure 6. Effect of products and oil types on the viscosity of the oil. Values: Mean $\pm$ SE, n=24. Plots with different number of asterisk (*) and letters are significantly different ($P \leq 0.05$).

Due to cheap price, nearly all the vendor uses Hayat, and Liba (palm oil), and Vera oil (sunflower oil) for frying purpose especially, about 99% of them uses Hayat and Liba oils. This research was conducted to assess the frying potential of those oil types. It was revealed that, among the oils, vera oil showed a significant increment in free fatty acid, peroxide value and viscosity of frying oil. Hence, the vera oil is less resistant and not fit for frying purpose as the qualities parameters are increasing above the recommended limits. While Hayat oil found much better than the remaining two types of oils.

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Garlic Powder is The Natural Anti Diabetic Agent: “The Effects of Garlic Powder on Glycemic control in the Patients of Type-2 Diabetes Mellitus”

Ali Raza Memon,¹ Imran Ali Shaikh,²

¹Department of Biochemistry Liaquat University of Medical & Health Sciences (LUMHS) Jamshoro Sindh. Pakistan.

²Liaquat University of Medical & Health Sciences (LUMHS) Jamshoro Sindh. Pakistan.

Abstract

Diabetes Mellitus is one the health hazardous problem all over the world especially at South Asian region. 9.2% of the Pakistani population suffering from Type-2 diabetes mellitus and type-2 diabetes can lead to macro and micro vascular complications if glycemic control not properly monitored. Garlic is one the natural product containing sulphur compounds like allicin, di allyl alicin etc which act as hypoglycemic agent. To evaluate the effects of Garlic powder on glycemic index in the patients of type-2 diabetes along with allopathic therapy. This RCT study includes 80 patients were divided in to 2 groups; each group included 40 diagnosed cases of type-2 diabetes; group A patients was taken only allopathic therapy oral hypoglycemic drugs while patients of group B was received allopathic along with formulated capsules of garlic powder for six months. Blood sample was taken at three levels; at zero level, level-I & level-II for analysis of Fasting & Random blood glucose level and HbA1c%. The outcome of garlic therapy was significantly observed. There was significantly ($p < 0.05$) good glycemic control with garlic therapy as compared with allopathic therapy alone. The results concluded that there was marvelous role of natural remedies like garlic powder with allopathic therapy in the management of type-2 diabetic patients with satisfactory glycemic index.

Key Words: Type-2 Diabetes Mellitus, Garlic Powder, Glycemic Index

Biochar Amendments For Reducing Nitrate Leaching From Soils Of Different Textural Classes In The Nigerian Savanna

Rejoice Ibrahim Solomon

Department of Soil Science, Faculty of Agriculture, Modibbo Adama University, Yola, Nigeria.

Abstract

Application of inorganic fertilizer to agricultural soil is an effective way of improving crop productivity. However, continuous fertilizer application has been the leading cause of nutrient release from agricultural fields into groundwater and aquatic systems; through runoff and leaching of the nutrients and is a major threat to environmental health. This study was carried out with the aim of assessing the effectiveness of four biochar materials; in reducing nitrate leaching from soils of three different textural classes in the Nigerian Savanna region. Soil samples (0-20 cm depth) were collected from three different soil types and three different locations each in the Nigerian Savanna using stratified random sampling. Two hundred and fifty (250) g of soil samples were amended with 0, 2.5, 5, 7.5 and 10 tonha⁻¹ of Maize cob biochar (MCB), rice husk biochar (RHB), cow dung biochar (CDB) and poultry litter biochar (PLB) and were subjected to laboratory leaching experiment. Sixty (60) ml of nutrient solutions containing 300 mg l⁻¹ nitrate using ammonium nitrate (NH₄NO₃) was applied to each of the laboratory biochar-incubated soil columns to study biochar effect on nutrients retention and transport. The experiment was laid in a Randomize Complete Block Design (RCBD) replicated three times. Leachates were collected and nitrate concentration was determined using a dual beam UV/VIS spectrophotometer. The data collected were analyzed using the Generalized Linear Model (GLM) procedure and the means were separated using Tukey's honest significant difference (SAS version 9.4). Results obtained revealed that there were no significant differences among the biochar treatments on nitrate leaching from Clay loam. However, highest nitrate leaching from Loamy soil of 30.53 % was recorded by the application of 2.5 tonha⁻¹ PLB and was significantly ($P < 0.05$) different from the application of 2.5 and 5-ton ha⁻¹ RHB and 5-ton ha⁻¹ MCB. Similarly, highest nitrate leaching from Sandy loam of 32.18 % was recorded by the application of 5-ton ha⁻¹ MCB and was significantly ($P < 0.05$) higher than 5.94, 2.40 and 7.12 % recorded by the application of 2.5 and 5-ton ha⁻¹ RHB and 7.5 tonha⁻¹ CDB respectively. Therefore, application of 2.5, 5-ton ha⁻¹ RHB and 7.5 tonha⁻¹ CDB can effectively reduce nitrate leaching from Sandy loam. While 2.5, 5, 7.5 tonha⁻¹ CDB and 2.5 and 5 tonha⁻¹ RHB reduced nitrate leaching from Loamy soils.

Key Words: Biochar, clay loam, loamy, nitrate leaching, sandy loam

Development of a Modified Dehusking Machine for Local Varieties of Coconut

B. J. Olorunfemi^{1*}, A. E. Olumilua¹, J. O. Esheshare¹ & A. A. Arounsoro¹

¹Mechanical Engineering Department, Federal University Oye Ekiti, Oye Ekiti, Nigeria

Abstract

Traditional dehusking of coconut is time consuming, not effective, not economical, and a difficult process, coupled with high cost of importing previously developed dehusking machines. This work is aimed at developing a coconut de-husker that is affordable, user-friendly, and has a higher productivity. Consideration was given to the three main varieties available in Nigeria; West African tall, hybrid and dwarf green varieties. All materials selected for the construction were locally sourced. The machine consists of two rollers made up of mild steel with spikes, shafts, electric motor, spur gears, block bearings and the mild-steel frame. Torque and speed reduction required for de-husking were calculated for average Nigerian coconut of 300-450 mm length, and 160-206 mm diameter. Spikes of length 20 mm at 135° sharpened edge were arranged on the rollers. While the teeth of pinion was 18; number of teeth of gear was 44. The total cost of production was ₦170,000 (\$300). Performance test shows an efficiency of 90.4 % and dehusking of 80 coconuts per hour. No distortion of extracted fibre length was observed.

Keywords: Coconut, dehusking machine, development, economic, local varieties

Introduction

Coconut (*Cocos nucifera*) is an important and useful perennial fruit crop in Africa sub-region. In Nigeria, coconut is a cash crop that is grown in 22 states with plantations that spread across the humid tropical forest of the south (Nwankwojike et al, 2012). Nigeria produces about 250,000 tons of coconut annually and is ranked eighteenth in the world (FDC, 2018). Abi and Jippu (2014). reported that Philippines is the world's largest producer, follow by Indonesia, and then India. The global demand for coconuts and derivatives increased by over 500 % in the last five years thereby underscoring the huge economic potentials yet to be explored in Nigeria (Olakuleyin, 2019). Coconut has high economic prospect if well annexed, both for industrial use, and food consumption. It is interesting to note that every part of coconut is useful (Nwankwojike et al, 2012). The outer exocarp better known as husk is gaining economic importance in automobile, plastic rubber, and cosmetic industries as natural fibber for reinforced composite, in products such as coir, asbestos, and carpets (Chandra, 1987; Thampan, 1981; Franco and Gonzalez, 2004; Shamsudin et al, 2018). Early matured fruits are harvested, the succulent endocarp is consumed as fruit-food, and as juice. Figure 1a shows the internal structure of a coconut fruit, while Figure 1b shows wholesome coconut fruits as they are being dehusked manually.



Figure 1. (a) Structure of a coconut fruit (b) dehusking coconut (coconut-botany.agrictech.tnau.com)

The following factors were considered for the development of the coconut dehusking machine. The machine would consist of a frame upon which other components are to be mounted. The machine is designed to make its operation simple for unskilled operators. Material selection would be based on local availability. This is aimed at to reducing cost of fabrication as well as maintenance during usage. As the husk is being removed, the mass of the coconut would also reduce; projection of rollers' spikes was made by increasing the projections from right to left. are designed to taper to effectively grip the coconut fruit during operation. The coconut dehusking should be complete without inflicting any damage on the nut, as well as ensuring the wholesomeness of the fibre, by using triangular shape spikes and proper choice of gear system. Figure 2 shows the exploded orthographic view of the coconut dehusking machine.

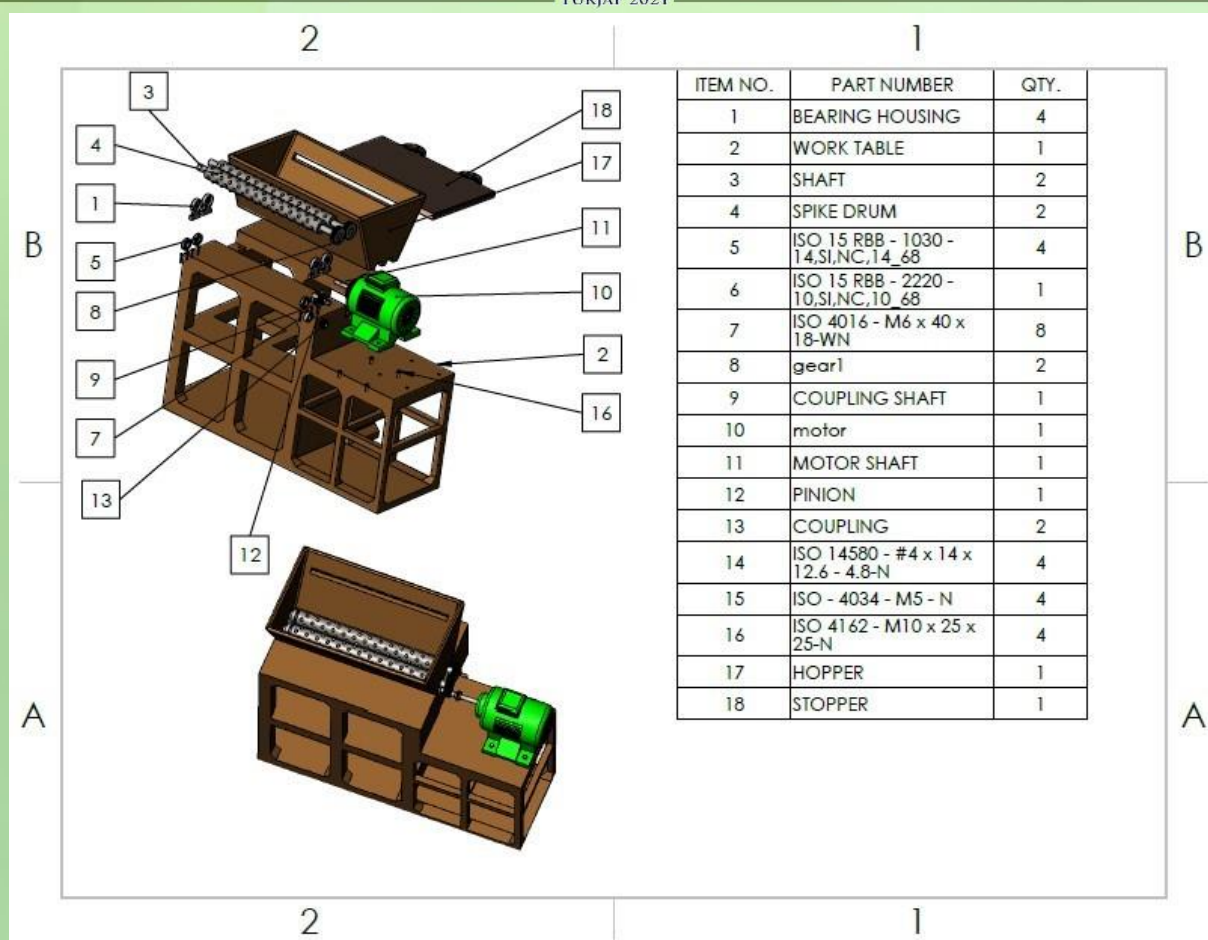


Figure 2. A SOLID WORK design of the coconut dehusking machine

Geometric Dimension

Vernier calliper and digital weighing balance were used to measure the geometry and mass of the coconut at different moisture content or maturity (dried and wet). Table 1 shows the physical properties obtained from three main varieties of coconut fruit/nut available in Nigeria (west African tall, hybrid and dwarf green varieties).

Table 1. Physical properties of Nigerian coconut measured

S/N	Parameter	Matured coconut
1.	Shape	Ovoid/ Ellipsoid
2.	Length	300-450 mm
3.	Diameter	160-206 mm
4.	Weight	0.62-1.32 kg
5.	Shell Diameter	80-120 mm
6.	Husk Thickness at pedicel end	65 mm
7.	Husk Thickness at apex end	35 mm
8.	Husk Thickness-1/4 distance from pedicel end	33 mm
9.	Husk Thickness- 1/2 distance from pedicel end	26 mm
10.	Husk Thickness 3/4 distance from pedicel end	30 mm

Design calculations

Spike Specifications

The dimension of spikes is selected to get effective penetration on the coconut husks. Spikes are welded on the rotating drums, and are made from shaft of 10 mm in diameter. The length of the spike including the sharp end was 20 mm, while the tapering sharpened edge length and angle was 5 mm and 135° respectively. Steel material was selected because of its hardness and toughness. The spikes are spaced from one another with substantially equal distance to ensure the thickness of fibre of coconut husk remove at a time is in the range of 20-40 mm. where by the patterned array in which the plurality of spikes are positioned which facilitates the penetration through the husk and peel them off.

Gear Design

Spur gear was selected for design because they are easy to design and manufacture with constant velocity ratio.

Centre distance between gears = 132 mm

Pitch Circle Diameter for Gear D = 138 mm

Pitch Circle Diameter for Pinion, d = 46 mm

Pressure Angle (Φ) = 20°

$$\text{Velocity Ratio (VR)} = \frac{\text{PCD of Gear}}{\text{PCD of pinion}} = \frac{138 \text{ mm}}{46 \text{ mm}} = 3.00 \quad (1)$$

The gear design is based on the weaker gear. To determine the weaker gear, a set of arbitrary tooth numbers are assumed such as 18 and 44, which satisfy a velocity ratio of 3:1. The gear and the pinion are made of same material (mild steel) having an endurance strength, S_o of 320 MN/m² with form factor of 0.098 for 18 pinions and 0.127 for 40.64 MN/m². Since 31.36 MN/m² is lesser than 40.64 MN/m², the pinion is the weaker gear. Our design for strength is based on the weaker gear.

The torque to be transmitted by the pinion, T = 200 Nm,

Pinion Diameter, $D_p = 46 \text{ mm} = 0.046 \text{ m}$

Speed of the pinion, $N_p = 28 \text{ rpm}$

Transmitted force, $F = \frac{2T}{D} \quad (2)$

$$= \frac{2 \times 200}{0.046} = 8695 \text{ N}$$

Pitch line velocity, $V = \frac{\pi d N}{60} \quad (3)$

$$= \frac{\pi \times 0.046 \times 28}{60} = 0.067 \text{ m/s}$$

Allowable tooth stress for the pinion for a speed of 0.067m/s is given by:

$$S_{\text{allowable}} = S_o \left(\frac{3}{3 + v} \right) \quad (4)$$

$$= 320 \times 10^6 \left(\frac{3}{3 + 0.067} \right) = 313 \text{ MN/m}^2$$

Since the diameters are known, the following form of Lewis equation is used.

$$\left(\frac{1}{m^2 y} \right)_{\text{ind.}} = \left(\frac{s k \pi^2}{F} \right)_{\text{allow.}} = \frac{313 \times 10^6 \times 4 \times \pi^2}{8695} = 1.42 \text{ MN/m}^2 \text{ (Allowable stress)}$$

Where, $k \leq 4$

In order to find the module (m) form factor (y) is assumed to be 0.1,

$$\frac{1}{m^2 y} = 1.42 \text{ MN/m}^2 = \frac{1}{m^2 \times 0.1} = 1.42 \text{ MN/m}^2$$

Therefore, $m = 2.65 \text{ mm}$ (use 2.75 mm as standard module).

$$N_p = D_p / m = \frac{46 \text{ mm}}{2.75 \text{ mm}} = 16.727 = 17 \quad N_g = D_g / N_g = \frac{138 \text{ mm}}{2.75 \text{ mm}} = 50.182$$

Where,

N_p = Number of teeth of the pinion, and

D_p = Pitch circle diameter of the pinion

N_g = Number of teeth of the gear, and

D_g = Pitch circle diameter of the gear

From the table of form factor (y) for a number of teeth of 17 at 20° full-depth $Y = 0.098$ and $m = 2.75 \text{ mm}$ (0.00275 m)

$$\frac{1}{m^2 y} = \frac{1}{0.00275^2 \times 0.098} = 1.35 \text{ MN/m}^2 \text{ \{Induced stress\}}$$

Since the induced stress is less than the allowable stress, the design is satisfactory from the stand point of strength.

The value of k is reduced to $k = 4 \left(\frac{\text{Induced stress}}{\text{Allowable stress}} \right) = 4 \left(\frac{1.35 \text{ MN/m}^2}{1.42 \text{ MN/m}^2} \right) = 3.80$

From Lewis equation, Face width $b = kP_C = k\pi m = 3.8 \times \pi \times 2.75 = 32.82 \text{ mm}$

From the design calculations above, the gear design parameters were obtained as;

Face width $b = 32.82 \text{ mm}$; Module, $m = 2.75 \text{ mm}$; Number of teeth of pinion $N_P = 18$; Number of teeth of gear $N_G = 44$.

Hopper design

There was the need to provide hopper, lever, and stopper in order to avoid scattering of the coconut during operation as well as the need to use a more durable material, such as mild steel. The design consideration for the hopper was a trapezium shape. Coconut is fed through the hopper and a lever is used to press the coconut on the spines. Also, the hopper mounted helps to prevent the slipping of the coconut fibres while the dehushing operation. The calculation for the volume is shown in Eq. (5) (Khurmi and Gupta, 2005).

$$V = \frac{1}{2} \times (a+b) \times H \times L \quad (5)$$

Where, V = Volume of the hopper, L = Length of the hopper, a, b = Breadth of the hopper on both side, H = Height of the hopper.

$$V = \frac{1}{2} \times (0.327 + 0.627) \times 0.260 \times 0.810 = 0.1 \text{ m}^3$$

Spike drum (Rollers) Design

The Spike drum or roller (Figure 3) is made of mild steel, and are two in number. The rollers are made to roll in opposite direction towards the centre, shearing the husk from coconut (Ohler, 1984). The mass area (the shape and size) of coconut were considered (160-206 mm diameter, ovoid shape) during the designing of the machine. The rollers are interconnected to each other by means of a spur gear arrangement. Coconut contacts with cylinder at an average angle of 30° contact sector. The size of the roller drum is given by Eq. (6);

$$V_C = \pi r^2 \cdot L \text{ (m}^3\text{)} \quad (6)$$

Where,

V_C = Volume of cylinder,

R = Radius of cylinder, (60 mm)

L = Length of roller (810 mm)

$$V_C = 9.17 \times 10^{-3} \text{ m}^3$$

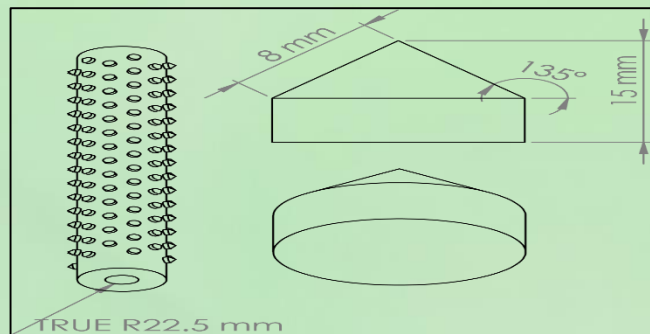
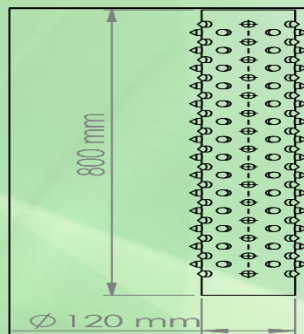


Figure 3. Spike drum

Shaft Design

The shaft considered for satisfactory performance is to be rigid enough while transmitting load under the various operating conditions. To achieve this, a solid circular shaft was considered for analysis of combined torsional and bending stresses. Shaft is made of Mild steel with 695 mm Length of the two shaft.

Number of shaft = 2 no

Diameter of the shaft = 25 mm

For solid shaft having little or no axial load, the diameter is given as Eq. (7).

$$d^3 = \frac{16}{\pi S_S} \sqrt{(k_b M_b)^2 + (k_t M_t)^2} \quad (7)$$

Where,

M_t = torsional moment,

M_b = bending moment

K_b = combined shock and fatigue applied to bending moment (1.5)

K_t = combined shock and fatigue applied to torsional moment (1.0)

S_s = allowable stress

For a shaft transmitting power (kW) at a rotational speed (rpm), the transmitting torque (M_t) is given as

$$M_t = \text{Power/Speed} \quad (8)$$

Speed Ratio

Speed ratio is important as it affect the rate of dehusking. The ratio of the smaller pulley on the shaft to larger pulley on the electric motor is given as Eq. (9).

$$N_1 D_1 = N_2 D_2 \quad (9)$$

Where,

N_1 = speed of electric motor

N_2 = speed of machine driving shaft

D_1 = diameter of motor pulley

D_2 = diameter of machine driven pulley

Detailed Design Drawings

The design drawings reveal all the machine details; these include Stopper for the hopper, block bearing house, coupler and electric motor. Bearing housings is usually made of grey cast iron. There was the need to provide hopper, lever, and stopper in order to avoid scattering of the coconut during operation and with his leg in each hushing. This rotation of the machine blades facilitated the husking process. A better grip on the coconut was provided by the flat blade, which acted as the stopper that prevented the nut to slip away vertically. The ball bearing is chosen because of its numerous advantages; it is suited for high loading, it avoids bearing edge loading, secures against distortion and ultimately reduce friction among moving parts. The bearing house protect the bearing from contamination, and keeping of lubricating oil to maximize its performance. The motor shaft is connected to the gear shaft using a flexible coupler.

Fabrication and Assembly Processes

The components of the coconut dehusking machine were fabricated and assembled one after the other following the designed diagram. L-angles metal material selected for the support frame were welded together after measurement. The two rollers and their shafts were fixed on the top of the frame using bolts and nuts the spikes were welded around the cylinder with a distance enough to ensure effective meshing with coconut in a way that will ensure complete removal of husk during operation. The sharpened spikes are spaced at a substantial equal distance while the gap of the Spiked roller was fixed either at 52 mm or 25 mm apart by adjusting the positioning of the spiked roller according to (Siva Kumar, 2016). The arrow head of the spike should not be less than 20 mm since the thickness of husk on coconut is in the range of 20-40 mm because separation takes place between the shell-husk interface (Figure 4). The gears are assembled to mesh in order to make the shaft to rotate in opposite directions. The spur gears were mounted on the tail end of the shaft to interlink the two shafts. The motor and pinion gear are fixed using the coupler, this enables transmission of drive to the shafts from the pinion gear. Now the drive is connected and the coconut is placed between the shafts for dehusking.

Results and Discussion

This machine was fabricated using locally sourced materials in order to make it economical and simple for use by peasant farmers. It has the capacity to dehusk the local varieties available of different thickness and at various hardness. The dehusking capacity and efficiency of the coconut dehusking machine were evaluated using twenty experimental runs. The dehusking period at each session was timed using a stop-watch. Each test involved operating the machine and recording the total number of fruits dehusked. In each of the operations, numbers of well-dehusked nuts without distortion on the length of the husk extract, and number of well dehusked nuts with distorted husk extract were recorded. This machine was fabricated at a relative cost of #170,000 (about \$300). Figure 5 shows the picture of the coconut dehusking machine during fabrication.



Figure 4. Fabricated and Sub-assembled of some components of the machine



Figure 5. The dehusking machine under construction

Performance Evaluation

The efficiency of the fabricated machine was determined. Results show that the machine performed above 90 % efficiency in all the tests cases as expected (Table 4).

Table 4. Results of performance test conducted with the fabricated coconut dehusking machine

S/ No	No of Fruits dehusked	No of fruits Well dehusked	No of fruits not dehusked well	Time (sec)	Capacity (fruits/h)	Capacity (fruits/h)
1	20	18	2	900.25	90.00	79.97
2	18	17	1	897.65	94.44	72.18
3	19	17	2	899.75	89.47	76.02
4	20	18	2	902.15	90.00	79.80
5	20	19	1	889.40	95.00	80.95
6	20	18	2	892.45	90.00	80.67
7	18	15	3	899.30	83.33	72.07
8	18	17	1	885.25	94.44	73.07
9	20	18	2	902.45	90.00	73.19
10	19	18	1	904.15	94.75	75.05
11	20	18	2	902.45	90.00	79.78
12	19	17	2	887.35	89.47	77.08
13	20	18	2	875.35	90.00	82.26
14	20	18	2	900.45	90.00	79.96
15	17	15	2	900.35	88.23	67.97
16	19	16	3	901.20	94.21	75.89
17	20	18	2	899.15	90.00	80.07
18	20	18	2	890.05	90.00	80.89
19	19	18	1	895.50	94.73	76.38
20	20	18	2	900.35	90.00	79.98
Average					90.40	73.00

It is also obvious from this table that the capacity of the developed machine ranges between 70-80 nuts per hour depending on the skill of operator. However, on average, an operator can dehusk 79 nuts per hour with this machine. The efficiency and capacity of the machine were computed in each case according to (Nwankwojike, 2012);

$$\eta(\%) = \frac{\text{number of well dehusked}}{\text{number of dehusked}} \times 100$$

$$\text{Capacity (fruit/hr)} = \frac{\text{number of dehusked}}{\text{Time (sec.)}}$$

Conclusion

Dehusking machine that can dehusk a coconut of varying dimensions has been developed and tested. The challenge of COVID-19 pandemic has reduced the economic capacity of lower-earners and farmers in the country. Agriculture is now seen as one of the ways to boost the economy by increasing the productivity and reduce required skilled man power. Coconut dehusking machine is made available at an affordable cost and can be utilized up to its potential. It dehusks the nuts without breakage or distortion of the extracted husk at an efficiency of 90.40 % and dehusking of 73 nuts per hour. The machine provides a less human energy loss and efficient productivity. It

has low maintenance cost and does not need skilled labour to operate. As a result of the nature of coconut farm, the machine can be easily dismantled, and carried from one place to another with ease. The results obtained compared relatively with existing coconut dehusking machine.

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Field Performance Evaluation of Two Disc Plows Makes as affected by Forward Speeds

Mysara¹, A., M. Abdalla N. O. Kheiry

Department of Agricultural Engineering- College of Agricultural Studies –Sudan University of Science and Technology – Khartoum – Sudan.

Abstract

Two different makes of disc plows were evaluated for field performance test. Namely, Giad Sudanese make and Baldan Brazilian make where examined for the effective field capacity, field efficiency, tractor rear wheel slippage, fuel consumption, implement draft and drawbar power and two plowing speeds were used (6, 9km/hr). The experiment study was carried out at the farm of college of agricultural studies, Shambat (Sudan) where the soil is considered light clay soil. The field area used was 875m (0.087ha) and was divided into sub-plots. A randomized complete block design was used to study the effect of two different makes of plows and two different speeds on various parameters. Field evaluation results showed that plow make had significant effect ($p<0.05$) on fuel consumption and effective field capacity. Plowing speed had a significant effect on fuel consumption and effective field capacity. Interaction effect between plow makes and plowing speed had significant effect ($p<0.05$) on fuel consumption only. The highest fuel consumption and tractor rear wheel slippage were obtained with Giad make plow. Giad plow gave lower field efficiency compared to Baldan make plow at 5.5km/hr forward speed.

Keywords: *plow make, performance, effective field capacity, wheel slippage, forward speed.*

Introduction

Farm machinery is an important element for agricultural development and crop production in many developed countries. The use of machines for agricultural operations has been one of the outstanding developments in the global agriculture during the last decade (Abdalla, 2007). It contributes a major capital input cost in most agricultural business. Farm machinery offers several potential improvements for farming system such as increased land and labor productivity, reduction of risk, increase of food quality and safe of time. One of the important influencing profits in farm business is the cost of owning and operating farm machinery.

Soil tillage may be defined as the mechanical manipulation of the soil aimed at improving soil conditions for crop production. It represents the most costly single item in the budget of an arable farmer. Tillage provides good weed control with low herbicide cost; allows the control of disease and insects by destroying them through burying of crop residues (Mohamed, 1997). Proper selection of tillage implement that suits available power, crop type and soil condition is important to reduce energy required (Hunt 1995).

Disc plow is widely used by farmers as a primary tillage tool. Performance data for disc plough is essential in order to optimize its performance and reduce the cost of tillage operation. The disk plow was developed as an alternative to be used in soil conditions where the moldboard plow would not work well such as heavy and sticky soils, excessively dry soils, soils too hard to penetrate and in very loose or stony soils.

Many studies have been conducted to test the performance of disc plows in numerous different ways under specific operating conditions. Field study was carried out at Sindh agric. University Tandojam by Mari (2011) to evaluate the performance of selected tillage implements (MB plow, Disc plow, Disc harrow, and cultivator) under the saline sodic soils. The disc plow resulted in 19.3% wheel slippage, 0.18 ha/ hr as field capacity and fuel consumed was 3.54 L/ha. Celik *et al* (2007) conducted field experiments on a wheat stubble field to compare specific draft and energy uses of three different plows with three bottoms mainly, disc plow, moldboard plow and experimental plow. The result indicated that highest draft and fuel consumption values were obtained for the disc plow 9.59 Kn and 17.31 L/ ha, respectively. The results concluded that, draft and fuel consumption increased with increasing forward speeds.

Ademiluyi *et al* (2007) investigated the effect of different field operations on some parameters which were , area of land covered , fuel consumption , wheel slippage , field capacity and field efficiency . Field efficiency determined for the disc plough was 53.98, the values obtained for the other parameters were: 42%, 0.086 ha/ hr, 6.68L/ha for wheel slippage, field capacity and fuel consumption, respectively. The field performance of some selected implements in Ebouyi State was evaluated by Oduma *et al* (2015). These implements include disc plow, disc harrow, 2row ridger and 4row planter, and some of the parameters evaluated were: field efficiency, effective field capacity and fuel consumption rate. Results revealed that the disc plow field efficiency was 76.1% , fuel consumption rate during plowing operation was 22.98 L/ha, and effective field capacity was found 0.69 ha/hr at 6.1 km/ hr . Oduma *et al* (2015) concluded that the disc plow recorded the lowest field efficiency and high fuel consumption rate, this might be due to the high tractive force and longer time required for it's operation as compared to disc harrow, ridger and planter . An experiment was conducted at the Agricultural Research Station, Mutah University in 2007 to study the effect of plowing speed, disc and tilt angles on tractor wheel slippage and on plowing depth (Ali, 2009). The result showed that increasing the plowing speed significantly increased tractor wheel slippage, the minimum value found was 3.9 % at 4k/hr when disc angle was 35°. Sheruddin *et al* (1992)

tested a three disc mounted plow in silt clay loam soil with 17% moisture content. He concluded that fuel consumption and field capacity values increased as disc and tilt angles were increased.

Abdalla *et al* (2011) carried out a field experiment to study the effect of three tilt angles (15°, 20°, 25°) of standard disc plow on some soil physical properties, effective field capacity and tractor wheel slippage under light clay soil. The results showed that increasing tilt angle of the plow significantly increased effective field capacity and decreasing the tractor wheel slippage. Adewunmi *et al* (2015) carried out the study of a two-wheel drive tractor during tillage operations on different soil surface conditions of the Atabadzi soil series of Ghana to determine the wheel slippage of the tractor mounted with a 2-bottom and 3-bottom disc plow. It was concluded that the wheel slippage of the tractor was 10.3% and 9.9% respectively for the 2-bottom and 3-bottom.

Plowing operation in most agricultural schemes of Sudan is carried out by disc plows using different manufacturer makes for most of the crops which lead to low machine performance and finally affect the crop yield. Recently, most of farm implements are imported and they are not specially designed to operate in the various Sudan regions and states and specific tropical conditions. In general, they are imported without any standardized testing and evaluation. In addition, it is realized that many of locally manufactured agricultural implements in Sudan are substandard quality. The low quality machinery leads to financial losses and at times is also unsafe for operation in the field.

The objective of this study was to determine the influence of plow make and forward speeds on field performance considering effective field capacity, field efficiency, tractor rear wheel slippage, fuel consumption and implement draft and drawbar power required.

Materials and Methods

Experimental design and treatments applications

The experiment was conducted on a selected area of (0.16ha) in the farm of the college of agricultural studies. The area was divided into sub-plots. The Massy Ferguson (MF285) tractor was used to pull the two disc plows in the field separately. The two plows used were namely Giad make and Baldan (Brazilian) type. Each of them, consist of three discs, and both of them were tractor fully mounted. A second Massy Ferguson (MF275) tractor with a dynamometer was used to measure the two plows draft. Other tools and implements, which were used in the study include: steel chain, meter tape (30m), ranging poles, stop watch, hundred liters graduated cylinder, fuel jercan, and a piece of chalk. A randomized complete block design was used to study the effect of two different makes of plows and two different speeds on various parameters, each replicated three times. To measure the field capacities and efficiencies, distance of 20m on each plot was marked with three replicates, and then the tillage operation was done at two plowing speeds (6 and 9km/hr).

Field measurements:

The field trials were conducted for the determination of effective field capacity (EFC), field efficiency (f.eff), fuel consumption and tractor wheel slippage. Investigation involved continuous observation and timing of each activity and time losses for turning at head land and adjustments.

a- Fuel consumption measurement:

The fuel tank of MF-285 tractor was filled up to its top level before field testing. After tillage operation, the tractor engine was stopped and the fuel tank was re filled up to the same level with the graduate cylinder. Fuel consumption per hectare was calculated by the following formula:

$$TF = \frac{F}{A \times 1000} \quad (1)$$

Where:

TF = Total fuel consumed (lit/ha)

F = Fuel consumed (mlit)

A = Area covered (ha)

b- Measurement of tractor rear wheel slippage:

The measurement of wheel slippage was done for the rear wheel of MF 285 tractor. At first the distance traveled with plow for 10 revolutions of the tractor rear wheel was recorded at without load. Then the measurements were taken for the same number of revolutions when operated with load.. The percentage of wheel slippage was then calculated as follow:

$$\text{Slippage\%} = \frac{L_1 - L_2}{L_1} \dots \quad (2)$$

Where:

L₁ = actual distance traveled (without loaded) (m)

L₂ = theoretical distance traveled (with load) (m)

c- Effective field capacity and field efficiency:

The time was recorded and the planting width was determined using the steel tape, then the effective field capacities and field efficiencies were calculated:

$$\text{Effective field capacity} \frac{(\text{EFC})\text{ha}}{\text{hr}} = \frac{\text{Plot area (438m)}}{\text{Total time require to cover the plot (hr)}} \quad (3)$$

$$\text{Theoretical field capacity (TFC)} = \frac{\text{plow width} \times \text{speed}}{\text{Constant}(10)} \quad (4)$$

$$\text{Field efficiency} = \frac{\text{Effective field capacity}}{\text{Theoretical field capacity}} \times 100\% \quad (5)$$

d- Implement draft and drawbar power:

A digital dynamometer was used to measure draft force. Two tractors MF285 and MF275 were made available. For the tractor drawn implements, draft was measured using a digital dynamometer attached to the front of the tractor on which the implement was mounted. Another auxiliary tractor was used to pull the implement mounted tractor. The draft was recorded within the measured distance of 10m as well as the time taken to reverse it. On the same field, the implement was lifted out the ground and the rear tractor was pulled to record the idle draft force. The draft force for the two implements was determined from equation (6) proposed by Mudamburi *et al* (2012).

$$\text{Implement draft (Kn)} = \text{draft with load} - \text{draft without load} \quad (6)$$

Drawbar power for tractor-powered implements is computed as proposed by ASAE (2003):

$$P_{db} = D \times S / 3.6 \quad (7)$$

where:

P_{db} drawbar power required for the implement, (kW);

D is implement draft, (kN);

S is travel speed, (km/h);

Results and Discussion

General:

Two different makes of disc plows were evaluated on basis of effective field capacity, field efficiency, tractor rear wheel slippage, fuel consumption and implement draft force as field evaluation. A factorial combination of two disc plows Baldan (Brazilian) plow and Giad make (Sudanese) plow and two plowing speeds were used (6, 9 km/hr).

Table 1. ANOVA table for all observed parameters at different forward speeds and different plow makes and their interactions.

Observed parameters	EFC		Efficiency		Fuel consumption		Wheel slippage		Draft	
Source	P	F	P	F	P	F	P	F	P	F
Speed	0.03	29.09	0.05	15.43	0.6	0.29	0.14	5.61	0.00	243.3
Machine	0.08	5.4	0.07	6	0.15	3.15	0.06	6.51	0.7	0.15
Speed × Machine	0.65	0.23	0.07	6	0.8	0.03	0.9	0.02	0.29	1.47

Effect of disc plows make and forward speed on effective field capacity and field efficiency

Fig. 1 and fig.2, showed the effective field capacity (ha/hr) and field efficiency percentage for the two plows at the two different speeds, respectively. It was cleared that at all different speeds there was no much variation in respect of effective field capacity for the two plows, and this may be due to the nearly same width of the plows working with the same speeds. Giad type plow recorded 0.59ha/hr at 9km/hr forward speed of effective field capacity while Baldan plow showed 0.55ha/hr. The statistical analysis of study data concerning the effective field capacity indicated that, effective field capacity was significantly influenced by forward speed ($P < 0.05$) (Table 2). While, the machine makes and interaction of machine makes and forward speed showed a non-significant effect (Table 1).

The two values of effective field capacity obtained by the two plows were greater than those obtained by Mari *et al* (2011) and Ademiluyi *et al* (2007) whose, reported 0.18ha/hr and 0.086ha/hr respectively. For the field

efficiency the two plows recorded the same value 88% at 9km/hr while it was 84% and 86% at speed 6km/hr for Giad and Baldan respectively (fig2). It was greater than that recorded by Oduma *et al* (2015) which was 76.1%. Analysis of variance (table 1) showed a non- significant difference between the field efficiency of the two plows at the two different speeds. And this is due to the highest values of effective Sfield capacity at speed 9km/hr. The average value of field efficiency obtained from the field was 88% for the two plows. This shows a satisfactory performance as it is above the range of values obtained for tillage operation by various researchers.

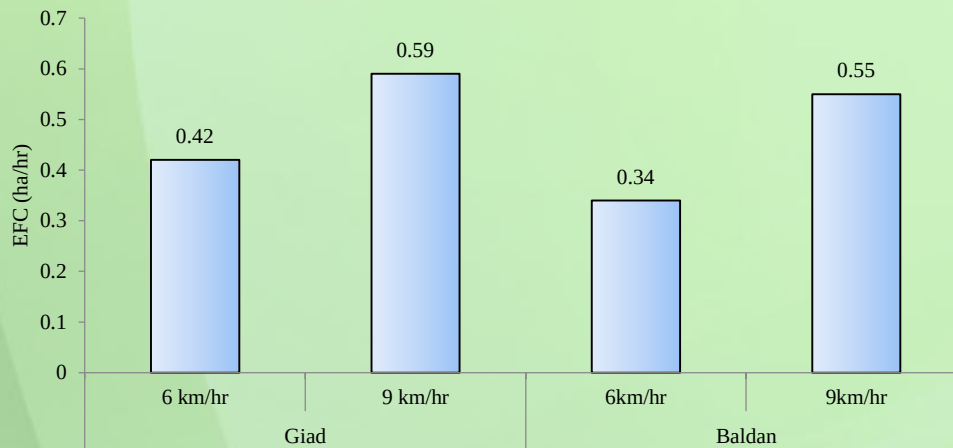


Fig. 1: Effective field capacity (ha/hr) for the two plows at the two different speeds

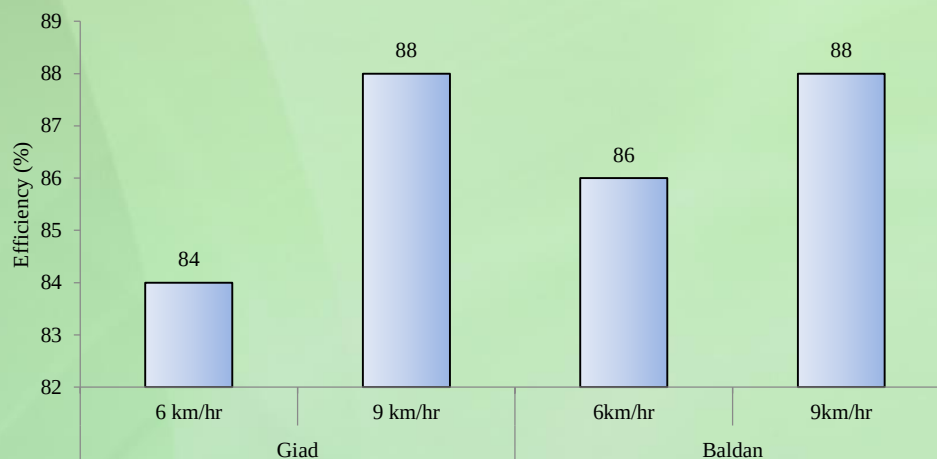


Fig. 2: field efficiency for the two plows at two different speeds

Effect of plow type and forward speeds on fuel consumption and tractor rear wheel slippage:

Fig. 3 showed the rate of fuel consumption for two plows at different forward speeds. Giad plow showed high rate of fuel consumption 2.9L/ha at 9 km/hr field speed. While Baldan plow registered 2.3L/ha at 9km/hr. The two values were less than those obtained by Mari (2011) and Ademiluyi (2007). Variation in forward speed and Machine makes and the interaction of speed and machine makes failed to show any significant effect on fuel consumption at 5% level (Table1).

The tractor rear wheel slippage was calculated and was shown in Fig. 4. Giad plow recorded lower slippage percentage (17%, 15%) at the two forward speeds which is higher than that value of 3.9% reported by Ali (2009). Further, the values of total wheel slippage were no significant at 5% level for speed and machine makes and the interaction of speed and machine makes as indicated in Table 1.

Effect of plow type and forward speeds on implement draft force and drawbar power:

Fig. 5 showed the implement draft force for the two plows at different forward speeds. Giad plow showed low Implement draft 6.5Kn at 6 km/hr field speed. While, Baldan plow registered high Implement draft 10.6Kn at 9km/hr, this is due to the disc diameter and weight of the disc plow. Table (1) indicates that, there was a highly significant difference only on machine draft when it was influenced by the forward speed ($P>0.05$).

Fig. 5 also showed the drawbar power for two plows at different forward speeds. Giad plow showed low drawbar power 10.8Kw at 6 km/hr. While, Baldan plow registered high drawbar power 26.5 at 9km/hr.

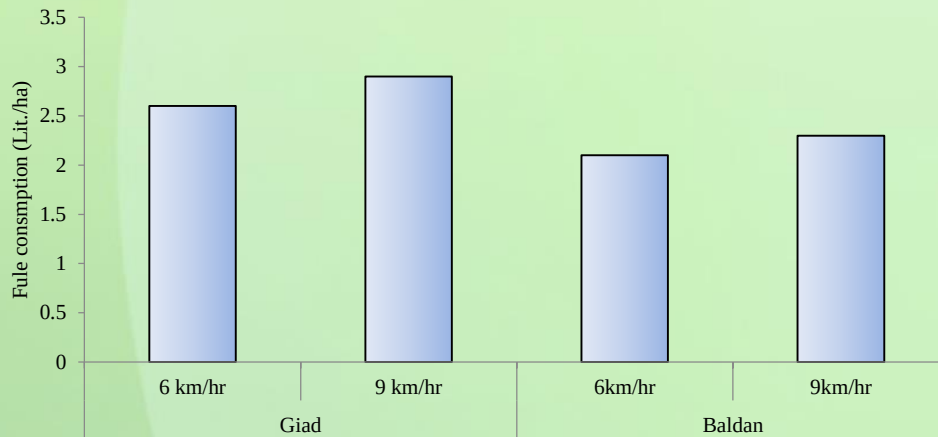


Fig. 3: Fuel consumption (lit./ha) for the two plows at the two different speeds

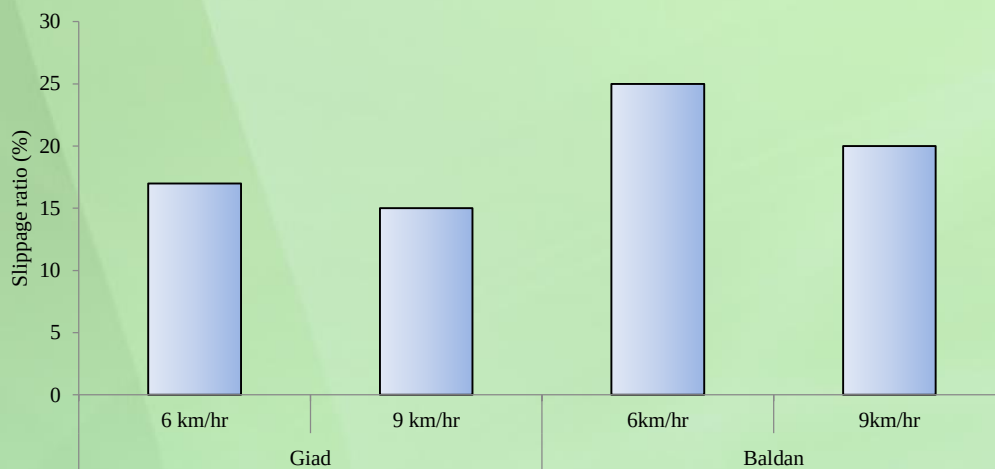


Fig. 4: Wheel slippage ratio (%) for the two plows at the two different speeds

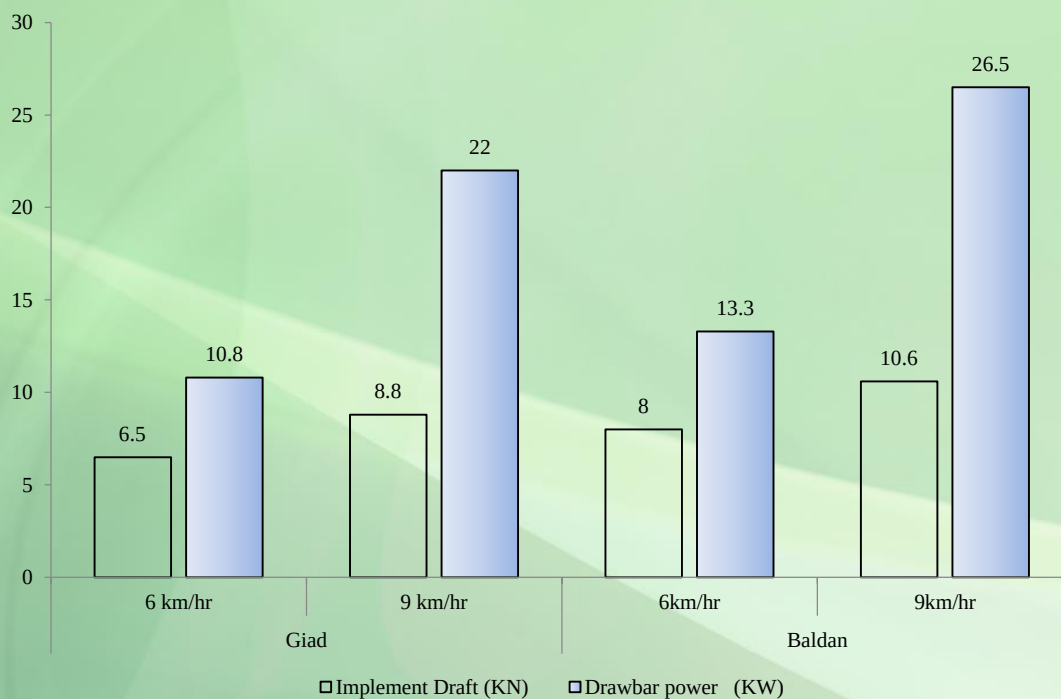


Fig. 5: Implement draft (kN) and drawbar power (kW) for the two plows at the two different speeds

Conclusion

Two disc plows makes were evaluated namely Giad Sudanese make and Baldan Brazilian make. They were evaluated and tested by field performance under field conditions. Effective field capacity, field efficiency, tractor rear wheel slippage, fuel consumption and implement draft were measured on actual field conditions. High percentage of field efficiency was found to be 88% for the two plows at the same speed (9km/hr). The lower rate of fuel consumption was found to be 2.1L/ha when using Baldan plow at 6km/hr, While Giad registered low percentage of wheel slippage(15%) at 6 km/hr.

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Enhanced power performance with the presence of sodium bicarbonate on *Chlorella* sp biofilm in a biophotovoltaic (BPV) system

Farah Husna Saifuddin, Nurul Affiqah Arzaee, Mohamad Firdaus Mohamad Noh, Mimi Hani Abu Bakar, Mohd Asri Mat Teridi, Mohd Sobri Takriff, Wan Ramli Wan Daud, Mohd Adib Ibrahim

The National University of Malaysia

Abstract

Sodium bicarbonate (NaHCO_3) is a low-cost inorganic carbon, highly soluble in water and widely used in microalgae research. Using carbon dioxide gas (CO_2) in microalgae culture is ideal for algae growth. However, the usage of CO_2 is restricted due to the high cost of CO_2 capture and transportation. In this work, the performance of non-axenic *Chlorella* sp (UKM2) biofilms on FTO glass anodes with varying NaHCO_3 concentrations in the BPV system was measured and discussed. The highest power density and photosynthetic pigments were obtained when employing 1 gL⁻¹ NaHCO_3 in the system. The presence of NaHCO_3 increased the photosynthetic pigments e.g., chlorophyll-a and improve the performance of the BPV system. After 12 days of operation, the power output of $0.035 \pm 0.003 \text{ mWm}^{-2}$ was generated, and the system still operated even after 50 days. However, an excessive amount of NaHCO_3 deteriorated the performance because high salt concentration provoked osmotic pressure.

Key Words:

Isolation and identification of fungus associated with leaf spot disease of *Ficus carica* and in-vitro chemical management

Rafia Tanveer, Muhammad Nabeel Afzal, Muhammad Amjad Ali, Kinza Ahsan, Amjad Abbas

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

The fig (*Ficus carica*) originated from middle east is a small fruit tree belongs to family Moraceae and is one of known early domesticated fruit species. *F. carica* is known as common fig which is widely spread throughout southwest Asia and eastern Mediterranean. Fruit of Common fig is pear-shaped, hallow and sweet in taste. Fig tree is the host of many bacterial and fungal pathogens. Leaf spot, leaf rust, mosaic and blight are some diseases which are major cause of low fruit yield. We observed leaf spot disease in the fig trees which are planted along the road side of the University of Agriculture, Faisalabad. Small dry necrotic spots were observed on the surface of leaf. The leaf samples were brought to the lab and were followed for pathogen isolation and purification on PDA media in the Petri plates. *Nigrospora sphaerica* was found dominant in all of our isolation studies as the causal organism responsible for leaf spot disease. In winters pathogen is active and chances of disease are higher than usual. DNA of the *N. sphaerica* was isolated by modified CTAB method. ITS1 and ITS 4 primers were used to amplify partial fragment of 18s ribosomal. After sequencing, evolutionary relationship of taxa in the form of dendrogram was established by comparing our sequence with the available sequences from NCBI. Detached leaf disc method was also used to check the pathogenicity of newly isolated fungus. Staining of leaf discs were preceded with Trypan blue staining (Keough staining). In-vitro test with fungicides having different dilutions were tested and data was recorded on alternate days. The data was then analysed by using MS Excel and statistical software Statistix 8.1.

Key Words:

Management of potato scab disease under field conditions by using different bio-control agents

Waqar Akram, Muhammad Usman Aslam, Muhammad Amjad Ali, Muhammad Nabeel Afzal and Amjad Abbas*

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan.

Abstract

Potato is a tuberous crop and used as staple food in many nations. However, this crop is susceptible to many diseases, the most important of which is the Common Scab of Potato, which reduces the market value of the tubers. Potato common scab is a tuber-borne or soil-borne disease caused by different species belonging to genus *Streptomyces*. To overcome the mentioned disease, a field experiment was conducted at University of Agriculture Faisalabad in Randomized complete Block Design (RCBD) with factorial arrangement and three replicates. Two factors were under study and treatments included were: bio-control agents *Metarhizium*, *Trichoderma harzianum*, *Lecanicillium lecanii*, *Siderophore*, *Bacillus spp* AS-40, and *Bacillus spp* AS-53. Five potato varieties (SANTE, LADY ROSETTA, MOZIKA, VSL-3 and VSL4) were sown during experiment. The objectives of this research were to check the efficacy of various bio-control agents through seed treatment. Results showed that all of the bio-control agent (BCA) treatments reduced the incidence and severity of common scab disease; however, *Bacillus spp* AS-40 and *Metarhizium* were the most effective. Among the varieties, VSL-4 remained more susceptible to disease, while the lowest disease attack was found on Lady Rosetta. It is concluded that Lady Rosetta should be planted where disease attack is forecasted and *Bacillus spp* AS-40 BCA should applied in case of disease attack.

Key words: *Streptomyces scabies*, Forecasted, Susceptible.

Evaluation of the phytoremediation ability of *Azolla filiculoides* in the purification of Congo red dye contaminated water using the Taguchi method

Zahra Alizadeh-Tarpouei¹, Akbar Noratehnia^{1*}, Zahra Masoodian¹

¹Department of Biology, Faculty of Basic Sciences, University of Guilan, Iran

*Corresponding author Email: norasteh@guilan.ac.ir

Abstract

Industrial effluents are usually one of the major environmental pollutants. The textile industry is one of the most basic industries in any country and usually the main characteristic of the effluent of this type of industry is their color, which is due to the use of dyes in such industries. Therefore, it is necessary to remove the colors before entering the natural water cycle. One of the inexpensive and non-polluting methods in advanced treatment is the use of floating aquatic plants, which due to their high growth rate, easy management, low cost and high efficiency; have a good ability to remove nutrients as well as heavy metals from effluents. In this study, the ability of the phytoremediation of *Azolla* (*Azolla filiculoides*) to bio-refine the Congo red dye using the Taguchi method and to investigate factors such as the initial concentration of the dye (20,15,10,5 mg / l), hardness (0.125, 0.065,0.025,0 g / l), salinity (0.1,0.05,0.025,0 g / l), nitrogen (0.4,0,2,0,1,0 mg / l) was investigated. Also, the effect of different concentrations (20,15,10,5,0 mg / l) on physiological parameters of *Azolla* plant such as photosynthetic pigments, relative growth rate (RGR), susceptibility index, membrane lipid peroxidation rate (MDA), anthocyanin concentration and antioxidant activity (DPPH free radical scavenging capacity) were evaluated in a 7-day treatment period. Based on Taguchi test analysis, it was found that the plant *Azolla* has the ability to refine Congo red dye, and adding nitrogen item is more effective than other agents.

Keywords: *Azolla*, Phytoremediation, Nitrogen, Congo

Evaluation of toxic elements in Dill (*Anethum graveolens dhi*) grown in different regions in Lahijan-Iran Northern

Ebrahim Alinia-Ahandani¹, Ali Akbar Malekirad^{1*}, Habibollah Nazem¹, Mohammad Fazilati¹, Hossein Salavati¹, Zeliha Selamoglu²

¹ Department of Biochemistry, Payame Noor University, Tehran, I.R. Iran P.O.BOX 19395-3697

² Medical Biology Department, Medicine Faculty, Nigde Omer Halisdemir University, Nigde, Turkey

*Corresponding authors: Ali Akbar Malekirad: Malekirad1973@gmail.com and Ebi.alinia@gmail.com Tel:+989362788299

Abstract

To evaluate cadmium, lead, mercury, arsenic, zinc and copper contents in Dill, one of the most consumed the populus herb in Iran northern, and to examine if the location variety in Lahijan affected investigated metals levels in herbs cultivated in the different regions were assessed. We measured the heavy metals by ICP-OES in standard methods. Statistical analysis (ANOVA) of obtained results showed no significant differences between Pahmedan and Ahandan regions. The results of analysis revealed that all dill samples met Public Health Regulation Standards regarding investigated metals except Bazkiyagourab region. However, Dill from 4 investigated locations exceeded the Maximum Permissible Concentrations (MPC) allocated for copper and mercury and met the standards considering other investigated elements. In the view of obtained results, pointing out mercury as major problem regarding heavy metal pollution of investigated herb, literature data estimating mercury intake in Iran were compared to average mercury intake in other countries and it was found to be similar to other considered countries. Based on obtained results and available statistical data, heavy metal intake through herbs consumption was estimated and expressed as the percentage of Iranian tolerable daily (weekly) intake for each investigated element.

Keywords: toxic elements, herbs, Iran, lead, Dill.

The effect of different nitrogen doses on the herbage yield of Italian ryegrass (*Lolium multiflorum* var. *westerwoldicum*) cultivars in Aegean Region conditions

Sabi Mohamed Sani Orou Ouennon Assouma, A. Esen Celen

Field Crops Department, Faculty of Agriculture, Ege University, Izmir, Turkey

Abstract

This research was carried out in the experimental areas of Field Crops Department, Faculty of Agriculture, Ege University in 2020-2021 growing season to determine the effect of different nitrogen doses (0, 75, 150, 225 ve 300 kg/ha N) on the herbage yield of Italian ryegrass (*Lolium multiflorum* var. *westerwoldicum*) cultivars. As a result of the research, the effect of application of different nitrogen doses on green grass and hay yields was significant, while the effect on plant height, stem thickness and dry matter ratio was insignificant. The effect of the application of the cultivars on all properties was insignificant except for the dry matter ratio. In the study, the highest green grass and hay yields were obtained from the nitrogen applied plots. Although there was no significant difference between the yields in terms of nitrogen doses, high yields were obtained with high nitrogen doses.

Key Words: Cultivar, Italian ryegrass, Nitrogen dose, Yield

Ege Bölgesi koşullarında İtalyan çimi (*Lolium multiflorum* var. *westerwoldicum*) çeşitlerinde farklı azot dozlarının ot verimine etkisi

Özet

Bu araştırma, Ege Üniversitesi Ziraat Fakültesi Tarla Bitkileri Bölümü deneme alanlarında, İtalyan çimi (*Lolium multiflorum* var. *westerwoldicum*) çeşitlerinde farklı azot dozlarının (0, 7.5, 15, 22.5 ve 30 kg/da N) ot verimi üzerine etkisini saptamak amacıyla 2020-2021 yetiştirme sezonunda yürütülmüştür. Araştırma sonucunda, farklı azot dozları uygulamasının, yeşil ot ve kuru ot verimleri üzerine etkisi önemli çıkarken, bitki boyu, sap kalınlığı ve kuru madde oranı üzerine etkisi önemsiz çıkmıştır. Çeşitlerin etkisi ise, kuru madde oranı dışında bütün özellikler üzerinde önemsiz çıkmıştır. Çalışmada, en yüksek yeşil ot ve kuru ot verimleri azot uygulanan parsellerden elde edilmiştir. Verimler arasında azot dozları bakımından önemli fark bulunmamakla birlikte, yüksek azot dozlarıyla yüksek verimler elde edilmiştir.

Anahtar Kelimeler: Azot dozu, Çeşit, İtalyan çimi, Verim

Giriş

Ege Bölgesi'nde kış aylarındaki iklim koşulları İtalyan çiminin yetiştirilmesine çok elverişlidir. Kış aylarında İtalyan çimi yetiştirmesinin pek çok avantajı bulunmaktadır. öncelikli olarak, bölgede gelişen hayvancılığın yem gereksinimi karşılanabileceği gibi eğimli alanlarda kış yağışları ile artan erozyon sorununa karşı da önlem alınabilmektedir. öte yandan, toprağın organik madde içeriği artırılarak fiziksel ve kimyasal özellikleri iyileştirilmektedir. Bölgede daha çok kışlık ara ürün olarak yetiştirilen İtalyan çimi, ot ve tohum üretmek amacıyla ana ürün olarak da ekilebilir. Çiçeklenme dönemi başlangıcında biçildiğinde çabuk kuruyan ve hayvanlar tarafından istekle yenen değerli bir ürün vermektedir. Normal koşullar altında 1500-2500 kg/da yeşil ot, 500-800 kg/da kuru ot verimi vardır. Tohum üretimi için ekim 40-60 cm aralıklı sıralara yapılmaktadır. Tohum için hasat, taneler sarı olum döneminde iken yapılmalıdır. Normal yetiştirme koşullarında 80-100 kg/da tohum verimi alınmaktadır (Sağlamtimur ve ark. 1998). Çelen (1991), Ege Bölgesinde tek yıllık çimden yararlanma olanaklarını araştırdığı çalışmada, farklı azot dozlarında (0, 5, 10 ve 15 kg/da saf azot) 2412-3502 kg/da yeşil ot, 560-728 kg/da kuru madde, 64-92 kg/da ham protein verimi elde etmiş ve en yüksek değerleri 15 kg/da N dozunda saptamıştır. Kuşvuran vd. (2014), Çankırı'da yaptıkları çalışmada İtalyan çimi - Macar fiği karışımlarında, İtalyan çiminin yalın ekiminde bitki boyunu 107.6 cm, yeşil ot verimini 2810 kg/da, kuru ot verimini 630 kg/da, ham protein oranını % 13.0, ham protein verimini 81.5 kg/da, ham kül oranını %9.4, ADF oranını % 37.4, NDF oranını % 58.7 ve nispi yem değerini 94 olarak bulduklarını bildirmişlerdir. Çolak ve Sancak (2016), azot gübresinin İtalyan çimi çeşitlerinin yem kalitesi üzerindeki etkisini belirlemek amacıyla yürüttükleri iki yıllık çalışmalarında; azotlu gübre olarak amonyum nitrat (%33 N) gübresinin 0, 4, 8, 12, 16, 20 ve 24 kg/da dozlarını ve İtalyan çimi

çeşidi olarak da Gemini, Tetraflorum ile Lolita çeşitlerini kullanmışlardır. Kontrol grubunda bitki boyu 55,1 cm, sap kalınlığı 3,04 mm, yeşil ot verimi 1377,5 kg/da, kuru ot verimi 323,1 kg/da olarak tespit edilmiştir. Çetin (2017), Tokat-Kazova koşullarında yaptığı çalışmada, güzlük ekilen tek yıllık çimde yedi farklı azot dozunun (0, 5, 10, 15, 20, 25 ve 30 kg N/da) ot verimi ve kalitesine etkilerini belirlemiştir. Araştırma sonuçlarına göre; ortalama başaklanma gün sayısı 210 ve birinci biçimde bitki boyu en yüksek 109.7 cm olarak dekara 20 kg azot uygulamasından elde edilmiştir. Ayrıca, en yüksek yeşil ot (4544.2 kg/da) ve kuru madde (1222.6 kg/da) verimi 25 kg/da N dozunda saptamıştır. Özdemir (2017), Bursa ekolojik koşullarında farklı N dozlarının tek yıllık çim Caramba çeşidinde ot verimi ve kalitesini araştırmıştır. Araştırmacı, yedi farklı N dozunun (0,10,20,30,40,50,60 kg/da) ele alındığı çalışmada azot dozu arttıkça yeşil ot verimi, kuru madde verimi, ham protein oranı ve ham protein veriminin arttığını, ADF ve NDF oranlarının ise azaldığını tespit etmiştir. İtalyan çiminde yüksek verim ve kalite açısından 50 kg/da N dozu Bursa ve benzeri ekolojik koşullar için önerilmiştir. Bıçakçı ve Türk (2018), Isparta koşullarında yürütülen çalışmada, yedi farklı azot dozunun (0, 5, 10, 15, 20, 25 ve 30 kg N/da) tek yıllık çimde ot verimi ve kalitesi üzerine etkilerini incelemişlerdir. Araştırmacılar, artan azot dozlarının kuru ot verimi, ham protein oranı ve veriminde artış sağladığını ve en yüksek ot verimi ve kalitesinin dekara 25 kg azot uygulamasından alındığını tespit etmişlerdir.

Materyal ve Yöntem

Araştırmada, materyal olarak dört İtalyan çimi çeşidi (Elif, Big Boss, Baquend ve Medoacus) kullanılmıştır. Elif çeşidi Ege Tarımsal Araştırma Enstitüsü'nden, diğerleri ise iki ticari firmadan alınmıştır. Araştırma, İzmir iline bağlı Bornova ilçesindeki Ege Üniversitesi Ziraat Fakültesi Tarla Bitkileri Bölümü deneme alanlarında, bölünmüş parseller deneme desenine göre 3 tekrarlamalı olarak kurulmuştur. Her bir deneme parseli 6 m²'lik (2 m x 3 m = 6 m²) alana sahip olup, toplam araştırma alanı 60 parselden (4 çeşit x 5 azot dozu x 3 tekrerrür) oluşmuştur. Toplam deneme alanı ise 360 m² (6 m² x 60 parsel) yer kaplamıştır. Denemede, sıra arası mesafe 20 cm ve dekara atılan tohum miktarı ise 3 kg alınmıştır (Eraç ve Ekiz, 1990; Avcıoğlu ve Geren, 1996). Ekimle birlikte her parselde eşit olmak üzere Triple Süper Fosfat (%44 TSP) gübresinden dekara saf olarak 5 kg hesap edilerek uygulanmıştır. İncelenen her bir azot dozunun yarısı (%20.5 Amonyum Sülfat) ekim zamanında tohumla birlikte toprağa, yarısı (%33 Amonyum Nitrat) ise bitkiler 20-25 cm boylandıklarında sıra aralarına elle verilmiştir. Gerekli toprak hazırlıkları yapıldıktan sonra, 23.12.20 tarihinde el ile ekim işlemi gerçekleştirilmiştir. Araştırmada kullanılan İtalyan çimi çeşitleri süt olum ile hamur olum dönemi arasındaki dönemde 18.05.21 tarihinde, kenar tesiri dikkate alınarak parsellerin tamamı biçilip tartılarak yeşil ot verimi belirlenmiştir (Erkun vd. 1960). Araştırmada, gübre faktörü olarak 0, 7.5, 15, 22.5 ve 30 kg/da olmak üzere 5 farklı N (azot) dozu uygulanmıştır.

Bulgular ve Tartışma

Bitki Boyu

Çizelge 1. incelendiğinde, bitki boyu değerleri bakımından uygulamalar arasında istatistiki olarak bir fark bulunmadığı saptanmıştır. Araştırma bulguları; İnce (2000), Kuşvuran ve Tansı (2005)'nin bulguları ile uyum içindeyken, Çelen (1991), Kesiktaş (2010), Kuşvuran (2011), Çolak ve Sancak (2016), Türk ve ark. (2019), Çınar ve ark. (2020)'nin bulguları ile uyum göstermemektedir.

Sap Kalınlığı

Çizelge 2. incelendiğinde, sap kalınlığı değerleri bakımından uygulamalar arasında istatistiki olarak bir fark bulunmadığı saptanmıştır. Araştırma bulguları; Taşsever (2019)'in bulguları ile uyum içindeyken, Çolak (2015), Çetin (2017), Türk ve ark. (2019) ve Pak (2019)'ın bulguları ile uyum göstermemektedir.

Çizelge 1. İtalyan çimi çeşitlerinde farklı azot dozlarının bitki boyu (cm) üzerine etkisi

Azot dozları (kg/da)	Çeşitler				
	Elif	Big Boss	Baquend	Medoacus	Ortalama
0	95.1	102.7	107.0	115.2	105.0
7.5	111.5	130.8	118.1	120.5	120.2
15	126.6	129.6	120.0	122.0	124.5
22.5	102.0	113.7	108.8	113.9	109.6
30	113.3	115.4	115.1	106.1	112.5
Ortalama	109.7	118.4	113.8	115.5	114.4
CV = 8.9%	AD : öd Ç : öd AD x Ç : öd				

Aynı satır veya sütunda farklı harflerle gösterilen ortalamalar arasında Duncan testine göre ($\alpha=0.05$) önemli fark vardır; (*): 0.05 Düzeyinde önemli; (**): 0.01 Düzeyinde önemli; öd: önemli değil; AD: azot dozları; Ç: çeşitler; AD x Ç: azot dozları x çeşitler etkileşimi; CV: varyasyon katsayısı

Çizelge 2. İtalyan çimi çeşitlerinde farklı azot dozlarının sap kalınlığı (mm) üzerine etkisi

Azot dozları (kg/da)	Çeşitler				
	Elif	Big Boss	Baquend	Medoacus	Ortalama
0	2.71	2.62	3.00	2.74	2.77
7.5	2.66	2.74	2.48	2.94	2.71
15	3.51	3.62	3.63	2.95	3.43
22.5	3.48	3.08	3.06	3.17	3.20
30	3.37	3.69	3.35	3.19	3.40
Ortalama	3.15	3.15	3.10	3.00	3.10
CV = 12.2%	AD : öd Ç : öd AD x Ç : öd				

Aynı satır veya sütunda farklı harflerle gösterilen ortalamalar arasında Duncan testine göre ($\alpha=0.05$) önemli fark vardır; (*): 0.05 Düzeyinde önemli; (**): 0.01 Düzeyinde önemli; öd: önemli değil; AD: azot dozları; Ç: çeşitler; AD x Ç: azot dozları x çeşitler etkileşimi; CV: varyasyon katsayısı

Yeşil Ot Verimi

Çizelge 3. incelendiğinde, uygulanan farklı azot dozlarının yeşil ot veriminde istatistiki olarak önemli bir fark yarattığı görülmektedir. Azot dozlarına bağlı olarak ortalama yeşil ot verimleri 1024 kg/da ile 2871 kg/da arasında değişmiş olup en düşük değer kontrol uygulamasından elde edilmiştir. Araştırma bulguları; Çelen (1991), İnce (2000), Parlak ve ark. (2007), Kesiktaş (2010), Kuşvuran (2011), Çolak (2015), Çınar ve ark. (2020)'nin bulguları ile uyum içindeyken, Kuşvuran ve Tansı (2005)'nin bulguları ile uyum göstermemektedir.

Kuru Ot Verimi

Çizelge 4. incelendiğinde, uygulanan farklı azot dozlarının kuru ot veriminde istatistiki olarak önemli bir fark yarattığı gözlenmiştir. Azot dozlarına bağlı olarak ortalama kuru ot verimleri 328 kg/da ile 1058 kg/da arasında değişmiş olup en düşük değer kontrol uygulamasından elde edilmiştir. Araştırma bulguları İnce (2000), Kesiktaş (2010), Çolak (2015), Pak (2019), Türk ve ark. (2019)'nin bulguları ile uyum içindeyken, Kuşvuran ve Tansı (2005) ile Yalçın (2019)'ın bulguları ile uyum göstermemektedir.

Çizelge 3. İtalyan çimi çeşitlerinde farklı azot dozlarının yeşil ot verimi (kg/da) üzerine etkisi

Azot dozları (kg/da)	Çeşitler				
	Elif	Big Boss	Baquend	Medoacus	Ortalama
0	1154	963	1038	940	1024b
7.5	2215	2309	2217	2340	2270a
15	2729	2663	2771	2611	2693a
22.5	2765	2371	2646	2488	2567a
30	3023	2963	2973	2523	2871a
Ortalama	2377	2254	2329	2180	2285
CV = 16.4%	AD : * Ç : öd AD x Ç : öd				

Aynı satır veya sütunda farklı harflerle gösterilen ortalamalar arasında Duncan testine göre ($\alpha=0.05$) önemli fark vardır; (*): 0.05 Düzeyinde önemli; (**): 0.01 Düzeyinde önemli; öd: önemli değil; AD: azot dozları; Ç: çeşitler; AD x Ç: azot dozları x çeşitler etkileşimi; CV: varyasyon katsayısı

Çizelge 4. İtalyan çimi çeşitlerinde farklı azot dozlarının kuru ot verimi (kg/da) üzerine etkisi

Azot dozları (kg/da)	Çeşitler				
	Elif	Big Boss	Baquend	Medoacus	Ortalama
0	316	308	339	348	328b
7.5	733	926	880	906	861a
15	986	1079	1085	1082	1058a
22.5	989	992	1057	1016	1013a
30	989	1107	1130	948	1043a
Ortalama	802	882	898	860	861
CV = 15.5%	AD : ** Ç : öd AD x Ç : öd				

Aynı satır veya sütunda farklı harflerle gösterilen ortalamalar arasında Duncan testine göre ($\alpha=0.05$) önemli fark vardır; (*): 0.05 Düzeyinde önemli; (**): 0.01 Düzeyinde önemli; öd: önemli değil; AD: azot dozları; Ç: çeşitler; AD x Ç: azot dozları x çeşitler etkileşimi; CV: varyasyon katsayısı

Kuru Madde Oranı

Çizelge 5. incelendiğinde, kuru madde oranı üzerinde azot dozlarının önemli bir etkisinin olmadığı, çeşitlerin ise kuru madde oranları üzerinde önemli etkisinin olduğu görülmektedir. En yüksek kuru madde oranları Big Boss, Baquend ve Medoacus çeşitlerinde ortaya çıkarken, çeşitler arasında istatistiki olarak farklılık bulunmamıştır. Araştırma bulguları Yalçın (2019)'ın bulguları ile uyum içindeyken, Çelen (1991)'in bulguları ile uyum göstermemektedir.

Çizelge 5. İtalyan çimi çeşitlerinde farklı azot dozlarının kuru madde oranı (%) üzerine etkileri

Azot dozları (kg/da)	Çeşitler				
	Elif	Big Boss	Baquend	Medoacus	Ortalama
0	31.21	37.22	35.84	35.07	34.84
7.5	35.28	38.04	40.09	40.79	38.55
15	34.26	40.87	36.80	39.17	37.78
22.5	36.26	41.77	39.92	39.27	39.31
30	34.36	38.29	40.52	43.56	39.18
Ortalama	34.27b	39.24a	38.63a	39.57a	37.93
CV = 8.2%	AD : öd Ç : ** AD x Ç : öd				

Aynı satır veya sütunda farklı harflerle gösterilen ortalamalar arasında Duncan testine göre ($\alpha=0.05$) önemli fark vardır; (*): 0.05 Düzeyinde önemli; (**): 0.01 Düzeyinde önemli; öd: önemli değil; AD: azot dozları; Ç: çeşitler; AD x Ç: azot dozları x çeşitler etkileşimi; CV: varyasyon katsayısı

Sonuç olarak, İtalyan çimi çeşitlerinin ot verimi üzerine farklı azot dozlarının etkilerinin araştırıldığı bu çalışmada, azot dozlarının yeşil ot ve kuru ot verimleri üzerine önemli etkilerinin olduğu, çeşitlerin ise sadece kuru madde oranı üzerine önemli etkilerinin olduğu belirlenmiştir. Öte yandan azot dozlarındaki artış ve kullanılan çeşitler bitki boyu ve sap kalınlığı açısından önemli bulunmamıştır. Bu araştırmanın sonuçlarına göre, Ege Bölgesi ekolojik koşullarında İtalyan çimi yetiştiriciliğinde yüksek ot verimi için Elif çeşidinin daha uygun olduğu, çevre kirliliği ve ekonomik durumlar da göz önünde bulundurularak 15 kg/da azot dozu uygulamasının önerilebileceği sonucuna varılmıştır.

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Determination of Plasticity Characteristics of Different *Trichoderma* Species

Elif Canpolat, Ayten Öztürk, Yunus Bozkurt

Niğde Ömer Halisdemir Üniversitesi Fen Edebiyat Fakültesi Biyoteknoloji Bölümü

Abstract

Since chemical pesticides damage the environment it has become an obligation to find alternative methods for control and management of the plant diseases. *Trichoderma* species are known to be the most used antagonists in biological control approaches. Studies with the members of the genus *Trichoderma*, which have a significant importance for agriculture, have been gradually increased in recent years. Morphological characteristics used for the identification of the species have shown high variations based on the type of culture media. This phenomenon creates some difficulties to perform identification by traditional methods. Thus, DNA based methods using molecular markers in addition to the traditional methods using morphological characteristics give more precise results in identification at the species level. In this study two *Trichoderma* species were isolated from soil and identified by molecular methods. Both *Trichoderma* species were cultivated in different culture media (YMA, MEA, PDA, YEA, NA, RBA) and showed variety in morphological development during cultivation period. This indicated that the plasticity of the species due to the ingredient of the culture medium should be investigated. In studies, which molecular identification was not performed, identification based on the morphological characteristics, that showed variety in different culture media, misled researchers. The species used in this study were identified as *Trichoderma citrinoviride* and *Trichoderma pleurotica* by performing both the traditional and molecular identification methods. It was aimed to contribute to the literature by indicating that variations in morphological characteristics could occur due to the type of the culture medium.

Key Words: *Trichoderma*, biocontrol, morphological identification, plasticity

Farklı *Trichoderma* Türlerinin Plastisite Özelliklerinin Belirlenmesi

Özet

Bitki hastalıklarıyla mücadelede alternatif yöntemlerin bulunması kullanılan pestisidlerin zararlarından dolayı bir zorunluluk haline gelmiştir. *Trichoderma* türleri biyolojik mücadelede en çok kullanılan antagonistler olarak bilinmektedir. Tarım için oldukça önemli olan bu genus üyeleri ile ilgili çalışmalar son yıllarda giderek artmaktadır. *Trichoderma* türlerinin besiyerlerinde besiyerlerine bağlı olarak morfolojik karakterlerinde yüksek değişiklik gösterdiği bulunmuştur. Bu durum geleneksel taksonomik yaklaşımlarla tür tayini yapmayı zorlaştırmaktadır. Fungal taksonomide kullanılan geleneksel morfolojik kriterlere ek olarak, moleküler markörlerin yardımı ile tür tayinleri daha kesin bir şekilde belirlenebilmektedir. Bu çalışmada iki adet *Trichoderma* türü topraktan izole edilip ve moleküler olarak tür teşhisi yapılarak tanımlanmıştır. Her iki tür *Trichoderma* suşunun farklı morfolojik gelişme gösterdiği ve besinsel olarak plastisite özelliklerinin araştırılması gerektiği ortaya konmuştur. Çalışma kapsamında izole edilen *Trichoderma* türleri çeşitli besiyerlerinde (YMA, MEA, PDA, YEA, NA, RBA) geliştirilmiştir. Moleküler olarak tanımlamanın yapılmadığı literatürlerde farklı besiyerlerinde farklı morfolojik gelişme gösteren türlerin farklı türler olacağı düşünülmüş ve farklı isimler verilmiştir. Bu çalışmada farklı besiyerlerinin farklı morfolojik karakterler gösterebileceği üzerinde durularak literatüre katkı sağlamak amaçlanmıştır. Morfolojik ve mikroskopik teşhis sonrasında moleküler olarak *Trichoderma citrinoviride* ve *Trichoderma pleurotica* olarak iki tür teşhis edilmiştir. Farklı besiyerleri denenerek üreme karakteristikleri belirlenmiştir.

Anahtar Kelimeler: *Trichoderma*, biyokontrol, morfolojik tanımlama, plastisite

The Effect of The Use of Lemon Oil on The Microbiological and Sensory Properties of Raw Meatballs

Eda Kılıç Kanak¹, Suzan Öztürk Yılmaz¹, Nurdan Aygün¹, Çağla Uzun¹

¹Department of Food Engineering, Faculty of Engineering, Sakarya University, Sakarya, Turkey

Abstract

In this study, the antimicrobial effect of lemon oil on raw meatballs was investigated. The aim is to investigate the effect of lemon oil on survival of raw meatballs *Escherichia coli* O157: H7 and *Salmonella* sp. Raw meat samples were inoculated with *Escherichia coli* O157: H7 and *Salmonella* sp. at high inoculum levels and lemon oil was added at different doses (50 µL / g, 75 µL / g, 100 µL / g). According to the results of analysis, total coliform bacteria decreased statistically as lemon oil concentration increased ($P < 0,05$). There was no statistically significant effect of lemon oil on total mesophilic aerobic bacteria and total yeast ($P > 0,05$). A statistically significant decrease in the number of *E. coli* O157: H7 bacteria was detected from 75 µl / g of lemon oil concentration ($P < 0,05$). There was no statistically significant effect of lemon oil on TMAB, coliform, yeast and *Salmonella* sp. ($P > 0,05$). As a result, a decrease in coliform and *E. coli* O157: H7 counts was observed when lemon oil was added to the raw meats at a rate of 75 µl/g. In addition there was no statistical difference in color, appearance, odour and overall acceptability according to sensory evaluation performed on 20 panelists. according to these results, it is advisable to use lemon oil in raw meatballs.

Key Words: Raw meatball, TMAB, coliform

Introduction

Raw meatball is a traditionally consumed product in Turkey and other Middle Eastern countries. Although the formulation of the product differs according to the region where it is consumed, it is prepared with finely ground bulgur, salt, red pepper, black pepper, cumin, tomato paste, onion and garlic. All of them are mixed and kneaded by hand and shaped into small pieces. It is usually consumed wrapped in lettuce. Most of the time, it is consumed by dripping lemon juice on it according to preference. No cooking or heat treatment is applied. Since heat treatment is not suitable for the raw properties of the product, the addition of antimicrobial lemon oil seems to be a potential technique for preserving raw meatballs.

Factors such as preparing raw meatballs under unhygienic conditions, storing them at unsuitable temperatures, and producing them without any heat treatment cause an increase in the microbial load. In addition, in many studies in Turkey, it has been reported that spices are contaminated by various pathogenic bacteria. These situations make raw meatballs a dangerous food product for human health. (Bingöl et al., 2007; Hampikyan et al., 2009).

In addition, the presence of unwanted microorganisms in raw meatballs; during transportation / preparation of the product, storage; It can be attributed to the lack of temperature control and / or the poor quality of the materials used and the lack of hygiene during safety. In some cases, raw meatballs support the viability of foodborne pathogens such as Shiga toxin producing *Escherichia coli*, *E. coli* O157: H7, *Salmonella* sp., *Bacillus cereus*, *Staphylococcus aureus* and *Listeria monocytogenes* (Ardic and Durmaz, 2008; Çetin et al., 2008; Vural, Aksu and Erkan, 2006). Since the product is consumed without heating and has potential association with foodborne pathogens such as *E.coli*, *Salmonella* and *L. monocytogenes* interventions are needed, such as adding products with a protective effect. Therefore, in this study, the microbiological quality of raw meatballs sold in retail markets and restaurants in Sakarya was evaluated and the effect of lemon oil on the viability of *E. coli* O157:H7 and *Salmonella* sp. was investigated.

Materials and Methods

Preparation of the inoculum

Salmonella sp. and *E. coli* O157:H7 strains were grown separately in 10 ml TSB site at 35°C for 24 hours and the supernatant was removed by centrifugation and the pellets were washed with sterile saline. It was centrifuged again and then all pellets were suspended in 0.1% peptone water. The pathogen density in this mixture was determined as 109 cfu/ml.

Addition of lemon oil to raw meatball samples and microbiological analysis

Raw meatball samples were divided into 4 groups as 25 g. Samples were prepared by adding 50 µL/g, 75 µL/g, and 100 µL/g lemon oil to each group, respectively. In addition, a raw meatball sample without lemon oil was prepared as a control sample. Lemon oil is sterilized by filtration (0.2 micron) before use. *Salmonella* sp. and *E. coli* O157:H7 mix culture was added to each sample group and mixed. After waiting for 24 hours, each 25 g raw meatball sample was homogenized in 225 ml sterile peptone water for 2 minutes and diluted up to 1/10⁸, and seeded from each dilution on double serial SMAC and XLT-4 agar plates with 0.1 ml surface smear method, and counted after 24 hours of incubation at 35°C.

Sensory evaluation

Raw meatball samples, uninfected and treated with lemon oil, were evaluated by a panel of twenty people. Raw meatball samples were given to the panelists to evaluate the selected qualities. The assessed attributes are: colour, appearance, odour, flavor and general taste. All attributes were scored on a five-point descriptive scale: 1 very bad, 2 bad, 3 fair, 4 good, and 5 very good. Each sample is randomly labeled with a three-digit code number (ISO 8589, 1988).

Statistical analysis

To determine the effect of lemon oil in raw meatball samples, one-way analysis of variance (ANOVA) was performed using the SPSS 10.0 statistical package.

Results and Discussion

The effect of lemon oil on raw meatballs added to *E. coli* O157:H7

Different concentrations (control, 50 µL/g, 75 µL/g, 100 µL/g) of lemon oil were added to the raw meatball sample and its effect on raw meatballs was investigated. Analysis results are given in Table 1.

According to the analysis results obtained, as the lemon oil concentration increased, the number of coliform bacteria decreased statistically ($P < 0.05$). There was no statistically significant effect of lemon oil on TMAB and yeast ($P > 0.05$). A statistical decrease in the number of *E. coli* O157:H7 bacteria was detected starting from 75 µL/g lemon oil concentration ($P < 0.05$).

In the studies, it has been determined that raw meatballs prepared and consumed without any heat treatment are risky in terms of *E. coli* O157:H7 and hygienic conditions are not adequately followed in both hawkers and restaurants. *E. coli* O157:H7 can be found in contaminated water and many other foods. It is highly resistant to cold, can develop resistance to high salt and acid. There have been outbreaks of *E. coli* O157:H7 with various vegetables, fruits and their juices. It is stated that drinking water can contain this bacterium and cause significant epidemics. It is known that soil and human also play a role in contamination. Therefore, the use of lemon oil may be recommended to reduce the risk of *E. coli* O157:H7.

Table 1. Effect of lemon oil at different concentrations on raw meatballs added with *E. coli* O157: H7 (log₁₀ cfu / g)

Concentrations	Coliform	Yeast	TMAB	<i>E. coli</i> O157:H7
Control	8,90±0,00 a	8,17±7,69 a	9,00±0,00 a	7,19±5,51 a
50 µl / g	8,76±0,00 a	8,17±7,69 a	8,94±8,62 a	7,16±6,13 a
75 µl / g	8,65±0,00 ab	8,3±7,65 a	8,78±8,32 a	6,92±5,88 b
100 µl / g	8,69±8,00 b	8,54±7,69 a	9,93±8,46 a	6,72±5,51 b

a-b: The differences between the averages in the same column are statistically significant ($P < 0.05$).

Salmonella sp. of lemon oil. effect on added raw meatballs

Different concentrations (control, 50 µL/g, 75 µL/g, 100 µL/g) of lemon oil were added to the raw meatball sample and its effect on raw meatballs was investigated. The results are given in Table 2.

By adding lemon oil to raw patties at concentrations of control, 50 µL/g, 75 µL/g and 100 µL/g; coliform, yeast, TMAB and *Salmonella* sp. No statistically significant difference was found in the number of patients ($P > 0.05$).

Table 2. Effect of lemon oil at different concentrations on raw meatballs added with *Salmonella* sp. (log₁₀ cfu / g)

Concentrations	Coliform	Yeast	TMAB	<i>Salmonella</i> sp.
Control	9,49±9,45 a	8,30±0,00 a	9,47±9,30 a	7,77±7,48 a
50 µl / g	9,60±9,59 a	8,47±0,00 a	9,19±7,74 a	8,08±7,95 a
75 µl / g	8,87±8,81 a	8,39±8,69 a	9,69±0,00 a	7,58±7,04 a
100 µl / g	9,00±0,00 a	8,47±0,00 a	9,60±0,00 a	7,58±7,48 a

a-b: The differences between the averages in the same column are statistically significant ($P < 0.05$).

Sensory analysis results

Sensory analysis values of raw meatballs containing lemon oil at different concentrations are given in Table 3. In the sensory panel evaluated by 20 panelists, color and appearance did not change statistically in any of the samples ($P > 0.05$). Smell; While there was no statistical change in raw meatballs with lemon oil added ($P > 0.05$), a statistical change was detected in the flavor parameter in raw meatballs containing lemon oil ($P < 0.05$). There was no statistical difference up to 100 $\mu\text{l/g}$ in the general taste level of raw meatballs to which lemon oil was added at different concentrations ($P > 0.05$).

Table 3. Sensory analysis results of raw meatballs samples with lemon oil added at different concentrations

	Color	Appearance	Odour	Taste	Overall acceptability
Control	4 $\pm$ 0,192 a	4,1 $\pm$ 0,176 a	3,7 $\pm$ 0,193 a	4,05 $\pm$ 0,17 a	3,9 $\pm$ 0,161 a
50 $\mu\text{l/g}$	4 $\pm$ 0,145 a	3,85 $\pm$ 0,182 a	3,7 $\pm$ 0,5 a	3,4 $\pm$ 0,197 ab	3,35 $\pm$ 0,167 ab
75 $\mu\text{l/g}$	4,05 $\pm$ 0,114 a	4,05 $\pm$ 0,153 a	3,65 $\pm$ 0,209 a	2,95 $\pm$ 0,235 b	3,1 $\pm$ 0,204 ab
100 $\mu\text{l/g}$	4 $\pm$ 0,162 a	3,9 $\pm$ 0,176 a	3,4 $\pm$ 0,184 ab	2,8 $\pm$ 0,2 b	2,9 $\pm$ 0,191 bc

a-b: The differences between the averages in the same column are statistically significant ($P < 0.05$).

Conclusion

Coliform and *E. coli* O157:H7 counts decreased when 75 $\mu\text{l/g}$ lemon oil was added to raw meatballs. In addition, no statistical difference was detected in terms of sensory color, appearance, smell and general taste. In line with these results, it can be recommended to use lemon oil in raw meatballs.

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A Special Taste Native to Syria; Kahke

Mustafa Satouf¹, Mehmet Köten²

¹Hemşirelik Bölümü, Yusuf Şerefoğlu Sağlık Bilimleri Fakültesi, Kilis 7 Aralık Üniversitesi, Kilis, Turkey

²Beslenme ve Diyetetik Bölümü, Yusuf Şerefoğlu Sağlık Bilimleri Fakültesi, Kilis 7 Aralık Üniversitesi, Kilis, Turkey

Abstract

Syrian cuisine is one of the most heir cuisines among the world cuisines. Syrian cuisine, which is the heir of mainly Arab and Turkish culture, has also been influenced by all Middle Eastern cuisines. Syrian cuisine is very rich in pastries and shows a very wide variety. One of the remarkable flavors in this variety is “kahke”. Kahke is a rather tasty snack that can be consumed at any time of the day, but is more preferable for breakfast. Kahke, which is included in the bakery products group, and it is remarkable with durability, with long shelf life and cheapness as well as its taste. The most important feature is that chickpea yeast (*Cicer arietinum* L.) is used in producing it and it has a crispy structure. In this study, information about the production of Syria's famous kahke and some of its features is given.

Key Words: Kahke, Syrian kahke, Syrian cuisine, Chickpea yeast

Suriye'ye Özgü Özel Bir Tat; Kahke

Özet

Suriye mutfağı, dünya mutfakları içinde en mirasçı mutfaklardan birisidir. Başta Arap ve Türk kültürünün mirasçısı olan Suriye mutfağı aynı zamanda tüm Orta Doğu mutfaklarından da etkilenmiştir. Suriye mutfağı hamur işleri açısından çok zengindir ve çok geniş bir çeşitlilik göstermektedir. Bu çeşitlilik içerisinde dikkat çeken tatlardan biri “kahke”dir. Kahke, günün her saatinde tüketilebilen ancak daha çok kahvaltıda tercih edilen oldukça lezzetli bir atıştırmalıktır. Unlu mamüller grubunda yer alan kahke, lezzetinin yanı sıra dayanıklılığı, uzun süre saklanabilirliği ve ucuzluğuyla dikkat çekmektedir. En önemli özelliği yapımında nohut mayasının (*Cicer arietinum* L.) kullanılması ve gevrek bir yapıda olmasıdır. Bu çalışmada Suriye'nin meşhur kahkesinin yapımı ve bazı özellikleri ile ilgili bilgiler verilmiştir.

Anahtar Kelimeler: Kahke, Suriye kahkesi, Suriye mutfağı, Nohut mayası

Giriş

Suriye mutfağı, Suriye'nin ulusal mutfağıdır. Dünya mutfakları içinde en mirasçı mutfaklardan biridir. Kahvaltıdan akşam yemeğine, içecekten tatlılara Osmanlı yemekleri ve Türk mutfağı ile oldukça benzer özelliklere sahip olan Suriye Mutfağı yaklaşık 10 bin yıllık bir geçmişe sahiptir. Suriye mutfağı yörelere göre farklılıklar göstermektedir. Güney Suriye mutfağı, Kuzey Suriye mutfağı gibi birçok yöreler kendilerine ait zengin bir yemek kültürüne sahiptirler (Anonymous, 2021a; Anonymous, 2021b).

Suriye mutfağı hamur işleri açısından çok zengindir ve çok geniş bir çeşitlilik göstermektedir. Bu çeşitlilik içerisinde dikkat çeken tatlardan biri “kahke”dir. Kahke, günün her saatinde tüketilebilen ancak daha çok kahvaltıda tercih edilen oldukça lezzetli bir yiyecektir. Aslında Ortadoğu'ya özgü olan kahkenin kelime anlamı arapçada çörek demektir. Kahke yapımında kullanılan baharatlar ve kahkenin yapım şekli Lübnan, Suriye, Filistin gibi ülkelerde biraz değişiklik göstermektedir. Anason, mahlep ve dövülmüş rezene tohumu kullanılan susamlı kahkeye karanfil, ceviz ve tarçın da katılabilmektedir.

Suriye'nin Halep şehriden 1900'li yılların başında Gaziantep'te ustalar tarafından getirilerek geliştirilmiş olan kahke, bugün Türkiye'nin kültürüne de kazandırılmış bir hamur işidir. Gaziantep ilinde yapılan kahkenin halka susamlı (yuvarlak ve susamlı), kalın çubuk, haşhaşı (haşhaşı ve ortası delik) çeşitleri tuz ile yoğrularak tuzlu; çıtır (düz susamlı) ve köy kahkesi (koyu renkli) çeşitleri ise şekerle yoğrularak tatlı olarak hazırlanmaktadır (Anonymous, 2021c; Köten et al., 2010).

Doğal mayaların ana malzemelerinden biri olan nohut (*Cicer arietinum*), yemek kültürümüzün önemli gıdalarından birisi olup son yıllarda geliştirilen beslenme piramitlerinde en fazla tüketilmesi önerilen gıda grubu içerisinde yer almaktadır. Nohut karbonhidratlar, proteinler, vitaminler, mineraller, diyet lifi ve koruyucu fitokimyasallar bakımından oldukça zengin olup, ıslatma, kabuk soyma, fermente etme, kaynatma, buharda pişirme, kızartma veya kavurma gibi çeşitli tekniklerle besleyici gıdalara işlenebilen bir baklagildir (Köksel et al., 1998; Sayaslan and Şahin, 2018). Çeşide ve yetiştirme koşullarına bağlı olarak değişmekle birlikte, nohudun bileşiminde %38–73 karbonhidrat,

%16–31 protein, %1.5–6 lipid, %2–10 kül ve %2–9 selüloz bulunmaktadır (Akçin, 1988; Baykara, 2006). Dünya’da yaygın bir şekilde tüketilen bu baklagilin karbonhidrat fraksiyonunda en önemli bileşen nişasta olup oranı %37- 50.8 arasında değişmektedir (Sayar et al., 2005). Nohudun ayrıca kalp, kanser ve diyabet gibi hastalıkları önlemede yararlı etkilerinden dolayı sağlık üzerinde oldukça önemli faydasının olduğu bilinmektedir. Sağlık üzerindeki olumlu etkilerinden dolayı dünya sağlık örgütü (WHO) nohut gibi biyoaktif bileşiklerce zengin olan baklagillerin diyetlerde kullanılması gerektiğinin üzerinde durmaktadır (Erginkaya et al., 2016).

Nohut Mayası

Nohut mayasının üretimi ve kullanımı geleneksel bir uygulama olduğundan oldukça değişkenlik göstermektedir. Nohut mayası Yunanistan, Kıbrıs ve Makedonya ile birlikte ülkemizin bazı bölgelerinde evlerde ve küçük fırınlarda farklı yöntemlerle hazırlanmakta; ekmek, simit, poğaça ve çöreklerin üretiminde kullanılmaktadır (Şahin et al., 2018).

Tuz, kaynamış su ve nohut’un 37- 40oC’de 16 -18 saat fermentasyona tabi tutulması ve elde edilen karışımın filtrasyonu ile elde edilen bir süzündür. Tatlı nohut mayası hamuru ise fermente olmuş süzününün, buğday unu ve tuz ile karıştırılıp başlangıçtaki hacme ulaşması ile elde edilen mayalı hamur olarak tanımlanmaktadır. Bu karışımdan elde edilen ekmek nohut ekmeği veya tatlı mayalı ekmek olarak adlandırılmaktadır. Tatlı maya olarak bilinen nohut mayası çok hassas bir mayadır ve tutturulması biraz güçtür. Sadece nohut kırıkları, un, tuz ve suyla hazırlandığından mayanın tutması biraz uzun sürmektedir (Erginkaya et al., 2016).

Buğday ununa eklenen fermente nohut, besin kalitesini arttırmanın yanı sıra ürünün raf ömrünü de uzatmaktadır (Singh, 1985; Shekib et al., 1994; Hatzikamari et al, 2007). Nohut mayası B vitamini açısından zengin bir besindir ve B vitamini sayesinde sinir sistemini düzenler. Özellikle nohut mayası ile hazırlanan ekmek daha fazla enerji verir. Sindirim sistemi sorunları olanların tüketimine uygun olan maya, mideye rahatsızlık vermez. Aynı zamanda nohut mayası ile hazırlanan gıdalar midede veya bağırsaklarda şişkinlik hissine neden olmaz. Doğal yapılan bir maya olduğu için sağlıklı gıdalar hazırlamaya imkân verir ve nohut mayası ile hazırlanan besinler daha uzun süre tokluk hissi vererek acıkmayı geciktirir (Anonymous, 2021d)

Nohut Mayasının Hazırlanması

Sert yapıya sahip 250 g nohut buğday iriliğinde kırılıp daha önce 121°C’de 15 dak. steril edilmiş olan bir şişeye konulur. Kırılmış bu nohut üzerine 10 g tuz ve kaynatılıp 50oC’ye soğutulmuş 350 ml su ilave edilir. Hazırlanan bu karışım 40oC’de 12 saat süreyle fermentasyona tabi tutulur. Fermentasyon sonunda kavanozdaki sıvının mayalanma sonucu kabarmış olduğu ve köpük oluşturduğu gözlemlenir. Aynı zamanda fermentasyon sırasında açığa çıkan koku da kontrol edilir. Eğer koku, mayalanmış yoğurt kokusu gibiyse herhangi bir sorunun olmadığı ancak kötü bir koku hissedilirse fermentasyonun hatalı olduğu sonucuna varılır. Fermentasyondan sonra nohut parçaları süzülerek ayrılır. Bu şekilde elde edilen nohut süzöntüsü hamur hazırlanmasında maya olarak kullanılır (Şekil 1) (Satouf, 2012).



Kırılmış nohut



Fermente Nohut



Nohut mayasından yapılan hamur

Şekil 1. Nohut mayasının hazırlanması

Suriye Tipi Kahke Üretimi

Kahke nohut mayası, sodyum karbonat ve yağ varlığında, esas olarak unun su, şeker ve tatlandırıcılarla (vanilya, mahlep, anason, muskat, çörek otu,...) karıştırılarak hazırlanan hamurdan yapılan bir gıda maddesidir. Üretim; hazırlanan hamurun fermentasyona bırakılıp daha sonra şekillendirme, pişirme, soğutma ve ambalajlama işlemlerini içermektedir. Kahke silindirik, halka, kısa kesim, susamlı ve susamsız gibi farklı şekillerde üretilmektedir (Satouf, 2012).

Kullanılan malzemeler (150 kg un için):

1. 50-100 ml nohut mayası
2. 70 lt su
3. 60 g vanilya
4. 14 kg şeker
5. 250 g mahlep
6. 60 g hint cevizi (muskat)
7. 50 g sodyum karbonat
8. 14 kg margarin

Önce nohut mayasının ve suyun yarısı ile diğer tüm malzemeler una eklenip yoğurma işlemi gerçekleştirildikten sonra 3 saat bekletilir. Daha sonra kalan maya ve su eklenip ikinci bir yoğurma yapılır ve ardından hamur yarım saat daha dinlendirilir (birinci fermantasyon). Birinci fermantasyondan sonra şekillendirilip tepsilere dizilen kakheler 40°C derecede nemli bir ortamda (fermantasyon odası) yaklaşık yarım saat ikinci fermantasyona bırakılır. İkinci fermantasyonu tamamlanan kakheler spiral veya dairesel olarak dönen özel raflı fırında 225°C’de 15 dakika pişirilir. Pişirme sonrası kek arabası dışarı çıkarılarak normal hava sıcaklığına kadar soğutma işlemine tabi tutulur. Soğuyan kakheler polietilen poşetlerle ambalajlanarak satışa ve tüketime hazır hale getirilmiş olur (Şekil 2)(Satouf, 2012).



Şekil 2. Kahke üretimi

Sonuç

Geleneksel gıda üretim ve muhafaza yöntemleri ile tüketim şekilleri, insanların binlerce yıllık deneyimleri ile ortaya çıkmış bölge imkanları ve yöre insanının ihtiyaçları ile birlikte gelişmiş ve kullanılabilirliği ile kabul görmüş yöntemlerdir. Bu alışkanlıkların hayat bulmasına, gelişmesine ve yayılmasına neden olan mekanlar ve süreçlere ilişkin bilgiler dünyanın kültür mirasının önemli bir parçasıdır. Kültürel ilişkiler ile geleneksel ürünler topluluklardan topluluklara geçmekte, oralandaki şartlara göre değişikliklere uğramaktadır. Suriye'deki iç savaştan

kaçan Suriyelilerin Türkiye’de yerleştikleri şehirlerde kendi kültürlerini devam ettirdikleri görülmektedir. Suriyeli mültecilerin sığındıkları büyük kentlerde hayatlarını idame ettirme çabaları en çok yemek kültürleri üzerine olmaktadır. Özellikle Türklerin de damak tadına hitap eden kahke gibi ürünlerin üretilip satıldığı mekanlar dikkat çekmektedir. Yapılan bu çalışmayla Suriye’nin geleneksel yemek kültüründe önemli bir yere sahip olan kahkenin tanıtımına katkıda bulunmak ve ilgili konuda araştırma yapmak isteyen araştırmacılara kaynak olmak amaçlanmıştır.

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Determination of Performance of Some Blackberry Genotypes in Kayseri Conditions

Ayşen Melda Çolak^{1*}, Fatma Alan²

¹Department of Horticulture, Faculty of Agriculture, Usak University, Usak, Turkey

² Department of Horticulture, Faculty of Agriculture, Erciyes University, Kayseri, Turkey

Abstract

The study was conducted in the Akkışla district of Kayseri Province in 2017 and 2018. A total of 13 blackberry genotypes collected from different regions of our country were used in the experiment. In these genotypes, pH, total flavonoids, total phenolic substances, and DDPH (Free radical scavenging activity) values were investigated. As a result of the study, the highest total flavonoid and total phenolic substance amount in both trial years (2224 mg / l, 832.32 mg / l) Erzurum, pH (3.09) Izmit-Kocaeli and DPPH (39.09%) Osmaniye (Kadirli) appeared in blackberry genotypes collected from the provinces.

Key Words: Adaptation, Blackberry, Variety

Introduction

Phenolic compounds in berry fruits are the most common antioxidant group and the content of the compounds; plant variety, agricultural management, climatic factors, ripening stage, harvest time, storage conditions, and post-harvest management (Castrejón et al., 2008). These compounds are important in plant adaptation and protect the plant under different stress conditions such as drought, UV radiation, pathogens, and diseases (Dietrich et al., 2004; Szajdek et al., 2008). There are a lot of antioxidants in blackberry (*Rubus fruticosus*), raspberry (*Rubus idaeus*), black currant (*Ribes nigrum*), and strawberry (*Fragaria ananassa*). Antioxidants are mainly represented by vitamin C and polyphenols such as anthocyanins, phenolic acids, flavonols, flavanol, and tannin. These fruits are known as natural antioxidants due to their high concentration of antioxidants (Benvenuti et al., 2004). The health benefits of berries are associated with their high antioxidant properties and phenolics, which are the main bioactive component (Häkkinen et al., 2020; Koponen et al., 2007; Sarıdaş, 2018; Dietrich, 2004). All over the world and in developed countries, interest in fruits with high antioxidant capacity and rich in anthocyanin, which is of great importance for human health, has increased considerably. It shows that the anthocyanins and phenolics found in blackberries are effective in the treatment of tumors in different types of cancer. Flavonoids are natural compounds found in plants that have positive effects on human health (Felicia et al., 1997; Skrede et al., 2010). Flavonoids help in preventing diseases such as Alzheimer's, coronary heart failure, cancer, bacterial ills, and inflammation (Shen and Li, 2014; Han et al., 2015; Gundogdu et al., 2017).

Within the framework of this information, in our study on the performance of 13 blackberry varieties and genotypes collected from different regions of our country in 2017 and 2018 in the Akkışla district of Kayseri, pH, total phenolic substance, total flavonoid, and DPPH values were examined.

Materials and Methods

Material

A total of 13 blackberry varieties and genotypes were used as plant material in the study conducted in 2017 and 2018 under the conditions of Akkışla district of Kayseri province of blackberry varieties and genotypes collected from different regions of our country. The cuttings of the blackberry genotypes to be used in the experiment were transferred to the rooting medium in a closed greenhouse in styrofoam boxes with peat + soil (1: 1).

Method

The cuttings rooted in the experiment were transferred to the land in the Akkışla district of Kayseri province at 2x2 m intervals between rows and rows with 3 repetitions and irrigation was done regularly in the form of drip irrigation.

In the study, total phenolic substance amount (mg gallic acid/g), total flavonoid amount (mg quercetin), antioxidant activity determination (DPPH), and acidity measurements were determined. Sampling was determined according to the following methods by taking 30 fruit samples, which were selected homogeneously from the fruits that reached commercial maturity and at the intensive harvest period, and squeezed the fruit juices.

Phytochemical Analysis

Total phenol content (TPC) to test Folin-Ciocalteu (Kähkönen, 1999). One 0.2 mL of freshly squeezed and filtered juice and 0.5 mL of Folin-Ciocalteu reagent (diluted 10 times with water) were added to the test tubes. The solution was then kept in the dark for 5 minutes and then 1 mL of sodium carbonate (7.5% w / v) was added. Tubes were covered with parafilm and kept in the dark again 1 hour. Absorbance at 765 nm was measured with a UV-Vis spectrophotometer. Compared to the gallic acid calibration curve. Results are expressed as mg gallic acid /g dry assay. Each experiment was done in triplicate.

Perform total flavonoid restriction of the crude extract by aluminum chloride colorimetric method (Ateş, 2015). In for short, 50 µL of freshly squeezed and filtered juice was taken into the Test tube. It is mixed with 950 µL of methanol and 4 mL of distilled water and then with 300 µL of 5% NaNO₂ solution; After the incubation, 5 mL of 300 µL of 10% AlCl₃ was added and the mixture was allowed to stand for 6 minutes. Subsequently, 2 mL of 1 M NaOH solution was added to make up the final volume of the mixture to 10 mL with distilled water. The mixture was allowed to stand for 15 minutes and absorbance at 510 nm was measured. After the total flavonoid content was calculated on the quercetin calibration curve, the result was expressed as mg quercetin equivalent per dry weight (Chang, 2020).

DPPH (2,2-diphenyl-1-picrylhydrazyl) Test The method developed by Brand-Williams et al. Was slightly modified (Attar, 2018). DPPH Stock solution, 24 mg DPPH was weighed and dissolved in some methanol. It was transferred to a 100 mL flask and the volume was completed with 100 mL of methanol. It was stored at -18 °C until later use. The working solution was obtained by mixing 20 mL of the stock solution with 90 mL of methanol to obtain an absorbance of 1.1 +/- 0.02 units at 515 nm using a spectrophotometer.

In a tube, 300 µl of freshly squeezed and filtered fruit juice was taken and 5.700 µL of DPPH working solution was added and mixed. It was allowed to react for one hour in a dark place. Then, the absorbance at 515 nm wavelength was taken in the spectrophotometer. Antioxidant activity was calculated as a decrease in absorbance value using the formula:

$$\text{Antioxidant activity (\%)} = (A_0 - A_1) / A_0 \times 100$$

A₀: Absorbance value of the control without sample.

A₁: Absorbance of the mixture containing the sample.

Absorbance results were converted using the calibration curve of the ascorbic acid standard and expressed as ascorbic acid equivalent (Ju et al., 2009).

The pH measurements of the samples were carried out in the laboratory with a Mettler Toledo brand pH-S20-K table type pH meter. Single standard reference items were used to check the accuracy of the calibration and the repeatability of the measurements.

Statistical Analysis

The results obtained after the experiment, One Way Anova Test was applied in SPSS 16.0 package program (SPSS, 2007).

Results and Discussion

The effects of genotype and breeding place on the phytochemical characteristics of a total of 13 blackberry varieties and genotypes transferred to the land in Akkışla district of Kayseri province were investigated, and the results obtained are given in Table 1.

In this study, the highest total phenol content among genotypes was determined in samples collected from Erzurum (832.32 mg gallic acid/g) and Kayseri province Akkışla district Kesdoğan (809.51 mg gallic acid/g), respectively. The lowest total phenol content was obtained from blackberry genotype (591.95 mg gallic acid/g) collected from Kayseri province Akkışla District (Central 3) region (Table 1). The highest total flavanoid amount was obtained from the samples obtained from Erzurum and Kırşehir provinces (2224 and 2219 mg quercetin), followed by blackberry genotypes obtained from Kayseri province Akkışla district Kesdoğan location (1299 mg quercetin) and İzmir-Kocaeli (1064 mg quercetin) (Table 1). It was determined that the samples obtained from Sivas and Kayseri province Akkışla district (Center-3) (324 mg quercetin and 219 mg quercetin) were also the genotypes with the lowest total flavanoid content (Table 1). The amount of antioxidant activity (DPPH) was determined in blackberry genotypes collected from Osmaniye (Kadirli) and Sivas center (37.02%) with the highest value of 39.09% according to the results obtained within the genotypes, while the lowest was 0.26% (Kırşehir), 0%, 64 (İzmit-Kocaeli), 0.72% (Erzurum), 1.78% (Kayseri province Akkışla district Kesdoğan location), 2.70% (Kayseri province Tavlusun location) and 3.63% (Kayseri center) (Table 1). According to the results of the two-year

analysis obtained, the average pH values of the fruit juices of the 13 blackberry genotypes used in the experiment varied between 3.09-2.23, the lowest pH was obtained from Bursa 3 variety with 2.23 and Tavlusun locality in Kayseri province with a value of 2.31. In the blackberry genotype, the highest pH was determined with 3.09 in the sample obtained from Izmit-Kocaeli region. It was found that the statistical difference between the pH amounts of the genotypes was significant (Table 1).

Table 1. Phytochemical characteristics of some Blackberry genotypes and cultivars

Location	TPC	TFC	AA	pH
Kayseri (Akkışla Merkez-1) Genotype	639,64d	359gh	25,41d	2,94cd
Kayseri (Akkışla Merkez-2) Genotype	700,24c	399gh	32,17c	3,06ab
Kayseri (Akkışla Merkez-3) Genotype	591,95e	219i	30,94c	2,84de
Kayseri (Merkez) Genotype	786,40b	654de	3,63e	3,02abc
Bursa 3- variety	650,85d	609d	26,47d	2,23g
Kayseri (Akkışla-Kesdoğan) Genotype	809,51ab	1299b	1,78e	2,51f
Kayseri (Tavlusun) Genotype	711,47c	439fg	2,70e	2,31g
Kırşehir (Merkez) Genotype	675,00cd	2219a	0,26e	2,82e
Erzurum (Merkez) Genotype	832,32a	2224a	0,72e	2,95c
İzmit-Kocaeli - Genotype	767,20b	1064c	0,64e	3,09a
Osmaniye (Kadirli) Genotype	651,60d	444fg	39,09a	2,84de
Trabzon (Akçaabat) Genotype	664,76cd	519ef	35,80b	2,79e
Sivas (Merkez) Genotype	685,61cd	324h	37,02ab	2,97bc

TPC: Total phenol content (mg gallic acid/g), TFC: Total Flavonoid content (mg quercetin), AA: Antioxidant activity %

Garazhian et al. (2020) collected fruit samples from 10 provinces across Iran in 2010 to create repository genotypes containing four different species, namely *R. sanctus*, *R. High* or very high levels of fruit weight (0.14-1.30 g), antioxidant activity (40.21-88.08%), anthocyanin activity (80.74-145.09 mg/100 g) and ascorbic acid (AA) (9.56-20.92 mg/100 g) they have done. They found that it showed very low levels of variation (109.5–129.1 mg/100 g) in total phenol (TP).

Eskimez et al. (2019) studies, Isparta, Turkey grown in ecological conditions in 4 different varieties of blackberries (Jumbo, Chester, Bursa Bursa 1 and 2) phenological were conducted to determine the yield and fruit quality characteristics. pH, soluble solids content (SSC), titratable acidity (TA) and maturation index values were 3.04 (Chester) and 3.16 (Bursa 1), 7.10 (Jumbo) and 9.52 (Chester), 0.98 (Chester) and 1.07 (Bursa 1), respectively.) and between 7.17 (Jumbo) and 9.71 (Chester). As a result, they revealed that Bursa 1 variety is the most suitable variety for Isparta ecological conditions.

Altunbaş (2019) found that the difference between the pH values of the varieties was statistically significant and the pH value was The highest variety was Arphe (3.93), followed by Boata (3.90), Jumbo (3.71) and Chester (3.57) varieties, respectively. In the adaptation study conducted in Trabzon, it has determined a pH value of 3.34 and 3.16 in Jumbo and Chester varieties, respectively.

Çolak (2018) found the pH value of blackberry fruit as 3.34, total antioxidant activity 40.20 mg/g, total phenolics 56.66 ppm/GAE, total flavonoids 4038.10 ppm/QE.

Çelik (2018) determined the average pH value of blackberry fruits as 2.50 ± 0.05 . In addition, the average total phenolic substance value of fruits was 260.29 ± 16.77 GAE/100 g fw, the average total anthocyanin amount 82.62 ± 3.48 mg cyn-3-glu / 100 g fw, the average total flavonoid amount 65.94 ± 1.95 mg CTE/100 g fw determined the total antioxidant capacity as 258.84 ± 13.66 μ mol TE/g fw by DPPH method.

Yıldız (2017) determined the general acidity average between varieties as 1.38% in his study and found that there are statistically significant differences between varieties. From phytochemical analysis, he measured the total amount of phenolic matter in blackberry varieties with 2763 μ g GAE/g ta and Black Pearl variety and statistical analysis showed that there were no statistically significant differences between Triple Crown, Obsidian, Metolius and Newberry varieties, but with these varieties Black Pearl and Chester Thornless and Black Diamond varieties. observed that there are statistically significant differences between the two groups.

In their studies, Motamed and Naghibi (2010) found that the methanol/water (8/2) extracts of the fruits of several plants, including *Rubus sanctus*, had a DPPH radical scavenging capacity of 83.27%, the total phenolic compound amount on gallic acid 4.52 mg/g, the total amount of flavonoid. They found it as 4.66 mg/g over rutin. According to the results of this study, they found that the DPPH radical scavenging capacity of *R. discolor* fruit ethanol extract (89.03%) was higher than that of *R. sanctus* fruit methanol/water extract (83.27%).

Burun (2009) found that blackberry (*Rubus fruticosus* L.) varieties in Bursa are the basic phenolic substance of Ellagic acid blackberry species, and ellagic acid (1828.07-1555.13 mg/kg fresh fruit), ferulic acid (757.69-413). 82 mg/kg fresh fruit), caffeic acid (736.85-337.89 mg/kg fresh fruit), para-coumaric acid (877.45-287.15 mg/kg fresh fruit) and quercetin (74.69 -56.78 mg/kg fresh fruit) blackberry varieties in water extracts.

In another study, *Rubus* sp. It was determined that the total phenolic compound amounts of fruits belonging to the species varied between 180.2-317.2 mg gallic acid/g (Wang et al., 2008). Pantelidis et al. (2007) stated that the total amount of phenolic compounds on gallic acid varied between 1052-2494 mg / 100 g in *R. idaeus* fruits and 1703-2349 mg / 100 g in *R. fruticosus* fruits.

Conclusion

According to the results obtained after the study, the highest amount of total flavanoid and total phenolic substance (2224 mg /l, 832.32 mg /l) Erzurum, pH (3.09) Izmit-Kocaeli and DPPH (39.09%) Osmaniye (Kadirli) blackberry genotypes collected from the provinces. As a result of these findings, we can state that there is a rich source of variation in terms of the place where the study is conducted, that it should be used in commercial breeding programs, that these genotypes need protection and that we can recommend blackberry genotypes with high values to our farmers.

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Seasonal variation of mineral content in some papaya cultivars grown in protected cultivation

Esma Güneş¹, Hatice Reyhan Öziyici², Hamide Gübbük³

¹ Antalya Directorate of Provincial Agriculture and Forestry, Antalya – TURKEY, 07030

² Antalya Bilim University, School of Tourism, Department of Gastronomy and Culinary Arts, Antalya – TURKEY, 07190

³ Akdeniz University, Faculty of Agriculture, Dept. of Horticulture, Antalya – TURKEY, 07058

Abstract

Papaya can be grown the whole year under subtropical condition in protected cultivation. Protected cultivation is improved yield and quality due to the favorable climatic conditions. Beside the yield and quality, nutritional content of the fruit, taste and its contribution to health are also important for the consumers. In this study, the mineral content of *Sel-42* and *Tainung* papaya cultivars grown in protected cultivation system were investigated. In each season (representative season months were January, April, July and October), the fruits were harvested at the same maturity level (one third yellow on fruit peel; Ripening Stage-3 [RST3]) and macro and micro minerals of the fruit samples were analyzed at Ripening Stage-5 (RST5). According to the results; papaya cultivars used in this experiment and different seasons for harvest did not cause any significant difference in terms of macro and micro minerals ($p>0.05$). Both cultivars had the highest concentrations for P and K minerals in the autumn harvest (P_{Sel-42} : 3.55 ± 1.91 g/kg, $P_{Tainung}$: 3.75 ± 2.33 g/kg; K_{Sel-42} : 41.1 ± 25.46 g/kg, $K_{Tainung}$: 39.1 ± 24.04 g/kg). Among the analyzed micro minerals, Fe and B minerals were the highest minerals for both papaya cultivars. In conclusion; the papaya cultivars of *Sel-42* and *Tainung* grown in the protected cultivation system were found high in concentration especially in terms of K, N, Fe, Zn and B minerals.

Key Words: *Sel-42, Tainung, harvest period, fruit quality*

Introduction

Papaya fruit is a tropical crop native to tropical America. However it is grown not only in tropical conditions but also subtropical conditions, too. Total production area of papaya has reached to 460 thousand hectares whereas While the total amount of papaya production is 13.7 million tons, its production is made on a total area of 460 thousand hectares. Asia continent dominates the production, followed by America and Africa. In 2019, the countries of India (6.050.000 tons), Dominic Republic (1.171.336 tons), Brazil (1.161.808 tons), Mexico (1.083.133 tons) were reported as the major papaya producing countries (FAO 2019).

Papaya contains high levels of minerals such as calcium, iron and is an excellent source of vitamins such as vitamin C and folic acid (Ramos-Parra et al. 2013, USDA 2017). Compared to other tropical fruits, papaya is a good source of proteins. These proteins are essentially cysteine-type proteases such as papain (Tripathi et al. 2011). The fruit contains relatively high amount (1.7 g) of dietary fiber (USDA 2014). Papaya (fruit, seeds or leaf extracts) consumption is claimed to prevent cancer (Pathak et al. 2014), to regulate lipidaemia (Esmael et al., 2015), type-2 diabetes (Abo et al., 2008), gastric lesions (Murakami et al., 2012), to improve immunity in vitro (Lee et al. 2011).

Some of the advantages of why papaya cultivation is preferred by the farmers are easy propagation, giving fruit at the same year, less labor cost compared to vegetable growing, commercially well-known fruit thus easy to sell. On the other hand, in subtropical conditions the fruit is generally grown with protected cultivation system. This system is popular due to the increase in temperatures during daytime hours in winter, protection of the plants against wind and other unfavorable weather conditions (sunburn, hail, etc.), reduction in water consumption, as evapotranspiration is reduced by up to 25%, increase of light on the leaf surface leading to higher photosynthetic capacity, reduction of the time for growth and the length of developmental phases, improved production, both in quality and in quantity (Galán Saúco, 2002). Salinas et al. (2021) stated that active climatic control improved papaya plant growth, flowering, fruit set and consequently, yields, producing more and heavier fruits.

In this study, seasonal variation the mineral content of different papaya cultivars (*Sel-42* and *Tainung*) grown in cultivated protection were evaluated in terms of seasonal variation.

Materials and Methods

Sel-42 and *Tainung* papaya cultivars were used as experimental material and grown for two-year period (2009-2011). The greenhouse structure consisted of iron and covered plastic. Top height and height from the gutter were 7 and 5 m, respectively. There were 1.8 m and 2.5 m distances between plants and rows, respectively. In the greenhouse, drip and sprinkler irrigation systems were used. Fertilization was based on the ratio of 1:3:1 (Nitrogen-Phosphorous-Potassium) in the first three applications after planting, followed by the ratio of 2:1:3 until fruit development and finally based on the ratio of 3:1:6 during fruit development. During protected cultivation, the temperature of year around was changed 13-30 °C. The fruits of the papaya cultivars were harvested in each season (representative months were January, April, July and October) at the same maturity level (one third yellow on fruit peel; Ripening Stage-3, Fig. 1)

The macro (Phosphorus_P, Potassium_K, Sodium_Na, Calcium_Ca, Magnesium_Mg) and micro minerals (Iron_Fe, Copper_Cu, Zinc_Zn, Manganese_Mn, Boron_B) of the samples were analyzed at the Ripening Stage-5 (Fig. 1). Total nitrogen was measured using Kjeldahl distillation method (Jones 1991). Phosphorus was determined by Spectrophotometer (Chapman and Pratt, 1961; Kacar, 1972). Potassium, calcium, iron, magnesium, manganese, zinc, copper were determined by Atomic Absorption Spectrophotometer. Macro and micro mineral values were given as g/kg and mg/kg.



Fig. 1. Ripening index of papaya (*Carica papaya* L.; Reference: Barragán-Iglesias et al. 2018)

The experimental design was completely randomized and data (average mean of two years) were analyzed using the ANOVA procedure and the Tukey test ($p < 0.05$) to compare means.

Results and Discussion

The macro and micro mineral content of *Sel-42* and *Tainung* papaya cultivars harvested at different seasons were monitored. According to the results; the papaya cultivars and different seasons were found as non-significant variables ($p > 0.05$). The reason for this was thought to be the high standard deviation between the values of the samples harvested in different years. On the other hand, K and N minerals were found as the highest macro minerals for both cultivars (Fig. 2). Although the seasonal difference between cultivars was not significant ($p > 0.05$), both cultivars had the highest concentrations for P and K minerals in the autumn harvest (P_{Sel-42} : 3.55 ± 1.91 g/kg, $P_{Tainung}$: 3.75 ± 2.33 g/kg; K_{Sel-42} : 41.1 ± 25.46 g/kg, $K_{Tainung}$: 39.1 ± 24.04 g/kg).

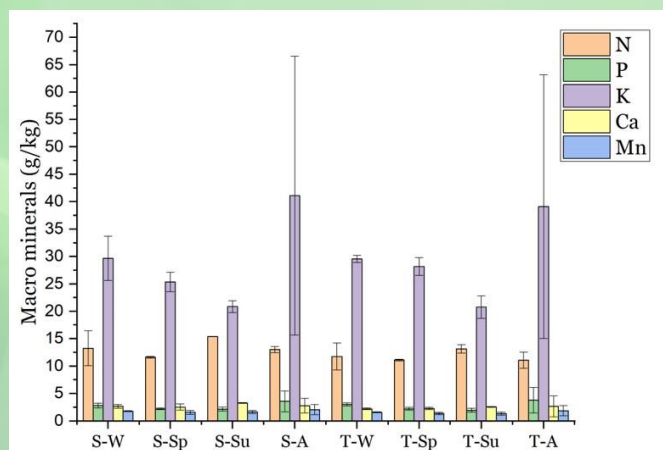


Fig. 2. Variation in macro minerals according to the harvest seasons (S: *Sel-42*, T: *Tainung*, W: Winter, Sp: Spring, Su: Summer, A: Autumn)

Among the analyzed micro minerals, Fe and B minerals were the highest minerals for both papaya cultivars (Fig. 3).

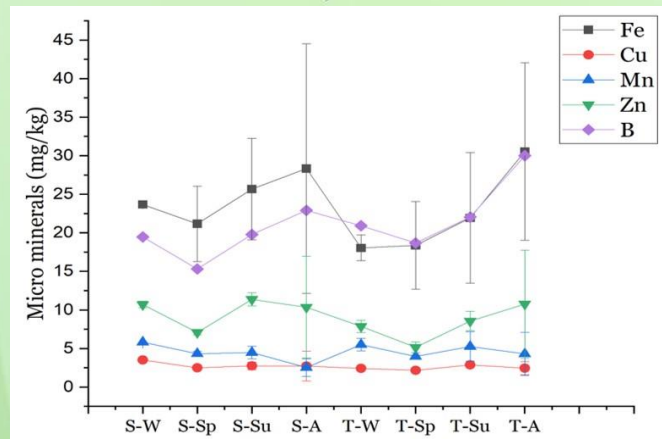


Fig. 3. Variation in micro minerals according to the harvest seasons (S: *Sel-42*, T: *Tainung*, W: Winter, Sp: Spring, Su: Summer, A: Autumn)

The highest values of *Sel-42* papaya cultivar were obtained for Fe mineral in the autumn (28.34 ± 16.18 mg/kg), Cu mineral in the winter (3.51 ± 0.11 mg/kg) and Zn mineral in the winter (10.71 ± 0.43 mg/kg) whereas of *Tainung* papaya cultivar were obtained for Mn mineral in the winter (5.49 ± 0.81) and B mineral in the autumn (30.00 ± 18.25).

Papaya at different ripening stages is reported a good source of minerals such as Ca, Mg and K (Chukwuka et al. 2013). Farina et al. (2020) have also reported that K was the predominant mineral for the different papaya cultivars they analyzed. They also reported that Ca and P minerals were slightly higher in concentration than USDA Nutrition Database. Hardisson et al. (2001) also reported that the papaya variety (*Sunrise*) they worked was mainly rich in K, Mg and B. When the literature studies are observed, it is seen that the findings obtained from this study are almost at a similar level with these studies, although there are slight differences according to the different papaya varieties used in the experiments. In this study; the papaya cultivars of *Sel-42* and *Tainung* grown in the protected cultivation system were found high in concentration especially in terms of K, N, Fe, Zn and B minerals.

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Comparative efficacy of commercial fungicides and *Trichoderma harzianum* against Fusarium wilt in strawberry

Abdul Hannan¹, Sagheer Atta¹, Muhammad Amjid Bashir¹, Sajjad Hyder², Nasir Ali Tauqir³,
Muhammad Ali⁴ and Irum Mukhtar⁵

¹Department of Plant Protection, Ghazi University, D.G Khan, Pakistan

²Department of Botany, Government college Women University Sailkot, Pakistan

³Department of Animal Sciences, College of Agriculture, Sargodha University Sargodha

⁴Sustainable Development Study Center, Government College University Lahore

⁵Institute of Oceanography, Minjiang University, Fuzhou, China

Abstract

Cultivation of strawberry (*Fragaria ananassa*) is surging among Pakistani farmers due to its profit ratio compared to other traditional crops. This crop is attacked by various pathogens responsible for low yield. The current study's objective was to identify a better approach to managing Fusarium wilt caused by *Fusarium oxysporum* f.sp. *fragariae* (Schlecht) in the field. Firstly efficacy of eight fungicides was evaluated by the poison agar technique against colony growth of *F. oxysporum* f.sp. *fragariae* *in-vitro*. Among tested chemicals, four (Score, Topsin-M, Avito and Carbendazim) were found to inhibit pathogen growth compared with control significantly. Later, the effectiveness of four different isolates of *Trichoderma harzianum* was also evaluated through dual culture technique against *F. oxysporum* f.sp. *fragariae*. However, only one isolate of *T. harzianum* was found to suppress pathogen growth. Subsequently, four fungicides and an isolate of *T. harzianum* were evaluated in the greenhouse. Later, three chemicals (Score, Topsin-M and Carbendazim) and biocontrol isolate were subjected to field evaluation using artificial inoculation in a randomized complete block design (RCBD). All three chemicals, controlled wilt disease with varying degree of success. The mean results of field trials indicated that Topsin-M gave 88.0%, *T. harzianum* 80.0%, while Carbendazim and Score showed 72.0% protection in the field after 42 days. Topsin-M was most effective, followed by *T. harzianum* and can be applied to manage Fusarium wilt of strawberry confidently.

Keywords: Biocontrol, Chemical Control, Dual culture, Fungicides, Inoculation, Poison agar

Use of Genome Engineering and manipulation Technologies for better Insect Pest and Disease Control

Allah Bakhsh

National Centre of Excellence in Molecular Biology, University of the Punjab, Lahore, 53700, Pakistan

Abstract

The crop plants are constantly exposed to insect pest and disease threats from their emergence from soil to harvesting. The literature suggest that 37% overall losses are incurred to crop yield because of the insect pests and diseases. Crop protection measures needs special attentions to address the yield concerns. Classical selection breeding of the genotypes that are resistant as well as searching for the resistance genes using quantitative trait loci (QTLs) have been exploited for this purpose. Such an improvement has been possible due to the existing crops' genetic diversity. We have also witnessed the use of genetically engineered crops against insect pests and weeds at commercial levels. Besides that, the use of chemicals (insecticides, herbicides, and fungicides etc) has been used widely to control the losses from insect pests and diseases. The researchers are exploiting new crop protection technologies (like RNA interference and genome editing) for crop improvement against pests and diseases. The use of RNA interference and CRISPR (Clustered regularly interspaced short palindromic repeat)-Cas9 (Crispr associated nuclease 9) associated with bacterial immune system against viral attacks has been utilized recently in silencing and editing genes in association with the RNA-guided nucleases. I will present our data on RNAi and Crispr-Cas how these techniques can efficiently be used as modern crop protection techniques. The regulator matters of genome edited crops will also be discussed shortly.

Key Words: *Gene knock outs, knock down, gene editing, regulatory affairs*

Development and Molecular Analysis of Indigenous Herbicide Resistant Corn Lines

Abdul Munim Farooq

Centre of Excellence in Molecular Biology, University of the Punjab, Lahore, Pakistan

Abstract

Maize is the 3rd major crop grown all over the world that fulfills the needs of millions of people. Various biotic and abiotic factors caused reduction in grain yield of maize; among them weeds show most adverse effects. Objective of this study was to develop glyphosate resistance maize for developing maize hybrids and synthetic varieties with high grain and fodder yield potential. Glyphosate is a broad-spectrum herbicide and resistance of crop against the herbicide, allows post emergence application, which otherwise is impossible. Higher GTG crude protein (479.94µg/g) was recorded for CIL 194-975 plant. The plant CIL 194-1786 showed higher expression level of GTG protein, indicated that transformation efficiency was better for line CIL-194 than CIL-123. GTGene stably integrated to the genome of the maize lines CIL-194 and CIL-123, these transformed lines showed more ability to cope with herbicides as compared with non-transformed lines in greenhouse and field trials. The transgenic lines were sown in field and data was recorded for various morpho-physiological, grain, fodder yield and quality traits. Data was statistically analyzed to check significance of results at contents, photosynthetic rate, cob length, grain protein, grain oil, embryo percentage and grain starch may be fruitful keeping in view as the major contributing traits to improve crop yield and production. It was suggested that the transgenic lines for glyphosate resistance may be used to develop transgenic hybrids and synthetic varieties with higher grain yield with high quality.

Keywords: *Herbicide resistance, maize, economic, farm*

Facts and figures of salinity in the country and opportunity for plant scientists

Sabahat Shaheen, Sidra Aslam, Rana Khalid Iqbal and Muhammad Tehseen Azhar*

Institute of Molecular Biology and Biotechnology Bahauddin Zakariya University Multan-60800, Pakistan

Abstract

Cotton is an important cash crop of Pakistan which is also called as silver fiber. Pakistan is the fifth largest producer of cotton, while it was on fourth position till 2019. There are several reasons of this decline in production of yield of seed cotton. During growth and reproductive period, cotton plant face numerous environmental stresses which are of categorized in two classes *i.e.* abiotic (salt, drought and temperature stress) and biotic stress (diseases and insects). Out of these abiotic stresses, salinity is one of the major reason of crop losses all over the world. If we talk about salinity level suitable for cotton, it is reported that 7.7 dS/m is considered as threshold level and in this sense cotton plant is considered as moderately salt tolerant. Because of the adverse effects of salinity on development and growth stages, it is the major issue to crop productivity around the globe. Many changes are induced in the metabolism like disruption in water uptake, growth pattern, photosynthesis, transpiration and imbalanced concentration of hormones due to the existence of toxic levels. Due to salinity, approximately 30% of Pakistani land will be deteriorated in next 25 years and it is estimated that this ratio will enhance upto 50% till 2050's. So, the salinity damages each process of plant system and indeed decrease the quality and productivity of field crops. Crop productivity is reduced by increasing level of salt stress which decreases the boll weight and size, and likewise delay in flowering and increased shedding of bolls. Biochemical attributes are also affected by salinity, like higher production of reactive oxygen species (ROS). When the plant is subjected to prolonged salt stress it results into the production of ROS which causes oxidative damage to plant at cellular level. The enzymatic activity of SOD, CAT and APX against ROS is adversely affected under long term salt stress. Although a number of strategies to tackle the salinity stress have been used by plant researchers but still there is a dire need to expand cotton cultivation per unit area to meet increasing demand of textile industry in the country. That's why it is the primary goal of cotton research institute of Pakistan to develop salinity tolerance varieties of cotton. Therefore, it is necessary to take steps for enhancing and stabilizing the national wealth of Pakistan by increasing the production of cotton in saline areas. To cope with the situation, it has been suggested by scientists to develop stress tolerant cotton cultivars by using recent conventional and non-conventional approaches. Moreover, the approaches like breeding through mutation, marker aided selection, somaclonal variation and somatic hybridization are also helpful in developing stress tolerance in cotton.

Key Words: Abiotic stressses, Genetics, *Gossypium hirsutum*, Germplasm, ROS, Tolerance

Molecular identification of Clerodendron yellow mosaic virus from *Duranta repens* and *Clerodendrum inerme* from Pakistan

Nazia Nahid¹, Muhammad Shah Nawaz-ul-Rehman²

¹Department of Bioinformatics and Biotechnology, Government College University Faisalabad

²Virology Lab, CABB, University of Agriculture, Faisalabad

Abstract

Plant viruses of the family *Geminiviridae* cause great loss to important cultivated crops, weeds and ornamental plants. Geminiviruses are small circular single-stranded DNA viruses classified into nine genera, depending on vector specificity, host range, genome structure and their vector, which are responsible for their transmission into host. Among these nine genera *Begomovirus* is the one infecting a vast majority of cultivated, ornamental and weed plants. Some of the ornamental plants are perennials in their growth habit and infected plants serve as a virus pool for the transmission to annuals and cultivated plants. For identification of begomoviruses from perennial ornamental hedge plants *Duranta repens* and *Clerodendrum inerme*, the leaf samples were collected from the infected plants. These plants were having distinct begomovirus infection symptoms of leaf yellowing (mosaic in case of *C. inerme*) and distorted or curled leaves (*D. repens*). Sequence analysis of PCR products amplified using diagnostic primers (CLCV1 and CLCV2) confirmed the presence of a begomovirus *Clerodendrum yellow mosaic virus* (CIYMV) infection. A pair of abutting primer based on this partial sequence was used to amplify a full-length molecule of 2.8 kb from the infected clerodendrum plants by PCR. A clone CIYMV-fsd-18 was partially sequenced that showed more than 90% identity to CIYMV. This is the first time that CIYMV was identified infecting both the *Duranta repens* and *Clerodendrum inerme* from Pakistan.

Key Words:

First report of Tomato leaf curl Palampur virus infecting chili crop in Pakistan

Muhammad Shah Nawaz-UI-Rehman*, Zonaira Zafar, Muhammad Mubin

Centre of Agricultural Biochemistry and Biotechnology, University of Agriculture, Faisalabad

Abstract

Chili is cultivated extensively in Pakistan and plays a significant role in commercial sector. Chili crop is vulnerable to many pathogens including viruses that may lead to heavy losses in production. The studies presented here were intended to understand the virus species responsible for the chili leaf curl disease complex. Fields of chili crops in Pakistan were surveyed; DNA was isolated and amplified with a single step polymerase chain reaction (PCR) protocol to identify the chili infecting viruses. Moreover, PCR and rolling circle amplification (RCA) were used to clone and sequence full-length viruses and satellites isolated from chili plants to evaluate the chili infecting begomoviruses. The cloning and sequencing approaches revealed Tomato leaf curl Palampur virus (ToLCPaV), previously not known from chilies. The sequence analysis revealed that ToLCPaV isolated from chilies in Pakistan shares maximum sequence identity with other isolates in GenBank. Infectivity analysis of ToLCPaV alone and in combination with chili leaf curl betasatellite (ChiLCB) was performed by Agro-inoculation in *Nicotiana benthamiana* plants using infectious molecules. The infectivity experiments suggested that Tomato leaf curl Palampur virus DNA-A alone is sufficient to induce leaf curl disease in *N. benthamiana* plants. This study analyzes the spread of chili leaf curl disease in Pakistan and diversity of begomoviruses infecting chili crop.

Key Words:

BetaC1 protein of Cotton Leaf Curl Multan betasatellite interacts with Double strand RNA binding protein 4 of *Nicotiana benthamiana*

Muhammad Mubin*, Sehrish Ijaz, Muhammad Shah Nawaz-Ul-Rehman

Centre of Agricultural Biochemistry and Biotechnology, University of Agriculture, Faisalabad;

Abstract

Begomoviruses infect many important cash crops worldwide. Like all other viruses, these single stranded DNA viruses use the similar strategy to hijack host machinery for their successful infection. Begomoviruses encode 5-7 multifunctional proteins that interact with a diverse variety of plant pathways. Along with their main function, most of the these proteins also work as a suppressor of gene silencing that is a plant conserved antiviral mechanism called RNA interference. Begomoviruses usually are associated with a betasatellite molecule encoding a BetaC1 protein. BetaC1 act as a pathogenicity determinant gene for helper virus as well as a suppressor of gene silencing. Present study was designed to investigate the interaction of BetaC1 protein of Cotton leaf curl Multan betasatellite (CLCuMB) with Double stranded RNA binding protein 4 (DRB4) of *Nicotiana benthamiana*. Plant DRBs proteins are involved in mRNA cleavage during RNA silencing. DRB4 is known to be involved in different kinds of silencing mechanism hence important to study. Yeast two hybrid approach was used to check the interaction between DRB4 of *N. benthamiana* and BetaC1 of CLCuMB. Plant total RNA was extracted and cDNA was synthesized. Both plant and viral genes were amplified by gateway primers and cloned into entry vectors. The integrity of clones was confirmed by complete sequencing; and then shifted into yeast expression vectors. Expression clones were transformed into yeast strains *AH109* and *Y187*. Diploid cells were obtained after yeast mating and selection was performed on nutrient deficient media to find positive interaction. This interaction was further validated via bimolecular fluorescence complementation approach (BiFC). Again, cloning was performed and positive clones were shifted into binary YFP vectors. These clones were transformed into *Agrobacterium tumefaciens* strain C58. *N. benthamiana* plants were infiltrated by agro-constructs to check the transient expression of interacting proteins. Fluorescence was observed and images were taken by confocal microscopy. Y2H results showed that BetaC1 strongly interacts with DRB4 protein. Further, BiFC has also confirmed this interaction. Both proteins were found to be localized and interacting in plant nucleus. It is already known that DRB4 is active in several RNA silencing pathways including siRNAs formation against viruses, miRNAs and tasiRNAs formation for developmental regulation in plants. So it seems that BetaC1 may target DRB4 to downregulate it's functioning in several antiviral plant mechanisms that are simultaneously active against viruses hence enabling the successful virus infection.

Key Words:

Some of the less famous Iranian traditional medicine remedies in tremor control

Azadeh Hamedei ¹, Zeliha Selamoglu ², Azar Hamedei ³, Ardalan Pasdaran ^{4*}

¹Department of Pharmacognosy, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran.

²Department of Medical Biology, Faculty of Medicine, Nigde Ömer Halisdemir University, Nigde, Turkey.

³School of Agriculture, Shiraz University, Shiraz, Iran.

⁴Medicinal Plants Processing Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

Abstract

Traditional remedies constitute important part of neurological complications popular care. In this abstract, we summarized various Iranian traditional medicine (ITM) that are used in control of various neurological disease especially various tremors. In modern medicine, following classification is common as clinical overview: peripheral neuropathy, cerebellar events, Parkinson, physiological based, functional, dystonic, orthostatic, and essential tremors[1]. Although the modern medicine has more focus on tremors treatment based on their causes classification, traditional medicine has a broad approach for tremor treatment. Current presentation focus on less famous traditional remedies. Based on various ITM references following remedies were used in various neurological complexities especially tremors[2-4]. These materials include:

Pistacia atlantica Desf (بنه), *Ipomoea hederacea* Jacq (حب النيل), *Peganum harmala* L. (اسپند), *Asafoetida* (أنفوزه)- dried latex gum oleoresin exuded from *Ferula* spp.), *Ricinus communis* L. (کرچک), *Alcea* spp. (ختمی), *Citrus medica* L. (بالنگ), *Artemisia absinthium* L. (افسننتین), *Semecarpus anacardium* L.f. (بلادر), *Setaria viridis* (L.) P. Beauv. (جورس), *Curcuma zedoaria* (Christm.) Roscoe (جدوار), *Jasminum grandiflorum* L. (چنپا), *Smilax china* L. (چوب چینی), *Calicotome spinose* (L.) Link (دار شیشعان), *Ruta graveolens* L. (سداب), *Cydonia oblonga* Mill. (به), *Thymus vulgaris* L. (اویشن), *Anacyclus pyrethrum* (L.) Link (عاققرحا), *Paeonia* spp. (فاوانیا), and *Dolomiaea costus* (Falc.) Kasana & A.K.Pandey (قسط).

These herbs were used historically as common ITM so that they could prepare commercially.

Key Words:

Reference

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Evaluation of toxic elements in Dill (*Anethum graveolens dhi*) grown in different regions in Lahijan-Iran Northern

Ebrahim Alinia-Ahandani¹, Ali Akbar Malekirad^{1*}, Habibollah Nazem¹, Mohammad Fazilati¹, Hossein Salavati¹, Zeliha Selamoglu²

¹Department of Biochemistry, Payame Noor University, Tehran, I.R. Iran P.O.BOX 19395-3697

² Medical Biology Department, Medicine Faculty, Nigde Omer Halisdemir University, Nigde, Turkey

*Corresponding authors: Ali Akbar Malekirad: Malekirad1973@gmail.com and Ebi.alinia@gmail.com Tel: +989362788299

Abstract

To evaluate cadmium, lead, mercury, arsenic, zinc and copper contents in Dill, one of the most consumed the populus herb in Iran northern, and to examine if the location variety in Lahijan affected investigated metals levels in herbs cultivated in the different regions were assessed. We measured the heavy metals by ICP-OES in standard methods. Statistical analysis (ANOVA) of obtained results showed no significant differences between Pahmedan and Ahandan regions. The results of analysis revealed that all dill samples met Public Health Regulation Standards regarding investigated metals except Bazkiyagourab region. However, Dill from 4 investigated locations exceeded the Maximum Permissible Concentrations (MPC) allocated for copper and mercury and met the standards considering other investigated elements. In the view of obtained results, pointing out mercury as major problem regarding heavy metal pollution of investigated herb, literature data estimating mercury intake in Iran were compared to average mercury intake in other countries and it was found to be similar to other considered countries. Based on obtained results and available statistical data, heavy metal intake through herbs consumption was estimated and expressed as the percentage of Iranian tolerable daily (weekly) intake for each investigated element.

Keywords: toxic elements, herbs, Iran, lead, Dill.

The Effects Of Some Supplements On Quality Parameters Of Royal Jelly

Samet Okuyan¹, Ahmet Şekeroğlu²

¹Apiculture Research Institute, Ministry of Agriculture, Ordu, Turkey

²Faculty of Agriculture Science and Technologies, Niğde Ömer Halisdemir University, Niğde, Turkey

Abstract

The main goal of this study was to investigate the effects of vitamin E and coenzyme Q10 supplementation on quality parameters of royal jelly. This study was carried out in Apicultural Research Institute campus in Ordu region. There were four different experimental groups; 1st vitamin E, 2nd coenzyme Q10, 3rd mix (vitamin E and coenzyme Q10), 4th control group. 19 honey bee colonies were employed in this randomized controlled trial. We measured cell acceptance rate, royal jelly yield per cell, dry matter, ash, protein, 10 HDA, sucrose, invert sugar. Six grafts were done for each cell builder colony. The measurements were, on average; 75,66 ± 2,02% for the average cell acceptance rate, 172,99 ± 5,12 mg for royal jelly yield per cell, 34,16 ± 2,20% for dry matter, 1,43 ± 0,03% for ash, 14,23 ± 0,14% for protein, 1,87 ± 0,01% for 10 HDA, 4,23 ± 0,13% for sucrose, and 7,39 ± 0,06% for invert sugar. The differences from cell acceptance rate and dry matter were statistically significant (P<0.05). The differences in royal jelly yield per cell, ash, protein, 10 HDA, sucrose and invert sugar rate were not statistically significant (P>0.05).

Key Words: Coenzyme Q10, acceptance rate, cell, 10 HDA

Bazi Takviyelerin Ari Sütü 'Nün Kalite Parametreleri Üzerine Etkileri

Özet

Bu çalışmanın temel amacı, E vitamini ve koenzim Q10 takviyesinin arı sütü kalite parametreleri üzerindeki etkilerini araştırmaktır. Bu çalışma Ordu bölgesinde bulunan Arıcılık Araştırma Enstitüsü yerleşkesinde gerçekleştirilmiştir. Dört farklı deney grubu vardı; 1. E vitamini, 2. koenzim Q10, 3. karışım (E vitamini ve koenzim Q10), 4. kontrol grubu. Bu randomize kontrollü denemede 19 bal arısı kolonisi kullanılmıştır. Aşılama randımanı, yüksük başına arı sütü verimi, kuru madde, kül, protein, 10 HDA, sakaroz, invert şeker oranları üretilen arı sütlerinde ölçülmüştür. Her başlatıcı koloni için altı aşılama yapılmıştır. Ölçümler ortalama olarak; Ortalama aşılama randımanı %75,66 ± 2,02, yüksük başına arı sütü verimi 172,99 ± 5,12 mg, kuru madde oranı %34,16 ± 2,20, 1,43 ± %0,03 kül oranı, protein oranı %14,23 ± %0,14, 10 HDA oranı %1,87 ± %0,01, sakaroz oranı %4,23 ± %0,13 ve invert şeker oranı %7,39 ± %0,06 hesaplanmıştır. Yüksük kabul oranı ve kuru madde oranı arasındaki farklılık istatistiksel olarak anlamlı bulunmuştur (P<0.05). Yüksük başı arı sütü verimi, kül, protein, 10 HDA, sakaroz ve invert şeker oranları arasındaki farklılıklar istatistiksel önemli bulunmamıştır (P>0.05).

Anahtar Kelimeler: Koenzim Q10, Aşılama Randımanı, Yüksük, 10 HDA



Land Fragmentation Indicators

Fırat Arslan

Department, Faculty, University, City, Country Biyosistem Engineering, Rafet Kayış Engineering Faculty, Alanya Alaaddin Antalya, Turkey

Abstract

Land consolidation projects (LCPs) aim to create sustainable farms for good agriculture practices besides increase production and productivity of agricultural enterprises and to raise the living standards of the rural population. It is achieved by making the best use of production factors with less time, labour and capital. Land fragmentation is the one of the most important courses of LCPs. Success of LCPs should be measured due to high expenditures on it by the governments. For this reason, some indicators are improved for observations by researchers. In this study, land fragmentation indicators used in LC projects are assessed and compared. As a result, best indicator for LCPs is changed according to available data and the project, however, New Land Fragmentation Index was found as recommended one.

Key Words: Land consolidation, land fragmentation, sustainable agriculture

Phytochemical and Nutritional Profile, Mineral Ratio and Mineral Safety Index of Young and Matured Corn Silk Collected from Ekiti State, Nigeria

Sunday Dele Oyeyemi*, Adedeji Olayinka Adebisi, Raymond Olayinka

Department of Plant Science and Biotechnology, Ekiti State University, Ado-Ekiti 36001, Nigeria

*Corresponding author: sunday.oyeyemi@eksu.edu.ng Tel: +234(0)8034494820

Abstract

The need for a supplement feed material that would be readily available, affordable and have nutritional qualities prompted this study on corn silk, an agricultural waste material from corn cultivation. Fresh and dry corn silk were collected from a farm land in Ado Ekiti, Ekiti State, Nigeria and evaluated for phytochemical and nutritional composition. The mineral ratio and mineral safety index were calculated from the mineral content of the corn silk. The phytochemical analysis revealed that both the young and matured corn silk contained alkaloids, tannins, saponins, flavonoids, phenols, steroids and reducing sugar. The qualitative phytochemical estimates showed high concentration of flavonoids and total phenols while tannins were found in moderate quantities. The proximate estimation (%) revealed high values of carbohydrate and crude fiber, moderate crude protein, ash, low crude fat, moisture as well as high energy content in young and matured corn silk respectively. Both samples contained high K, P, Ca, Mg, moderate Na, Fe, Mn, Zn and Cu while Pb and Ni, toxic metals, were absent. The mineral CV% ranged from 1.32-38.92. The results of the mineral safety index were lower than the standard, an indication that there would be no mineral overload. The two corn silk samples were rich in active secondary metabolites which could offer protective health benefits, also safe and contained nutritional qualities that could make them suitable to be incorporated into man's diet and domestic feed.

Key Words: Corn silk, Phytochemical, Proximate, Domestic feed, Ado Ekiti

Introduction

Corn (*Zea mays* Linn) popular called maize belongs to the family Poaceae. It is the most abundant staple food crop grown all over the world particularly in Africa. Maize is an important crop in Africa mainly in the eastern and southern regions where it serves as dominant food crop and the mainstay of rural diets (Morris, 1998). It is a major important cereal being cultivated in the rainforest and derived savanna zones of Nigeria (Iken and Amusa, 2004). Corn silk, the yellowish thread like strands from the female flower of maize are often regarded as a waste material from corn cultivation (Maksimovac *et al.*, 2005). In most cases, corn silk threads are normally discarded after corn harvesting. The colour of the corn silk are usually light green at first and later turn into red or yellow and finally light brown at maturity. The major function of corn silk is to trap the pollen for pollination.

Corn silk is harvested just before pollination occurs when needed for medicinal purposes. It can also be used in fresh or dried form (Maksimovac and Kovacevic, 2003). This agricultural waste material has been consumed for a long time as a therapeutic remedy for various ailments. It has been reported to be used as traditional medicine in many parts of the world such as China, Turkey and Africa. It is commonly used for the treatment of edema, kidney stones, diuretic, prostrate disorder, obesity and urinary infections (Dat, 1992; Grases, 1993; Hu *et al.*, 2010). Corn silk has been used based on folk remedies as an oral antidiabetic agent in China for decades. It is also considered to be effective in treating hypertension, nephritis and prostatitis (Hasanudin *et al.*, 2012).

Recently, there is a sharp increase in the demand for animal feeds in Nigeria fueled by competing use and demands for corn and soybeans. There is a pressing need for feed sources that would serve as supplements. Such feeds should be readily available, sourced locally, affordable and at the same time, rich in energy, provide essential nutrients and safe for consumption. In order to achieve this, attention is now being shifted to neglected, underutilized crops as well as crops regarded to as agricultural waste.

Hence, this study is aimed at investigating the phytochemical and nutritional profile, mineral ratio and mineral safety index of young and matured corn silk, an agricultural waste material from corn cultivation in Ekiti State, Nigeria.

Materials and Methods

Samples of young and matured corn silk used in this study were collected from Ekiti State University campus, Ado Ekiti, Ekiti State, Nigeria. The plant samples were rinsed with distilled water to remove the sand and other impurities. The corn silk materials were air dried for three weeks. The dried samples were then ground into a

powder using an electric blender (Binatone BLG-600SMK2). The powdered sample was used for phytochemical, proximate and mineral analyses.

Qualitative Phytochemical Screening

Test for flavonoids

Flavonoid was tested using 1 g of the extract dissolved in 1% Aluminum chloride in methanol. Few drops of concentrated HCl, magnesium turnings and potassium hydroxide solution were added. Orange to pink colour change indicated the presence of flavonoids.

Test for Alkaloids

Alkaloid was detected by taking 1 g of the powdered sample and stirred with 5ml of 1% HCL on a steam bath and filtered. 1ml of the filtrate was treated with a few drops of Dragendorff's reagent (Bismut nitrate + conc, HCl). A change in the colour of the sample to black indicated the presence of alkaloids.

Test for Saponins

A portion (2 g) of the dry powdered sample was taken and boiled in 20 cm³ of distilled water in a water bath and then, filtered. The filtrate (5 cm³) was mixed with 5 cm³ of distilled water and shaken vigorously. The formation of stable foam was taken as an indication for the presence of saponins.

Test for Tannins

To test for tannins, 1 g of the sample was taken and boiled in 10 ml of distilled water in a test tube and filtered. A few drops of 5% ferric chloride were added. Black colouration or precipitation showed the presence of tannins (Banso and Adeyemo, 2006).

Test for Phenols

For phenol detection, 2 ml of ferric chloride (FeCl₃) solution was added to 2 ml of the sample extract in a test tube. Formation of deep bluish green solution showed the presence of phenol.

Test for Steroids

The presence of steroids was confirmed by taking 0.5 ml of sample extract and dissolved in 3 ml of chloroform, then filtered. A few drops of concentrated Tetraoxosulphate (VI) acid were added. Reddish brown colour at the lower layer of the tube indicated the presence of steroid.

Test for Phlobatannins

In a test tube, 0.5 ml of the extract was taken, 3 ml of distilled water was added and shaken for a few minutes then 1 % aqueous hydrochloric acid (HCl) was added and boiled on water bath. The formation of red colour indicated the presence of phlobatanins.

Test for Terpenoids

One gram of each plant sample was mixed with 2 ml of chloroform and 3 ml of conc. H₂SO₄ was carefully added to form layer. A reddish-brown colouration of the interface indicated the presence of terpenoids.

Test for cardiac glycosides (Keller-Killiani test)

One gram of plant sample each was shaken with 5 ml of distilled water in a test tube and 2 ml of glacial acetic acid containing a few drops of ferric chloride was added slowly along the side of the test tube. Formation of brown ring at the interface gave positive indication for cardiac glycoside. A violet ring may also appear below the brown ring (Ayoola *et al.*, 2008).

Quantitative Estimation of the Phytochemicals

The amounts of phytochemicals in the sample was further determined using the standard procedure of Harbone (1993), Boham and Kocipal (1994) and Obadoni and Ochukwo (2001).

Proximate Analysis

The estimation of moisture, ash, crude fat and crude fiber were determined in accordance with the official method of AOAC (2005). The moisture content was determined by taking 2 g of the dried sample and drying at 105 °C in an ovum until a constant weight was reached. For total ash determination, the dried plant sample was weighed and converted to dry ash in a muffle furnace at 550 °C for incineration. The crude fat content was determined by extraction with hexane, using Soxhlet's apparatus. The crude protein content was calculated as percent of nitrogen

value and Full stop between (AOAC, 2005) and Crude lipid (AOAC, 2005). Crude lipid content of the sample was determined using Soxhlet type of direct petroleum ether solvent extraction method. Carbohydrate was determined according Onwuka (2005) by calculating the difference between the sums of all the proximate composition from 100 percentages.

Determination of the mineral composition

Elemental analysis was carried out using atomic absorption spectrophotometer (Buck Scientific Model-210 VGP) for sodium, potassium, manganese, magnesium, iron, calcium, zinc and copper while phosphorus was determined calorimetrically according to method described by State *et al.* (2011).

Determination of Energy

This was calculated using Atwater factor method as described by Osborne and Voegt (1978). The estimated energy value in the samples in Kcal/100g was determined by adding the multiply values for crude fat, crude protein and carbohydrate using the factor (9Kcal, 4Kcal and 4Kcal) respectively. The energy value in Kilojoule was determined by adding the multiply values for crude fat, crude protein and carbohydrate using the factor (37Kcal, 17Kcal and 17Kcal) respectively.

Other Calculations

Other calculations made from the mineral elements include mineral ratios and Mineral Safety Index (MSI).

Statistical Analysis

Descriptive statistics (mean, standard deviation and coefficient of variation) were determined (Chase, 1976).

Results

The young and matured silk corn samples were screened for phytochemical. The results revealed the presence of alkaloids, tannins phenols, saponins, flavonoids, steroids and reducing sugars while terpenoids and cardiac glycosides were absent in both the young and matured corn silk (Table 1). Quantitative phytochemical estimates of the corn silk samples showed low concentration of alkaloids (0.23 and 0.28 MgTAE/g), high flavonoids (8.22 and 14.37MgQE/G) and high total phenol (12.16 and 6.94 MgAE/g) in young and matured silk respectively (Table 2).

Table 1. Qualitative phytochemical estimates of young and matured corn silk

Parameters	Young silk	Matured silk
Alkaloids	+	+
Tannins	+	+
Phenol	+	+
Saponins	+	+
Flavonoids	+	+
Terpenoids	-	-
Steroids	+	+
Cardiac Glycosides	-	-
Reducing Sugar	+	+

(+) Indicates presence, (-) indicates absence

Table 2. Quantitative phytochemical estimates of young and matured corn silk

Phytochemical	Young silk	Matured silk
Alkaloids (MgAT/g)	0.23±0.01	0.28±0.00
Saponins (MgGAE/g)	0.14±0.00	0.18±0.00
Total phenol (Mg GAE/g)	12.16±0.06	6.94±0.06
Tannins (MgTAE/g)	5.70±0.14	4.15±0.01
Flavonoids (MgQE/g)	8.22±0.03	14.37±0.24

Values are expressed as means ± SD, n = 3

Table 3. Proximate composition (%) of young and matured corn silk

Proximate	Young silk	Matured silk
Moisture content	8.76±0.06	9.11±0.02
Crude protein	5.74±0.06	4.33±0.07
Crude Fat	1.21±0.04	1.29±0.01
Ash	5.52±0.12	5.53±0.12
Crude fiber	10.20±0.05	12.42±0.06
Carbohydrate	68.27±0.04	67.34±0.01

Values are expressed as means ± SD, n = 3

The result of the proportion of percentage energy contributed by crude fat, crude protein and carbohydrate to total metabolizable energy is given in Table 4. The total energy for young and matured corn silks were 1302.94kJ/100g (306.93Kcal/100g) and 1265.78kJ/100g (298.23Kcal/100g) respectively with both the kJ and Kcal values very close with CV% range of 2.03-2.05. The utilizable energy in the young and matured silks were in order of PEC%>PEP%>PEF%. The UEDP% (assuming 60% of protein energy utilization) was low 4.49% in young silk and 5.43% in matured silk.

Table 4. Proportion of percentage contribution from fat, protein and carbohydrate to total energy

Parameter	Young silk	Matured silk	Mean	SD	CV%
Total energy					
(E in kJ/100g)	1302.94	1265.78	1284.36	26.27	2.05
(E in kcal/100g)	306.93	298.23	302.58	6.15	2.03
PEF % (E in kJ/100g)	(3.44) 44.77	(3.77) 47.73	3.59	0.21	5.85
(E in kcal/100g)	(3.52) 10.8	(3.89) 11.61	3.71	0.26	7.01
PEP % (E in kJ/100g)	(7.48) 97.58	(5.82) 76.61	6.65	1.17	17.59
(E in kcal/100g)	(7.48) 22.96	(5.81) 17.32	6.65	1.18	17.74
PEC % (E in kJ/100g)	(89.07) 1160.6	(90.44) 1,145	89.76	0.97	1.08
(E in kcal/100g)	(88.97) 273.1	(90.32) 269.4	89.65	0.95	1.06
UEDP %	4.49	5.43	4.96	0.66	13.31

PEF = proportion of total energy due to fat; PEP = proportion of total energy due to protein; PEC = proportion of total energy due to carbohydrate; UEDP = utilization of 60% of PEP %.

The result shown in Table 5 revealed the mineral composition of young and matured corn silk. The Table equally revealed the mean, standard deviation and coefficient of variation percent. The composition of mineral (mg/100g) investigated were: Na (42.70 and 40.40), K (8425 and 6630), P (584.80 and 591.33), Ca (140.14 and 137.55), Mg (104 and 119.70), Fe (7.87 and 6.15), Mn (4.11 and 3.13), Cu (1.50 and 1.10), Zn (9.21 and 5.23) in young and matured silk respectively while Pb and Ni were not detected in the samples. The CV% of the mineral ranged from 1.32-38.92.

Table 5. Mineral composition (mg/100g) of young and matured corn silk

Parameter	Young silk	Matured silk	Mean	SD	CV%
Sodium	42.70	40.40	41.55	1.62	3.89
Potassium	8425.00	6630.00	7527.5	1269.2	16.86
Phosphorus	584.80	591.33	588.07	4.62	0.78
Calcium	140.14	137.55	138.80	1.83	1.32
Magnesium	104.00	119.70	111.85	11.10	9.92
Iron	7.87	6.15	7.01	1.21	17.26
Manganese	4.11	3.13	3.62	0.69	19.06
Copper	1.50	1.10	1.30	0.28	21.54
Zinc	9.21	5.23	7.22	2.81	38.92
Lead	Nd	Nd	-	-	-
Nickel	Nd	Nd	-	-	-

Calculated Mineral Ratios and Mineral Difference

Table 6 depicts the calculated mineral ratios of young and matured corn silk. Na/K ratio had the lowest CV% value of 0 while Ca/K had the highest value of 52.03.

Table 6. Calculated mineral ratio of young and matured silk corn

Minerals	Standard	Young silk	Matured silk	Mean	SD	CV%
Na/K	0.06	0.006	0.006	0.006	0.0	0
K/Na	5.0	197	164	181	23.33	12.93
Na/Mg	4.17	0.411	0.338	0.375	0.05	13.33
Ca/Mg	1.0	1.35	1.15	1.25	0.14	11.20
K/(Ca+Mg)	2.2	34.5	25.8	30.2	6.15	20.36
Ca/P	≥0.5	0.239	0.233	0.236	4.24	1796
Ca/K	4.00	0.017	0.021	0.019	2.82	52.03
Fe/Cu	5.59	5.25	5.59	5.42	0.24	4.43
Zn/Cu	4.75	6.14	4.75	5.45	0.98	18.08

Mineral difference of the two samples is shown in Table 7. The result revealed that seven minerals (Na, P, Ca, Fe, Mn, Cu, and Zn) had greater values in young silk than matured silk. The % difference ranged between 1.85-43.21 (both coming from Ca and Cu).

Table 7. Mineral difference in young and matured silk corn

Minerals	Differences	
	mg/100g	%
Sodium	2.30	5.39
Potassium	1,795	21.31
Phosphorus	-6.53	-1.12
Calcium	2.59	1.85
Magnesium	-15.7	-15.10
Iron	1.72	21.86
Manganese	0.98	23.84
Copper	3.98	43.21
Zinc	0.40	26.66

Mineral Safety Index (MSI)

Table 8 showed the mineral safety index (MSI) of Na, Mg, P, Ca, Fe, Zn, and Cu of the two samples. The MSI values were; Na (0.41 and 0.39), Mg (3.90 and 4.49), P (4.87 and 4.93), Ca (1.17 and 1.15), Fe (3.52 and 2.75), Zn (20.3 and 11.5) and Cu (16.5 and 12.10) in young and matured silk respectively. The highest level of index was recorded in Cu while Na had the least value.

Table 8. Mineral Safety Index (MSI) of Na, Mg, P, Ca, Fe, Zn and Cu in the young and matured corn silk

Mineral	RAI	TV of MSI	Young silk			Matured silk		
			CV	D	%D	CV	D	%D
Na	500mg	4.80	0.410	4.39	91.5	0.390	4.41	91.9
Mg	400mg	15.0	3.90	11.1	74.0	4.49	10.5	70.1
P	1200mg	10.0	4.87	5.13	51.3	4.93	5.07	50.7
Ca	1200mg	10.0	1.17	8.83	88.3	1.15	8.85	88.5
Fe	15mg	6.70	3.52	3.18	47.5	2.75	3.95	58.9
Zn	15mg	33.0	20.3	12.7	38.6	11.5	21.5	65.2
Cu	3mg	33.0	16.5	16.5	50.0	12.10	20.9	63.3

CV = calculated value; TV = Table value; D = difference; RAI = recommended adult intake, No standard for K, Mn and Pb

Discussion

The results of analyses of medicinally important compounds in young and matured corn silk revealed that both the samples being analyzed are rich in bioactive compounds having medicinal properties. The qualitative estimation of the percentage crude yield of phytochemical constituents of the two samples studied revealed low quantity of

tannins and high quantity of flavonoids and total phenols. It has been reported that saponins are used medicinally in hypercholesterolemia, antioxidant, anticancer, anti-inflammatory and weight loss (Malairajan, 2006). In addition, it is used to stop bleeding, treating wounds and ulcer. It helps red blood cells to precipitate and coagulate (Thamaraiselvi, 2012). Alkaloids have been reported to exhibit analgesic, antispasmodic and antibacterial properties (Patra, 2014). Flavonoids are noted for their antioxidative, antibacterial, anti-inflammatory, anticancer and also potential antiviral properties (Kumar *et al.*, 2013; Saxena *et al.*, 2013). Nutrients are substances found in food which drive biological activities. Nutrients support vital functions such as growth, the immune, the central nervous system and also preventing diseases. The proximate content of the young and matured silk was investigated in order to find out the nutritive values of the two samples for possible incorporation into human diet and domestic animal feeds. The results of the proximate composition revealed that the silk samples have low moisture content compared to 16.11% and 14.10% report for *Amaranthus cruentus* and *Ocimum gratissimum* (Onwordi *et al.*, 2009). The low moisture content in the two samples would afford long shelf life for the silk samples. The crude protein content in the young and matured corn silk were high compared to 1.98% reported for *Securinega virosa* leaves (Danlami *et al.*, 2012) but low to the value (27.13%) reported for *Crassocephalum crepidioides* (Adjatin *et al.*, 2013). The crude protein content was higher than 1.82%, 2.86% and 3.50% reported for *Talinum fruticosum*, *Murraya koenigii* and *Corchorus olitorius* respectively (Idoko *et al.*, 2014). Protein intake can help in formation of hormones, which control several biological functions in the body such as growth, tissue repair and maintenance. The crude fat content in the two samples were low. The values obtained in this study were low compared to the previous research work of Alowode *et al.* (2019) on *Cordyllum pinnata* and Oyeyemi *et al.* (2014) on *Myrianthus arboreus* and *Sparganophorus sparganophora*. The crude fat were high compared to 0.4% and 0.3% reported in the work of Saudi and Jideobi (2009) for *Talinum fruticosum* and *T. occidentale*. Iludibia *et al.* (2014) reported that fat yield more energy per gram than carbohydrate. However, it should be consumed with caution so as to avoid obesity and other related complications. The relatively low crude fat in the young and matured silk is cheering because the silk can be recommended as part of weight reducing diets. The crude fiber content for the young and matured silk were comparatively lower than the values reported by Baloch *et al.* (2015) for dehydrated and open sun Dried Cauliflower samples. However, the values obtained in this present study were high compared to 3.17% reported for *Parkia biglobosa* (Hassan *et al.*, 2011). The crude fiber obtained in this study is desirable because adequate consumption of dietary fiber may help to aid digestion, prevent diabetes and high levels of blood cholesterol (Iheanacho and Udebuani, 2009). Carbohydrate is one of the major sources of nutrition in animals including humans. It provides fuel for the central nervous system and energy for working muscles. Carbohydrate contents of the two silk samples investigated were higher than the values reported in the previous works of Orhuamen *et al.* (2012) for sixteen vegetables collected from Lagos State market, Nigeria and Idoko *et al.* (2014) for nine leafy vegetables consumed in Nigeria. The high content of carbohydrate in the silk samples is pleasing and suggesting that the silk samples can serve as energy rich food for man and animal. The result of the mineral analysis of the young and matured corn silk indicated that K and P were found in high concentrations while Na, Ca and Mg were in moderate levels and Fe, Mn, Cu and Zn were found in low concentrations. Sodium and Potassium are important in the transport of metabolites in the human body. The Potassium levels in the present study were higher than the levels in *Amaranthus dubius* (170.82 mg/100g) and *Lomariopsis guineensis* (367.48 mg/100g) (Mih *et al.*, 2017) but lower than the value in Apple *Malau domestica* (28,010 mg/100g) (Ozioma *et al.*, 2013). The result of our finding corroborated the report of Saranya and Vijithan (2017) who reported potassium as the major nutrient in corn silk. Sodium and Potassium play an important role in controlling nerve irritability, glucose absorption and promote normal retention of protein during growth (Aremu *et al.*, 2006). The phosphorus levels obtained in the studied samples were comparatively higher than the value in *Prosopis africana* (196.40 mg/100g) (Aremu *et al.*, 2007a). However, the values were lower than the Recommended Daily Allowance (RDA) of 800 mg. Phosphorus is always found with Ca in the body, both contributing to the supportive structures of the body. Calcium contents in this present report were higher when compared to the value 65.0 mg/100g reported for *Cajanus cajan* (Arawande and Borokini, 2010) but lower than 220.87 mg/100g reported for *Anarcadium occidentale* (Aletor *et al.*, 2007). The Ca level could be said to be low since the values can only contribute about 11.68% and 11.46% respectively to the Recommended Daily Allowance (RDA) value of 1200 mg. Deficiency of Ca and P can cause metal deficiency syndrome like rickets in children, calcification of bones (Agbaire, 2011) as well as osteoporosis among older people (Adeyeye, *et al.*, 2012).

The Iron levels recorded in this study were higher compared to the Fe value of 1.04 mg/100g reported for *Vigna unguiculata* (Owolabi *et al.*, 2012) but lower than 9.30 mg/100g reported for *Glycine max* (Odumodu, 2010). The values were also lower than the daily requirement of iron by human beings which is 15 mg for children, 12 mg for men and 18 mg for women (Fleck, 1976). These values could help in boosting the blood level in anemic condition. The Magnesium levels of the two corn silk samples investigated were higher than the values (2.68 mg/100g and 3.90 mg/100g) reported for *Myriathus arboreus* and *Sparganophorus sparganophora* leaves respectively (Oyeyemi *et al.*, 2014). The RDA for magnesium in adult is given as 350 mg/day (NRC, 1989). Hence, the young and matured corn silks could contribute 29.71% and 34.20% respectively to the recommended daily allowance (RDA) for an adult man. The Cu contents were comparatively lower than 2.84 mg/100g found in *Lablab purpureus*

(Olaleye and Olatoye *et al.*, 2017). Cu, although, a trace element is essential in human body and exists as an enzyme that catalyzes the oxidation of iron ion (Saupi *et al.*, 2009). The Zn concentrations of the samples were higher than the values 1.82 mg/100g (*Ocimum grattissimum*) and 2.60 mg/100g (*Gnetum africanum*) reported in the previous work of Idoko *et al.* (2014). The values could not meet the minimum Zn allowance (about 15-20mg) per day. Zn is useful for protein synthesis, normal body development and convalescence (Mohammad *et al.*, 2011). Manganese is an activator of many enzyme systems and maintains the electrical potential in nerves (Adeyeye *et al.*; 2007).

The total metabolizable energy obtained for both young and matured corn silk were high compared with values reported for some edible vegetables *Amaranthus dubis* (109.78 kcal/100g) and *Gnetum africanum* (268.02 kcal/100g) (Mih *et al.*, 2017). However, the values in this present study were comparatively lower than 354.20 kcal/100g for *Telfaria occidentalis* and 363.60 kcal/100g for *Moringa oleifera* respectively (Iyaka *et al.*, 2014). The values also compared favourably with 300.94 kcal/100g reported for water spinach leaves (Umar *et al.*, 2007). Carbohydrate contributed the highest energy values followed by protein. The CV% of the values was close with a range of 1.06-17.74 which showed that the values were close on parameter basis. The results of utilizable energy due to protein (UEDP%) in this present finding were low (assuming 60% of protein energy utilization) The values were lower than 8% recommended safe level for adult man who requires about 55 g protein per day with 60% utilization. This implies that other foods such as legumes may be added to the samples to meet the protein requirement when use as domestic feeds. The low PEF% of the young and matured corn silk was as a result of low level of lipid which in turn plays a significant role in prevention of chronic diseases such as liver cirrhosis, diabetes and heart related diseases (WHO, 2004).

Mineral ratios are often more important in determining nutritional deficiencies and excesses than mineral alone. Mineral ratios represent homeostatic balances. They are also indicative of disease trends as well as predictive of future metabolic dysfunction. The Na/K ratios in the two samples were lowered than 1 recommended for the prevention of high blood pressure (FND, 2002). It is observed that prevalence of hypertension in Nigeria is high and increasing on daily basis (Banigbe, 2020). It is already becoming a public health burden hence, food low in sodium and high in potassium should be encouraged. The low Na/K ratio in the samples is good for human health and the corn silk could be recommended for people suffering from high blood pressure diseases. The Ca/Mg ratios were lower than the required 6.67. The ratio of Calcium to Magnesium intake has gained attention in recent years. DeLuccia *et al.* (2019) reported that a ratio above 2:1 has been associated with increased risk of metabolic, inflammatory and cardiovascular disorder. The Ca/Mg ratios in this present study could not pose any health risk to the consumer.

The milliequivalent ratios $[K/(Ca + Mg)]$ in the silk samples were higher than the ideal value of 2.2 (Hathcock, 1985). The high levels obtained in the study were due to the relative high values of K as against low level of Ca and Mg. The low calcium and magnesium could be supplemented with food rich in Ca and Mg to boost the milliequivalent ratios $[K/(Ca + Mg)]$. The Zn/Cu ratios obtained conform to the standard value of 4.75. Values below the standard value suggest possible copper toxicity and zinc deficiency problems. The ratio of Zn/Cu not only reflects the individual level of trace elements, but also seems to have an important impact on metabolism, indicating that these trace elements play an important role in the pathogenesis of metabolic diseases (Hamasaki, 2016). Ca/K ratios were low compared to the ideal level (4.00). Low Ca/K ratios is considered good since a high Ca/K ratio would imply reduce thyroid function which if this imbalance persists for a long time could lead to symptoms such as fatigue, dry skin, overweight and constipation. Fe/Cu ratios in this present study were within the ideal value 5.59 requirement for favourable Fe absorption in the body. High copper relative to iron could impair many functions of iron metabolism and iron-deficiency anemia. Na/Mg ratios were lower than the ideal 4.17. However, lead was absent in the samples hence, the toxic ratios Ca/Pb, Zn/Pb and Fe/Pb could not be ascertained. Absence of lead in the samples was cheering because its presence which might be as a result of onset of pollution could pose health challenges. Toxicity of lead could lead to calcium displacement which in turn may raise glucose level.

The result of mineral difference in the two samples indicated that young silk had greater value in seven minerals (Na, P, Ca, Fe, Mn, Cu, and Zn) while matured silk had greater value in two minerals (P and Mg). The least % difference was obtained in Ca and highest % difference came from Cu. The result is an indication that the young silk is richer in mineral content compared to the matured silk.

Conclusion

The results of the phytochemical investigation showed that both the young and matured silk corn were rich in phytochemical and could be used to justify silk corn as a therapeutic remedy for various diseases and illnesses. The corn silk were rich in crude protein, crude fiber with low crude fat. The high total energy in the two samples could imply a good source of energy. They equally contained essential minerals K, P, Ca, Mg and moderate Fe. The absence of lead, a toxic metal would make the corn silk safe for consumption while the mineral safety index

implies that there would be no mineral overload in the body of the consumer. The plant materials could be recommended as good medical and supplement diets for man and domestic animal.

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Technical Efficiency of Ginger Production in Ilam, Nepal: A Stochastic Production Frontier Approach

Dikshya Khatiwada

Agriculture and Forestry University, Rampur, Chitwan, Nepal

Abstract

Nepal, being the fourth-largest producer of ginger has great potential to improve its economy via ginger production and trade. However, the country's average productivity is far below the potential yield. This yield gap could be due to the inability to properly utilize the existing resource and technology. There's a dearth of literature profiling the technical efficiency of ginger production in Nepal. This study thus measured the level of technical efficiency among smallholder ginger growers and examined the determinants of inefficiency by employing the Stochastic Frontier Production Function. The paper used a simple random sampling technique to interview 100 ginger farmers in Ilam, a leading ginger-producing district in Nepal with the help of a pre-tested interview schedule. The STATA.13 software was used to obtain both stochastic frontier estimates and the determinants of technical inefficiency. The results revealed that the average farm-level technical efficiency is 67.8% which shows the scope of increasing the technical efficiency by 32.2%. The coefficients of seed and farm yard manure were positive and showed significant relation to ginger output at a 1% and 5% level of significance respectively. Education level, training, and membership in cooperatives had a negative and significant impact on technical inefficiency whereas areas under ginger production had a positive impact on technical inefficiency. Hence, improving the technical knowledge of farmers through training on optimum input use complemented with motivation to join agriculture cooperatives and farmer's associations may increase the technical efficiency of ginger growers in the study area.

Key Words:

Effect of Soil Applied Zinc and Boron on Growth, Yield and Quality of Spring Planted Maize (*Zea mays* L.)

Abid Shehzad^{1,*}, Muhammad Farukh Saleem¹, Muhammad Abdullah Saleem¹, Taseer Ahmad^{1,2}, Iqra Akram³, Wajeesh Ur Rehman¹ and Waqar Akram⁴

¹Department of Agronomy, University of Agriculture Faisalabad

²Department of plant production and technologies, Faculty of Agricultural Sciences and Technologies, Omer Halisdemir University, Nigde, 51240 Turkey

³Department of Botany, University of Agriculture Faisalabad

⁴Department of Plant Pathology, University of Agriculture Faisalabad

Corresponding author: abidshehzad232@gmail.com

Abstract

A field experiment was conducted at University of Agriculture Faisalabad to evaluate the effectiveness of zinc and boron in maize hybrid DK-6317. Randomized Complete Block Design (RCBD) with factorial arrangement was used for treatments allocation. The treatments included were different levels of zinc (4, 6, 8 kg/ha) and boron (0.75, 1 kg/ha) along with control. Zinc sulfate and borax were used for Zn and B source, respectively. The collected data was statistically analyzed using Fisher's variance analysis and 5% probability for LSD test to determine differences among treatments means. All agronomic and yield related parameters were significantly affected with micronutrients usage. It was concluded that maize crop must be supplied with zinc and boron at 8 kg ha⁻¹ & 1 kg ha⁻¹, respectively to achieve higher productivity.

Key Words:

Response of Soyabean germplasm against soyabean mosaic virus and its impact on biochemical contents of plants

Muhammad Yousuf Aazaz*, Waqar Akram, Wajeeh Ur Rehman, Muhammad Usman Aslam, Muhammad Abdullah Saleem, Abid Shehzad,

*corresponding author: yousufyousuf2074@gmail.com

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

Soybean (Arshad et al.) is one of the important legumes and its demand is ever increasing. Soyabean production has been prone to various biotic and abiotic factors, among them plant diseases are the most important one. Particularly, Soyabean mosaic virus disease causing mosaic disease in Soyabean. Disease control mainly involves use of certified seed, cultural practices, regulatory measures, host-plant resistance and vector control but vector control via insecticide is posing certain economical and health risks for both farmers and consumers. Therefore, safer alternatives to control pathogen causing disease have become chief research priority. In present study, 10 varieties of soybean were selected to evaluate the effects of SMV on soybean plants. These varieties i.e., FS-60, Ajmeri, William-82, Crawford, 95-1-14, Woodworth, Kargyo, Amsoy, Faisal Soybean and FS-85 were cultivated in virology section of Ayyub Agriculture Research Institute, Faisalabad and were screened for their resistance against SMV under field conditions. Secondly, biochemical analysis provided certain details resulting from SMV. Different disease, vegetative, biological parameters, physiological parameters were recorded. Responses of soyabean germplasm against SMV was analyzed. 95-1-14 showed highly resistance response against the SMV disease which was followed by Crawford which showed partial resistance while the other varieties showed moderate to high susceptibility towards SMV. Amsoy, William-82, Faisal Soybean, Woodworth, Kargyo were moderately susceptible while FS-60, Ajmeri and FS-85 were susceptible. Among the 10 varieties, FS-85 had the most adverse effect of SMV disease. Molecular diagnosis was done by using ELISA for virus confirmation in soybean. The experiment was performed according to randomized complete block design (RCBD) under field conditions. Data was statistically analyzed.

Key words: *certified seed, Soyabean mosaic virus, physiological.*

Effect of Gamma Radiation on the Development of *Tribolium castaneum* (H.) (Coleoptera: Tenebrionidae) and *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae)

Muhammad Salim^{1*}, Faiqa Altaf¹, Inamullah Khan², Ahmad Ur Rahman Saljoqi¹ and Ayhan Gökçe³

¹Department of Plant Protection, Faculty of Crop Protection Sciences, The University of Agriculture, Peshawar, Pakistan.

²Pakistan Atomic Energy Commission, Nuclear Institute for Food and Agriculture (NIFA) G. T. Road, Tarnab, Peshawar, Pakistan.

³Department of Plant Production and Technologies, Faculty of Agricultural Sciences and Technologies, Niğde Ömer Halisdemir University, 51240 Niğde, Turkey.

Author for Correspondence: Dr. Muhammad Salim, Email ID: muhammadsalim@aup.edu.pk, Cell No: +923330917001

Abstract

Research on the effect of gamma radiation from Cobalt 60 source on various life stages of red rust flour beetle, *Tribolium castaneum* and pulse beetle, *Callosobruchus maculatus* were carried out under laboratory condition at $27 \pm 3^{\circ}\text{C}$ and relative humidity (RH) $48 \pm 5\%$. Low and high dose rates (5- and 7-seconds exposure time) of five different gamma radiation (0, 20, 40, 60 and 80 Gy) were tested against various developmental stages of *C. maculatus* and *T. castaneum*. After treated the eggs of *C. maculatus* at low dose rate of radiation, 60 Gy radiation dose rate was found sufficient to cause complete mortality in eggs whereas at high dose rate of irradiation, 20 Gy showed 100 percent mortality. Similarly, adults of *C. maculatus* were also treated at various low and high dose rates of gamma radiations (0, 200, 400, 600 and 800 Gy) respectively. At low dose rate of radiation, the adults showed a little resistance than high dose of radiation. At low dose, the highest mean percent mortality was recorded at 800 Gy (93.33%) whereas at high dose rate of 800 Gy, 100% mean percent adults mortality were observed with no fecundity data. Larvae of red rust flour beetle, *T. castaneum* were also exposed to various low and high dose rates of gamma radiations. At higher dose rate of 80 Gy, highest mean percent larval mortality (95.5%), lower mean percent pupae formation and lower adult emergence were recorded as compared to the low dose rate of gamma radiations from irradiated larvae. Higher dose rates of gamma radiations also caused sterility in emerged adults and showed significant delay in developmental stage. The irradiated pupae of red rust flour beetle (*T. castaneum*) showed adult emergence in all dose rates except 80 Gy and significant delay in developmental stage. Fresh adults of red rust flour beetle were also exposed to 0, 200, 400, 600 and 800 Gy of gamma radiations. A 100 percent mortality was observed when adults were treated at a dose rate of 800 Gy. From the current study it is evident that Cobalt 60 gamma radiation is effective to control all stages of the above stored grain pests.

Key words:

Study of the sustainability of potato farms in the region of Oued Souf (Southern Algeria)

Djoughri Nesrine¹, Bouammar Boualem², Dadamoussa Mohamed Lakhdar³

¹ Department of Agronomy, Faculty of Nature and Life Sciences, University of Kasdi Merbah, 30000 Ouargla, Algeria

² Department of Agronomy, Faculty of Nature and Life Sciences, University of Kasdi Merbah, 30000 Ouargla, Algeria

³ Department of Agronomy, Faculty of Nature and Life Sciences, University of Kasdi Merbah, 30000 Ouargla, Algeria

Abstract

The objective of this study is to diagnose the potato sector in the El Oued region by highlighting the technical and environmental situation of this sector. For this purpose, a field survey was carried out at the level of 75 farms in the El Oued region. The Oued Souf region's Farm Sustainability Indicator (IDEA) is important. The assessment of agro-ecological, socio-territorial and economic indicators indicates that the agro-ecological indicator is the most represented by (the indicator of fertilizer and agricultural practices) by 98 out of 100.

The results of this study show that this crop presents a good adaptation to the conditions of the region. This sector is undergoing significant development and is of great importance because this agricultural activity represents an economic potential at the local, regional and national levels. However, this sector remains fragile in relation to various constraints of a technical nature (unreasonable irrigation and fertilization and high seed prices), economic (price fluctuations and disorganized markets) and environmental (diseases, weeds) which directly influence the functioning of farms and therefore their profitability. This is why it is necessary to face the problems encountered and fight against the factors that can hinder the sustainability of this sector and give a competitive value.

Key Words: Dynamics, Potato, Sustainability ,Indicator, Oued Souf

***Sporobolus pungens* (Schreb.) Kunth physiological, biochemical and reproductive response under saline conditions.**

Marcello Dante Cerrato¹, Arnau Ribas Serra¹, Iván Cortés Fernández¹, Carles Cardona Ametller¹, Cyril Douthé³, Jaume Flexas Sans^{3,4}, Pere Miquel Mir Rosselló¹, Lorenzo Gil Vives¹, Antoni Sureda Gomila²

¹Interdisciplinary Ecology Group, Department of Biology, University of the Balearic Islands, E-07122, Palma, Balearic Islands, Spain

²CIBEROBN (Physiopathology of Obesity and Nutrition), Instituto de Salud Carlos III, E-28029, Madrid, Spain.

³Research Group on Plant Biology under Mediterranean Conditions, Departament de Biologia, Universitat de les Illes Balears (UIB) - Agro-Environmental and Water Economics Institute (INAGEA). Carretera de Valldemossa Km 7.5, 07122 Palma, Illes Balears.

⁴King Abdulaziz University, P.O. Box 80200 Jeddah 21589, Saudi Arabia.

Abstract

Sporobolus pungens (Schreb.) Kunth is a C4 grass which develops mainly in coastal areas, specifically in salt marshes and embryonic dunes. Plants potted for one year were treated for two months with different seawater (SW) dilutions (tap water, 6.25%SW, 12.5%SW, 25%SW, 50% SW and 100%SW). After the initial treatment period, gas exchange measurements and plant samples were collected for oxidative stress enzymatic activity related measurements. Salinity treatment was further maintained until flowering ended to evaluate reproductive effort. Salinity displayed lack or small physiological effect until 12.5%SW, and assimilation rate decrease in the following treatments mainly due to stomatal limitations and probable metabolic impairment. Enzymatic activity showed stable activity of Catalase (EC 1.11.1.9) and increasing activity of Glutathione peroxidase (EC 1.11.1.6) and Glutathione reductase (EC 1.8.1.7). Both Superoxidase dismutase (EC 1.15.1.1) and malondialdehyde levels increased solely at 100% SW level. Eventhough no death rate was recorded throughout the experiment, reproductive effort was depleted at low salinity levels with strong flowering delay and culm inhibition at 6.25%SW and complete inhibition in further treatments. This results indicate that *S. pungens* is capable to undergo physiological adjustments and activate different enzymatic mechanisms to tolerate high salinity, prioritising survival rate and growth over reproductive effort.

Key Words: *Sporobolus*, Salinity, ROS, Stress, Halophyte

Lethal Genetic Defects and Poor Fertility in Holstein Friesian Cattle

Yasemin Gedik¹, Habiba Mohshina¹

¹Department of Animal Science, Faculty of Agriculture, Eskisehir Osmangazi University, Eskisehir, Turkey

Abstract

Worldwide use of Holstein Friesian sires, mostly from North America, chosen exclusively for their high productive performances with a little consideration of reproduction, have resulted in an increased level of inbreeding rate, minimizing genetic variation, and lower fertility. Inbreeding raises the expression of lethal alleles, and now it is well accepted that a part of decreased fertility in Holstein cows is contributed by some lethal genetic defects. These defects have been discovered in the last decade by analyzing haplotype data of a large number of genotyped animals and designated as Holstein Haplotype (HH). Till today there are seventeen defects from HH1 through HH17 documented in Holstein cattle, although the first seven are well explained. Many of these deleterious alleles originated in some of the influential sires of Holstein history and their causative mutations were also identified. Through artificial insemination, these harmful defects are spread all over the world and are responsible for embryonic mortality mainly in the first trimester of pregnancy, causing huge economic losses. This paper aimed to discuss the lethal defects of Holstein Friesian from HH1 to HH7 and their effects on cow fertility, their prevalence in different countries, and control measures to keep the alleles frequency as low as possible among the cattle population.

Key Words: Embryonic loss, Fertility, Haplotypes, Lethal defects

Introduction

Milk is considered a popular source of animal protein, and milk production is the result of the successful reproductive performance of cows. Holstein Friesian is the largest dairy cattle breed widely distributed in more than 150 countries (FAO, 2021). The fertility of dairy cows is one of the most important determinants of sustainable dairy farming which, affects farm profitability by directly influencing milk production and herd size management, and obtaining one healthy calf per year is the main goal of a profitable dairy operation (Adams et al., 2016; Özcan and Özbeyaz, 2017). However, fertility in dairy cows is declining globally (Walsh et al., 2011; Fritz et al., 2013; Spencer et al., 2014). The conception rate of Holstein cows was 50% in 1950, which decreased to 35% in recent years, and this rate lowered to 25% in summer and autumn (Guo et al., 2020). Not only conception rate, other fertility traits such as calving interval, days open, and sire conception rate also reduced by showing an unwanted increase of these traits reported in different times (Rodriguez-Martinez et al., 2008; Spencer et al., 2014). A plethora of factors such as increased milk production per cow, growing herd size, extensive use of confinement housing, labor shortages, global warming, and higher inbreeding percentages are all regarded as responsible for this decrease (Lucy, 2001; Walsh et al., 2011; Zahedi et al., 2021). Heritability of fertility is low, accounting for 1 to 10 percent, meaning that genetics have a low effect on fertility traits (Spencer et al., 2014). However, when considering the total decline patterns, it is clear that genetics has a role in it (Spencer et al., 2014). Now, it is well accepted that some lethal genes are linked with reduced reproductive performances of dairy breeds, especially in Holstein Friesian (Fritz et al., 2013).

Worldwide use of Holstein Friesian sires, mainly from North America, intensively chosen for production traits, have resulted in an increased level of inbreeding rate and minimizing genetic variation (Briano-Rodriguez et al., 2021). One great example of the current inbreeding level in the USA Holstein is that almost nine million dairy cows are descendants of two bulls, one is Pawnee Farm Arlinda Chief and, another one is Round Oak Rag Apple Elevation, both born in the 1960s and each one is related to around half of the current bulls (Yue et al., 2015). In the USA, the inbreeding coefficient is currently at 8%, which means that an average calf receives identical copies of 8% of its genes from parents, and it is increasing by 0.3 or 0.4 each year (Undark, 2019). Another reason behind higher inbreeding is that modern animal breeding use genomic selection which increases genetic gain more than progeny testing and allows bulls to evaluate in a very early stage, causing shorter generation interval. Thus, genomic selection ultimately results in increased annual inbreeding rates and large homozygous segments of chromosomes surrounding QTL (quantitative trait locus) in the selected population (Pryce et al., 2012; Scott et al., 2021). Fertility and milk yield are inversely correlated and, Ma et al. (2019) revealed that genetic selection for milk production resulted in genome modifications of cattle that negatively affect fertility and disease resistance genes, resulting in lower fertility in Holstein cattle since 1964. Animals are more likely to inherit two copies of harmful recessive alleles among breeding of closely related individuals, which could lead to major health problems (Adams et al., 2016; Undark, 2019). Similarly, inbreeding raises the expression of lethal and semi-lethal alleles

(Fritz et al., 2013). Naturally, every animal carries some recessive harmful alleles without showing any negative impact but, when one specific animal is used for breeding in large numbers over generations, lethal alleles they carry come in front. Some of the influential sires in the dairy industry's history have been found to carry mutations that influence fertility and spread quickly through artificial insemination (AI) (Adams et al., 2016). In recent years, a substantial number of lethal and semi-lethal alleles in Holsteins have been identified around the world, responsible for embryonic or fetal mortality, stillbirth, and deformed or immunosuppressed calves like bovine leukocyte adhesion deficiency (BLAD), deficiency of uridine monophosphate synthase (DUMPS), brachyspina (BY), complex vertebral malformation (CVM), citrullinemia (CI), cholesterol deficiency haplotype (CDH), and different Holstein-Friesian haplotypes (Fritz et al., 2013; Briano-Rodriguez et al., 2021; OMIA, 2021). Because all these alleles are recessive and phenotypically expressed only when homozygous, the problem is only perceived when the gene frequency is high and the allele has already been fixed at the population level (Zhang et al., 2020; Briano-Rodriguez et al., 2021).

Large numbers of animals genotyped from different dairy breeds in the USA by using commercially available genome-wide single nucleotide polymorphism (SNP) panels has allowed researchers to identify genome sections with disequilibrium Mendelian inheritance, could be linked to lethality (VanRaden et al., 2011a; McClure et al., 2014). These chromosomal regions are called haplotypes and included in genomic information from August 2011 by breeding companies (VanRaden et al., 2011b). Identified haplotypes showed a high population frequency but had a deficit of homozygous condition (VanRaden et al., 2011a). Primarily five haplotypes were reported in three dairy breeds, three in the Holstein (HH1, HH2, HH3), one in the Jersey (JH1), and in the Brown Swiss (BH1). Scientists adopted a specific method to designate them sequentially for each breed, where the first letter is the breed's name, followed by an "H" for haplotype (VanRaden et al., 2011a). These haplotypes were associated with early embryonic loss and reduced calf survivability, which leads to severe financial losses (Cole et al., 2016; Segelke et al., 2016). After identifying lethal haplotypes, further research aimed to mark out causative polymorphisms and then examine those mutations found in the haplotype region that might impair usual gene functions crucial in the embryonic stages (McClure et al., 2014). Eventually, researchers discovered actual mutations in the succeeding years and established them as genetic defects. Following the same method of VanRaden et al. (2011a), a long list of haplotype sourced defects identified from HH4 through HH17 in Holstein and other different haplotypes in the other breeds (Fritz et al., 2013; Cooper et al., 2014; Cole et al., 2018; Wu et al., 2020). In general, recessive defects were identified by examining affected calves or occasional abortion but in the case of early embryonic mortality, knowing the genetic structure of animals is the only way to discover that lethal recessive. Therefore, for the control and elimination of such defects, screening the heterozygous carrier animals based on genotyping is a prerequisite (VanRaden et al., 2011a). Existing immense improvement in genomics made it possible to genotype animals quickly at a low cost (Berry et al., 2014; Spencer et al., 2014). When large numbers of genotype data of animals are available, it is simple to identify lethal haplotypes with a lower frequency, and the regular increase in genotyping databases will lead to the identification of new deleterious haplotypes segregating at low frequencies (Hozé et al., 2020).

Almost 25% of genes in mammals are functional genes, and mutations in one of these genes can lead to lethality (Charlier et al., 2016). In lethality, mutations that occur in the gene are essential for survival carried out by a loss-of-function (LOF) mutation. So homozygous carriers of these mutations die in the embryonic stages and affect both male and female fertility (Taylor et al., 2018). Due to embryo loss in early pregnancy, lethal alleles are naturally decreasing in population-level in every generation. However, some lethal alleles can be frequent at the population level if the founder of the alleles is a popular breeding bull used in AI, which sires many daughters and subsequently produces many granddaughters and great-granddaughters (Cole et al., 2016; Taylor et al., 2018). Taylor et al. (2018) reported that the frequency of the lethal allele in the current cattle population is 3.8 %, and this is for extensive use of elite sires worldwide. They also pointed out that Holsteins have 17 lethal alleles, the highest among three breeds, whereas Jersey, Brown Swiss, and Ayrshire have 3, 2, and 1 allele, respectively. Interestingly, the average frequency of lethal alleles in Holsteins is 2.4% which is much lower than Jersey (6.66%), Brown Swiss (7.23%), and Ayrshire (11.4%). The reason behind this is, Holstein breed has more bulls used in AI than other breeds and, many genotypes are available, allowing enrichment of lethal loci in the breed, although at lower frequencies (Taylor et al., 2018).

This review paper aimed to discuss the lethal defects of Holstein Friesian from HH1 to HH7 and their effects on cow fertility, their prevalence in different regions and ways to fight with them without minimizing productivity in the Holstein population.

Sources or Earliest Genotyped Bulls of Lethal Haplotypes

Lethal defects of fertility in Holstein Friesian found in some prolific bulls of America, Canada, and France, born within the last seventy years. Primary sources or the earliest carriers of haplotypes were traced by four generations of ancestry analysis (VanRaden et al., 2011b). The USA originated bulls Pawnee Farm Arlinda Chief (Chief) (1962), Gray View Skyliner (1954), and Mountain (1987) were found as the earliest founders of deleterious alleles

HH1, HH3, and HH6, respectively (VanRaden et al., 2011b; Fritz et al., 2018). Prominent sires of Canada named Willowholme Mark Anthony (1974) and Thornlea Texal Supreme (1957) known as the founder of HH2 and HH5 in orderly (VanRaden et al., 2011b; Cole et al., 2016). Another defect HH4 identified in a France bull named Besne Buck was born in 1986 (Cole et al., 2016). In the case of HH7, instead of a single ancestor, three bulls, two are of USA origin, named Secret (1980) and Dutch Boy (1996), and one of France's bulls, Merdrignac (1996), were indicated as the carrier (Hozé et al., 2020). These bulls served as a source of currently prevalent Holstein haplotypes in the last fifty years, produced a significant number of daughters directly, and were used not only in the country of origin but also in other countries (Cole et al., 2016).

Location of Haplotypes in *Bos taurus* Autosome (BTA) and Molecular Basis of Mutation

Holstein haplotype 1, 2, and 3 spanned in 62-68 Mbp, 93-96 Mbp, and 92-97 Mbp intervals on the cattle autosomes 5, 1, and 8, respectively (VanRaden et al., 2011b). Further investigation reduced the mapped areas and mutations underlying fertility identified in HH1 and HH3. In HH1, VanRaden et al. (2011b) identified the earliest genotyped ancestor Chief, and in 2016 a nonsense mutation in apoptotic peptide activating factor 1 (APAF) gene was identified in reported chromosome interval by whole genome sequencing of Chief and three of his famous sons (Adams et al., 2016). McClure et al. (2014) searched for the location of HH2 and narrowed the area from 94.8 to 96 Mbp (1.7Mbp) but found no possibly causative mutation by using exome capture and next-generation sequencing method. However, a missense mutation in the exon 24 of the Structural Maintenance of Chromosomes 2 (SMC2) gene was found for HH3 in the same study (McClure et al., 2014). Including HH4, a total of seventeen haplotypes were identified in the French cattle population by examining Bovine 50k Beadchip genotype data implying the similar methods of VanRaden et al. (2011a) (Fritz et al., 2013). HH4 was specified in the 1.9-3.3Mb region of chromosome 1 and identified a missense mutation in the glycinamide ribonucleotide transformylase (GART) gene by Fritz et al. (2013). HH5 was identified by Cooper et al. (2014), and the genomic region was found in 91.8–93.8 Mbp on BTA9. Finally, Schütz et al. (2016) identified a 138kb deletion from 93.233Mb to 93.371Mbp containing the dimethyl-adenosine transferase 1 (TFB1M) gene as the likely causative locus. HH6 was discovered after examining Illumina BovineSNP50 genotyping data in the French genomic evaluation database and mapped to a 1.1Mb region on chromosome 16 and identified a mutation in the telomere maintenance homolog (SDE2) gene (Fritz et al., 2018). HH7 was recently reported from French genomic data analysis and identified its location in chromosome 27 within intervals of 13.0-14.4Mbp and reported a four-base deletion in the centromere protein U (CENPU) gene (Hozé et al., 2020).

Mutations and Lethality

The early embryonic losses due to mutations can be explained by the functional study of the affected genes, and one mutation may lead to lethality if it occurs in any functional gene of cattle (Adams et al., 2016; Charlier et al., 2016). Mutation in HH1 changes the CAA sequence of exon 11 to stop codon TAA (g.63150400 C→T) at position 579 in the polypeptide, cut off 670 C-terminal amino acids (53.7%) from the 1248 amino acid long APAF1 protein with a WD40 domain (Adams et al., 2016). Proteins involved in apoptosis, signal transduction, and transcriptional regulation contain the WD40 domain. Moreover, APAF1 encoded protein is an important component of the cytochrome-c-mediated apoptotic cascade and has been connected to developmental and neurodegenerative disorders. APAF1 mutated cattle embryo aborts at an early age, probably for acute abnormalities in brain overgrowth, the persistence of interdigital webs, and craniofacial malformation (Adams et al., 2016).

Mutation in HH3 is the result of T to C conversion at g.95410507 number base sequence inside exon 24 of the SMC2 gene, which alters phenylalanine to serine, creating a substitution in the NTPase domain in the final protein product (McClure et al., 2014). SMC2 has a critical role in DNA repair, chromosomal condensation, and segregation during cell division. The ability of a mutated homozygous SMC2 carrier to hydrolyze ATP is highly attenuated, resulting in attenuated condensin activity, which eventually leads to chromosome structural abnormalities (McClure et al., 2014).

The point mutation in the case of HH4 in GART gene involves A to C transversion at g.1277227 base position, which changes amino acid asparagine to threonine in the manganese binding site of the protein (Fritz et al., 2013). This protein is completely conserved across all eukaryotes and is essential for the primary synthesis of purines, which are important elements of hereditary molecules. An embryo without GART function is likely to result in death during the early stages of development because of the inability to synthesize nucleic acid (Fritz et al., 2013). A 138kb deletion in HH5 contains the TFB1M gene (Schütz et al., 2016). The main role of TFB1M is the dimethylation of adenine residues which appears to be critical for biosynthesis and function of the small ribosomal subunit. The loss of gene function destabilizes ribosomes, causing mitochondrial protein translation to cease. Lack of protein translation in mitochondria, cell-specific knockdown verified a severe fatal effect on mammalian cells (Schütz et al., 2016).

Change of A to G (g.29773628) alters an initial codon in the nucleotide sequence of the SDE2 gene in HH6 (Fritz et al., 2018). This mutation results in the deactivation of gene function and loss of the whole 83 amino acids long protein. SDE2 protein is required for genomic stability and cell cycle regulation, and a deficit in SDE2 protein could result in embryo lethality after several cell divisions (Fritz et al., 2018).

HH7 is a result of 4bp deletion from nucleotide g.14168130 to 14168133 (TACT) in the CENPU gene, and the resulting mutation alters the splicing of the gene (Hozé et al., 2020). CENPU is a centromere component essential for proper chromosome segregation during mitosis. Aberration in the CENPU gene in human and mice show mitotic defects and lethality, respectively (Hozé et al., 2020).

Lower Fertility Due to Lethal Defects

Fertility loss due to recessive lethal defects of Holstein cattle was measured by comparing normal mating and at-risk mating (between a carrier sire and daughter of carrier sire) (VanRaden et al., 2011b; Fritz et al., 2013; Fritz et al., 2018; Hozé et al., 2020). Negative effects of lethal haplotypes on the conception rate of cows were reported at a rate of 3 to 3.5% on average, although these rates are higher in heifers than cows (VanRaden et al., 2011b; Fritz et al., 2013; Schütz et al., 2016; Fritz et al., 2018; Hozé et al., 2020). Days of abortion are linked with genes affected by the mutation. If a mutation occurs in a gene essential from a very early stage of embryonic life, the carrier embryo will die in that stage. Abortion occurs before 60 days in the case of HH3, HH4, HH5, HH6, and HH7 (Fritz et al., 2013; McClure et al., 2014; Fritz et al., 2018; Hozé et al., 2020). Homozygous embryos of HH1 and HH2 die within 60 to 200 days and before 100 days of pregnancy, respectively (VanRaden et al., 2011b; Adams et al., 2016). Besides abortion, HH2, HH3, and HH5 were also reported with a small number of stillbirths (VanRaden et al., 2011b; Cooper et al., 2014; McClure et al., 2014).

The cost for a specific defect depends on carrier frequency and time of the abortion. Economic loss due to recessive haplotype was estimated at 7.5 million US dollars in the American dairy industry (Cole et al., 2016). Estimated spontaneous abortion due to HH1 is approximately 140,000 and 525,000 in the USA and all over the world, respectively, and account for a \$420 million loss in total (Adams et al., 2016).

Status of Deleterious Haplotypes in Different Countries

In the beginning, commercial SNP genotyping was used to detect haplotypes. Currently, besides genotyping, scientists have developed other PCR-based molecular techniques for specific lethal alleles such as Kompetitive allele-specific PCR (KASP), PCR primer induced restriction analysis (PIRA), and PCR-Restriction Fragment Length Polymorphism (PCR-RFLP) (Khatib et al., 2020; Kumar et al., 2020; Khan et al., 2021). Newly developed techniques can use at the farm level in carrier screening and, many countries started to screen their cattle population for the presence of these lethal defects. Newly identified defects are breed-specific and, Holstein haplotypes were found only in pure Holstein and its crossbreed (Khatib et al., 2020; Kumar et al., 2020). Earlier data shows significantly higher haplotype frequencies. However, ten years of reporting indicates frequency rates are declining in the USA, Germany, and France. These trends can be explained by the direct selection against haplotypes implemented by breeding companies. For example, in 2011a, VanRaden et al. reported haplotype frequency as 2.25%, 2.3%, and 2.35% in HH1, HH2, and HH3, respectively. However, in 2016, Cole et al. reported HH1 frequency as 1.92%, but in the report of 2018, this rate showed 1.28% in the USA genomic evaluation system (Cole et al., 2018). The same patterns were observed in HH2 and HH3, where frequency rates declined from 1.66% to 1.21%, and 2.95% to 2.64% in orderly (Cole et al., 2016; Cole et al., 2018). Haplotype frequencies were also decreased in other cases, and the current status of HH4, HH5, and HH6 indicate 0.23%, 2.39%, and 0.44% (Cole et al., 2018). HH3 and HH4 showed a haplotype frequency of more than 3%, whereas other defects HH1, HH5, HH6, and HH7 indicated a frequency lower than 2% among the French Holstein cattle population reported in 2020 (Hozé et al., 2020). Lethal haplotype frequencies were below 2% in HH1 and HH2 however, HH3, HH4, and HH5 showed a substantially higher frequency (HH3 - 5.1, HH4 - 4, HH5 - 5.5) in German cattle (Schütz et al., 2016). Russian Black and White cattle is a crossbreed composed of local cattle and Dutch Holstein cattle and, a study reported that fertility haplotypes were spread there in various percentages. The results showed mutant allele frequencies as 1.48%, 0.49%, 1.44%, 0.57%, and 1.12% in the HH1, HH2, HH3, HH4, and HH5, respectively (Khatib et al., 2020). The carrier frequency of six haplotypes were 3.24, 2.64, 5.27, 1.10, 6.88, and 0.72 percent in HH1 through HH6, respectively, in the Italian Holstein population (Intermizoo, 2021). HH1 carrier frequency in Japan was reported 2.9% in cows and 33.3% in mummified fetuses although, HH1 homozygous fetuses were not found (Ghanem et al., 2018). The carrier frequency for HH1 (4.44%) and HH3 (3.13%) is comparatively higher in Uruguay but lower in the case of HH4 (1.04%) and HH5 (0.26%) (Briano-Rodriguez et al., 2021). Each of the three carrier frequencies is reported as 3.34% in HH1, HH3, and HH4 in Indian Holstein Friesian bulls (Kumar et al., 2020). The carrier percentages indicated 6.92%, 5.76%, 4.30%, and 1.84% for HH1, HH3, HH5, HH6, respectively, in the Chinese Holstein cattle population (Khan et al., 2021). HH1, HH3, HH4, and HH5 are widely

distributed in a higher percentage in the current cattle population. The haplotype frequencies vary from country to country because some founder bulls are more used in one region than others.

Solutions

Avoiding carrier to carrier mating is a simple way for improving fertility, but an increasing number of identified defects make it difficult to conduct (Taylor et al., 2018). Management of haplotypes with lower frequencies like HH2, HH6, and HH7 is relatively easy by avoiding carrier mating and gradually reducing the number of carriers among breeding bulls (Hozé et al., 2020). One method described by Pryce to manage inbreeding uses a genomic relationship matrix (GRM) to reduce progeny inbreeding, resulting in lower homozygous SNP and around 1% decrease in inbreeding with minimal loss of overall breeding objectives (Pryce et al., 2012). Cole, (2015) proposed an alternative approach in which individuals' estimated genetic merits for net merit are adjusted for economic losses due to fetal losses. This method is effective in reducing recessive lethal alleles while maintaining current rates of genetic improvement. Dairy farmers are unlikely to avoid using carriers, therefore lethal alleles must be included in selection processes to keep their frequencies low (Cole et al., 2016). A heterozygous carrier animal can be used for breeding if its favorable alleles can overcome its losses due to lethal alleles, however, carrier bulls can be generally avoided (Cole et al., 2016). Segelke et al. (2016) proposed that balancing selection for (or against) specific alleles with genetic gain can be achieved by selecting cows on an index that includes haplotypes of interest and bulls on breeding values. Genome editing technologies such as zinc finger nucleases (ZFN), clustered regularly interspaced short palindromic repeats (CRISPR), and transcription activator-like effector nucleases (TALEN) can be used to remove deleterious alleles from the genome of the carrier breeding bulls, which impact fertility (Hickey et al., 2016).

Conclusion

Modern cattle breeding practices have brought a huge improvement in the dairy cattle industry since the last century however, over time, these results in some inevitable negative effects. We suggest that screening breeding animals, especially, bulls are crucial, and considering these defects in breeding policies of all countries is urgent. One of the most important solutions will be to increase the breed diversity and select breeding animals from a wide range of populations and ultimately work not only for production but also for environmentally sustainable farming. Before adopting techniques, like genome editing, detailed studies are indispensable for further unwanted damage on the cattle population.

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ITS based characterization of Fusarium isolates collected from chickpea core areas and screening for resistant plant genotypes

Kinza Ahsan, Saman Shahzadi, Iram Khalid, Sobia Shaukat, Waqar Akram, Muhammad Amjad Ali, Amjad Abbas*

*corresponding author: amjad.abbas@uaf.edu.pk

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

The chickpea (*Cicer arietinum* L.) is a globally important and valued crop. It is an annual legume of the family Fabaceae, subfamily Faboideae. In India, Pakistan, Turkey, Myanmar, and Ethiopia, it is a commonly produced legume crop in tropical, sub-tropical, and temperate climates. It stands out from other pulses due to its high protein, minerals, unsaturated fatty acids, fibre, and β -carotene content. Its production is threatened by a number of devastating fungal infections. Chickpeas account for 18 percent of global grain legume production and are an important source of dietary protein. The crop is favored in the rain-fed parts of Punjab province's Thal regions with marginal soils because to its low water requirements. Moisture is essential during the germination and pod development stages, and rain provide it. The crop is affected by a large range of biotic and abiotic stresses. Various fungal, bacterial, and viral diseases affect the chickpea crop. Fusarium causes chickpea wilt, which is the most prevalent soil-borne fungus that affects chickpeas all over the world. Under ideal conditions, the Fusarium wilt disease can completely destroy crops, resulting in a 100 percent loss in densely affected regions. Plants with common wilt symptoms include drooping petioles and rachis, as well as leaflet drooping. Drooping begins in the upper parts of plants, but within 24 to 48 hours, the entire plant has been impacted. Wilted plant samples were collected throughout the seedling and pod development stages in the districts of Layyah, Jhang, and Bhakkar, which account for over 80% of the national yield. On water agar and PDA media plates, a fungus related with wilt was identified. DNA was extracted from pure isolates and used to determine diversity using the 18S ribosomal gene amplification method. For the amplification of the targeted product, an ITS1 and ITS4 primer pair was utilized. Seeds of 33 different species of chickpeas were collected from the University of Agriculture Faisalabad's CAS (Center for Advanced Studies) and seeded in the field using the RCBD design. Chickpea samples were also collected for molecular characterization of Foc in the districts of Bhakkar, Jhang, and Layyah. For each of the cultivated plants, several physiological data were calculated.

Key words: Symptoms, Devastating, Legume.

Selection of suitable chemicals through *in-vitro* assay to better manage Potato Scab Disease under storage

Waqar Akram, Muhammad Usman Aslam, Muhammad Abdullah Saleem, Abid Shehzad, Kinza Ahsan, Muhammad Amjad Ali, Amjad Abbas*

*corresponding author: amjad.abbas@uaf.edu.pk

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

Potato plays a crucial role in local food system and its cultivation is well suited in the environmental conditions where other crops may fail to persist. However, this crop is prone to become victim of many diseases among of which Common scab of Potato carries significant importance. The objectives of the present study were to outline the incidence of Common scab of potato in different nearby regions of Okara in addition to its management by testing the efficacy of various chemicals. Isolation, identification, and purification of the pathogen causing common scab of potato was carried out after the sampling of scabbed tubers from disease infected soils accompanied with pathogenicity test. *In-vitro* experiment was conducted to evaluate the effectiveness of Ampicillin Kanamycin and chloramphenicol against *Streptomyces scabies* causing common scab of potato disease. Ampicillin showed best result against *Streptomyces scabies*. In plant extract we were used *Azadirachta indica* (Neem), *Cichorium incubus* (Kasni), *Parthenium hysterophorus* (Gajar boti) and *Trachyspermum ammi* (Ajwain) against *Streptomyces scabies* causing common scab of potato disease. *Cichorium incubus* (Kasni) showed best result against *Streptomyces scabies*.

Key words: *Streptomyces scabies*, Ampicillin, Pathogenicity

Optimization of vermicomposting of sugarcane bagasse, trash, molasses and farm yard manure and their impact on wheat (*Triticum aestivum* L.)

Wajeeh Ur Rehman^{2*}, Muhammad Sajjad², Mamoonah Jamil³, Mehwish Nadeem⁴, Waqar Akram¹,
Muhammad Abdullah Saleem², Abid Shehzad², Muhammad Yousuf Aazaz¹

*corresponding author: Wajeeh.qurashi2833@gmail.com

¹Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

²Department of Agronomy, University of Agriculture, Faisalabad, Pakistan

³CABB, University of Agriculture, Faisalabad, Pakistan

⁴Department of Plant Sciences, University of Quaid e Azam, Pakistan

Abstract

Sugarcane (*Saccharum officinarum* L.) residue management is a serious concern in Pakistan. Vermicomposting provides solution to this and transforms these residues into nutrient-rich organic fertilizer (vermicompost). Vermicompost improves soil physical and chemical properties and increase nutrients availability to the plants. Wheat (*Triticum aestivum* L.) is a cereal crop and rich carbohydrate source. Wheat production can be enhanced by vermicompost application which improves soil fertility and nutrient's availability. Therefore, a pot experiment was conducted to prepare vermicompost from sugarcane trash, sugarcane bagasse, molasses, and farmyard manure (FYM) to evaluate its effects on wheat growth during Rabi 2020-21 at Student Research Farm, University of Agriculture, Faisalabad. Current experiment was carried out by using a completely randomized design (CRD), with seven treatments, and three replications. Treatments consisted of the use of vermicompost prepared from Farmyard manure (100%), Sugarcane Bagasse (100%), Sugarcane Trash (100%), Molasses (100%), Farmyard Manure (50%) + Sugarcane Bagasse (50%), Farmyard Manure (50%) + Sugarcane Trash (50%), and Sugarcane Bagasse (25%) + Sugarcane Trash (25%) + Farmyard Manure (25%)+Molasses (25%) and were applied @ 5t/ha. Parameters related to wheat yield and yield-related attributes were taken. Analysis of Variance technique and differences among treatment means was compared by using Least Significant difference (LSD) test at 5% probability level. Present study was helpful for screening the best vermicompost levels that can improve soil fertility and plant growth.

Key words: Vermicompost, Farmyard manure, chemical properties.

Development of a simple adaptable tractor-mounted rotary slasher

Sunday Emmanuel Kayode^{1*}, Bayode Julius Olorunfemi ²

^{*}Department of Agricultural and Bio-resources Engineering, Federal University, oye-ekiti, Akure, Nigeria,

²Department of Mechanical Engineering, Federal University Oye- Ekiti, Oye, Nigeria

Abstract

Developing a simple adaptable tractor mounted rotary slasher solves high cost of keeping lawn grass low and uneven cutting of lawn grasses. It was designed to be a simple, easy to operate, maintain and power by a tractor with little cost of production. The machine comprises of the frame to protect the blade and provide seat for gearbox, side-skid adds to the firmness, angular bar provides balancing during operations, hitches, three point of linkages provides lifting and lowering during transportation and operation of the machine, blade provides fine grass cut, pin, guard chain and gearbox transmits and increases motion from the PTO of the tractor to the blade for uniform cutting of grasses. The machine was tested on the lawn on three difference types of grasses (Elephant grass, Bonnie grasses and Bermuda grasses) at different forward speed of operation (1, 1.5, 2, 2.5 and 3 mph respectively). The average moisture content of the grasses was 70.1% (elephant Grass), 60% (Bermuda grass) and 66.3% (Bonnie grass) at wet bases. The mean cutting efficiency of the implement on elephant grass at 1 mph, 1.5 mph, 2mph, 2.5mph and 3mph were 40.9%, 52.0%, 59.4%, 71.3% and 87.2% respectively. The mean cutting efficiency of the implement on Bermuda grasses at 1 mph, 1.5mph, 2mph, 2.5mph and 3mh was 44.5%, 52.6%, 61.9%, 70.9% and 85.7% respectively. The mean cutting efficiency of the implement on Bonnie grass at 1 mph, 1.5mph, 2mph, 2.5mph and 3mph was 43.5%, 53%, 62.3%, 70.4% and 82.8% respectively. Mean cutting efficiency of the implement on the grass at 1 mph was 52.2%, at 1.5 mph was 55.9%, at 2 mph was 60%, at 2.5 mph was 70.3% and 89.3% at 3 mph respectively. The result of mean cutting efficiency and efficiency of the implement shows that the implement is more effective and efficient at high cutting speed (3 mph). The cutting depth and width of the blade is 20 mm and 1000 mm respectively

Key Words: lawn-grasses; gear-box; cutting efficiency, cutting blade, efficiency

Introduction

The aesthetic value of man environment is as important as food and shelter. Grasses are known to survive and grow in a variety of conditions and hence there is need to keep their growth to the nearest minimum to enhance the beauty and safety of our habitat (Basil, 2013). A weed is any plant considered undesirable. They are commonly unwanted plant in human-control setting such as farm, fields, gardens, lawns, and parks. Weeds have no botanical classification value since a plant that is a weed in one context is not a weed when growing where it is wanted. A number of plants that many considered weed are often intentionally grown in gardens and other cultivated settings. The term 'weed' is also applied to any plant that grown or reproduces aggressively, or outside its native habitat (Basil, 2013).

Weeds have many attributes undesirable to crop producers, controlling of weed has been the major problem in agronomy, effective and sustaining method to control weed has not been sufficiently available in the past years. Though several methods have been implemented but did not give the significant solution to the problem as they have significant effect on the soil and costly for farmers. The effect of weed on the land includes, competing for food with the crops and serve as hidden place for crop pest and dangerous animals. Though they contribute to the organic content of the soil, but the harm cause is more than their positive effects on the crop. Hence there is need for them to be controlled so as allow better growth condition for crops, and for the beauty of lawn (Farsaniet *al.*, 2012).

Transformation in intellect has made grass cutting into an inescapable and unavoidable art. As technology advanced grass cutting techniques developed from the use of human labour to the machines, that is, use of hoes, machete and cutlasses to motorized grass cutter (Henry *et al.*, 2000). Technology had continued to advance and better techniques of grass cutting has been invented and constantly improved upon. This gave birth to the invention of tractor-mounted rotary slasher (Vance, 1996). Tractor-mounted rotary slasher or mower is a sturdy implement which is most suitable for slashing pasture topping and shrubs. It also very well suffices the purpose of maintaining grassland, roads verge and lawn. A lawn is any area of grass, mostly tough grass which is neatly cut like in a private garden or a public park (Basil, 2013).

There are primarily two types of mowers (Md.Akhir, 2010). namely the reel mowers and rotary mowers. The reel (cylindrical) mowers seem to be better. Made of blades on a revolving cylinder, they achieve clean cut by scissors action. As the mower moves forward, the rotating blades come in contact with a stationary bar called the bed knife and placed parallel to the ground. Grass is held by the shearing action of the reel blades against the bed knife. The

mower is adjusted to various cutting heights. Rotary mowers are often powered either by an internal combustion engine or an electric motor and are generally moved manually, with the engine only spinning the cutting blades (Khurmi and Gupta, 2003). Basil (2013) reported Reel mower as the first lawn mowers which were manually operated, it is also known as cylinder mowers. The wheel would spin a cylinder of sharpened, grass-cutting blades when pushed. Shippen (1980) asserted that rotating-disc mowers consist of cutting mechanism in a rotating disc mower is that a knife edge, travelling at high speed, cut through the grass on impact. Flail mowers are mowers that are trailed on off-set hitches behind the tractor and consist of a horizontal rotor (Khurmi and Gupta, 2003). Self-propelled mowers generate power from within, and their motion or movement is also enhanced from within. Example includes self-propelled rotating disc mowers, Self-propelled Nylon cord mowers (Traynor, 2005). Tractor-mounted mowers or slashers are mounted at the back of the tractor and they are powered by PTO shaft of the tractor and lifted through the three-point linkages. They are advanced type of hand pushed mowers. The stones hit by rotating blade can be dangerous to the operator and the scattering of the slashed grasses are the major disadvantages of this machine. Hence this can be corrected (Ameret *et al.*, 2011; Khurmi and Gupta, 2005). There is need for locally made implements that will provide adequate and efficient means of removing weeds with little or no effect on soil, and also saves time and energy with low cost involve. Tractor-mounted rotary slasher was designed to these criteria with local material. It works on the same principle with rotary hover mower. It is mounted on the tractor through three-point linkages and power is transmitted through the PTO shaft of the tractor. It is readily available at low cost.

Materials and Methods

Design considerations

The following factors were considered to design tractor-mounted rotary slasher; simple in design: hence it is easily understood and operated, implement with a moderate shaft, implement should be able to cut at desired level, implement adaptability to local conditions, Implement rigidity to overcome any obstruction such as stones, rocks encountered during cutting operation, implement made with readily available local materials, The implement should be able to cut grass at desired level, be easier to operate and maintain, and be relatively affordable (Donald *et al.*, 2001).

Design concept

The mechanism of cutting was conceptualized from the use of manual technique of weeding (use of cutlass). The design requirements for choosing weeding and cutting mechanism were:

- An effective weeding and cutting mechanism should be able to cut grass at desired level
- The cutting width should be wide enough to save time of operation (Heiselet *et al.*, 2002; Jorge *et al.*, 2009).

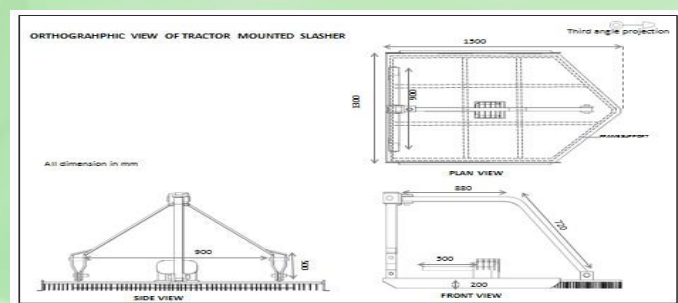


Figure 1. Orthogonal view of the Tractor-mounted rotary slasher

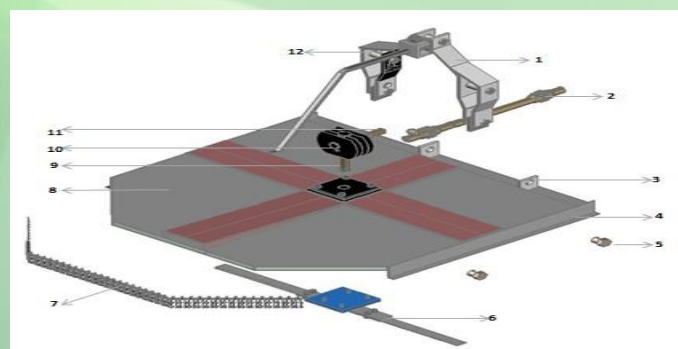


Figure 2. Exploded view of Tractor-mounted rotary slasher

Table 1. Component parts of Tractor- mounted rotary slasher

S/No	Item	Quantity	S/No	Item	Quantity
1.	Three Point Linkage	1	7.	Safety Chain Shield	1
2.	PTO Shaft	1	8.	Main Frame	1
3.	Hitch	2	9	Transmission Shaft	1
4	Side Skid	1	10	Gear Box	1
5.	Nut	4	11	Driving Shaft	1
6.	Cutting Blade	2	12	Pin	5

Component design

The tractor mounted rotary slasher majorly consists of the cutting blade that does the slashing or cutting. it uses the rotational motion of the blades to shear the grasses leaving an average cutting height of 20 mm. the major component of the tractor mounted rotary slasher are cutting blade, frame, hitches, side skids, three point linkages, gearbox, shafts, angular bar and pin. It used rotary motion from the PTO of tractor which is transmitted from the tractor through the universal coupler to the gearbox. The gear transfers rotary motion to the cutting blades which cuts the grasses. Main parts are as described below.

The frame was made of flat plate mild steel with thickness of 3 mm. With the aid of steel rule and scribe, the correct measurements of the angle iron and mild steel were marked out and cut out using cutting disc. The mild steel plate was guarded by angle iron of thickness 5 mm to enhance the rigidity and strength of the frame. The frame has height of 5 mm, length of 1500 mm and width of 1200 mm. the frame was tapered at 500 mm and 400 mm in both ends to form trapezium shape. Point of sit was made for gear box and blade shaft at the centre of the frame.

The cutting blade was made of high carbon steel which was sharpened at both sides to give two sharp edges for efficient cutting. It has a length of 1000 mm, width of 70 mm and thickness of 6mm. the cutting blade was fastened at the centre to the vertical shaft by means of bolt and nut leaving a length 500 mm to each side. The clearance between the ground and he cutting blade is 20 mm which is the maximum height of cut

Side skid was made of mild steel of 3 mm. it has height of 20 mm and length of 1300 mm. it is guarded by angle iron of 2 mm to add to the strength and firmness of the whole implement.

Hitches were made of high carbon steel of 10 mm thickness; it is square in shape and 75 mm at both sides. Hole of 30 mm was drilled at the centre of the plate to provide access for 30 mm rod used as pin. Hitches were welded to the frame for easy sitting of the three point linkages and angular bar.

Three point linkages provide point of connection to the top and lower links of tractor for easy lifting and carrying during work and transportation. It was made of high carbon steel with good ductility and malleability properties. It has two legs with each leg of length 17 00mm. hole of 30 mm was drilled at the top and lower end of the leg to provide link for pin (rod) for easy attachment to the hitches. Three point linkages were bent to required length at each segment by supplying heat before hammering to required angle.

Pins were made from iron rod of thickness 30 mm with each height of 80mm. the pins holds each components together and fastened at the end with bolt and nut.

Angular bar was made of 4 mm rectangular iron hollow pipe of thickness 4mm. and length of 1700 mm. the rectangular iron bar was attached to the top link of the three point linkages and also fastened at the end to the middle of the later part of the frame to provide balancing for the implement.

The universal coupler was used in transmitting power from the tractor to the implement via PTO shaft.

Gearbox is a boughtout component. It increases the speed coming from PTO shaft by the ratio of 1:2.

Operation principles

Tractor-mounted rotary slasher uses rotary motion from the PTO of tractor which is transmitted through the universal coupler (transmission device) to the gearbox. The gear transmits and increases the rotary motion to the cutting blades which cuts the grasses.

Design analysis

The shearing force of most annual and perennial grasses found on most lawns is usually between 9.2N ~ 13.51N (Young and Chow, 1991). Force required by cutting blade to shear the grass is given by;

$$F = T/R \quad (1)$$

Where

T = Shaft torque;

R = Radius of cutting blade but shaft torque is given by Khurmi and Gupta, 2003) as;

$$T = P/2\pi N \quad (2)$$

Where

P = Power developed by shaft;

T = Torque required; and

N = Shaft speed in Rev/min

Specifications of the selected gearbox

The type of the selected gearbox was the two ways gearbox, that is, it can be used as speed reduces and speed increasing. (Weight = 23g)

The gear was selected base in the following conditions; the speed from the tractor PTO shaft (output speed) was 540rpm and the speed required by the blade to shear the grass must be greater than the output speed (540rpm produced) by 6-spline PTO shaft tractor; hence speed increasing Gear was preferred and used.

Gear of ratio 1:2 (speed increasing Gear) was preferred and used

Therefore, Gear ratio equation is given by (Khurmi and Gupta, 2005). as;

$$\frac{N_1}{N_2} = \frac{T_1}{T_2} \quad (3)$$

Where,

N₁ = speed of the PTO shaft in rpm.

N₂ = speed of the blade shaft in rpm.

T₁ = ratio of the drive gear,

T₂=ratio of the driven gear

$$\frac{N_1}{N_2} = \frac{T_1}{T_2}, \text{ Where, } \frac{T_1}{T_2} = \frac{1}{2} = \frac{540}{N_2} = \frac{1}{2}, N_2=1080\text{rpm}$$

Power transmission

PTO power claimed is 47 hp

1hp = 0.746kw. 47 × 0.746 kw= 35kw

The average working speed (v) of tractor for slashing is between 2mph to 3mph (BCS America). 1mph = 0.447m/s. 3 × 0.447 = 1.34m/s

Calculated working speed (v) of tractor for slashing is 1.34m/s. Empirically, the working speed is 1 m/s (Young and Chow, 1991).

Cutting power

$$P = F \times V \quad (4)$$

F (cutting force) = 12 N, V is the speed of tractor for mower operation

P = 12 × 1.34 = 16 Nm/s or 16watts

Cutting blade

Speed of Blade and Shaft =1080rpm. Power Transmitted =16 watts

$$\text{Torque Transmitted, } T = \frac{P \times 60}{2\pi N} = \frac{35 \times 60}{2 \times 3.142 \times 540} = 0.618 \text{ Nm} \quad (5)$$

Shaft design

Design for horizontal shaft

F = M g = 25 × 9.81= 245N

Ra + Rb = 245 N

Taking moment about Ra as the reference point, Clockwise moment is equal to anti-clockwise moment. Length of the shaft = 0.26m

Ra × 0 + (245 × 0.13) = Rb × 0.26

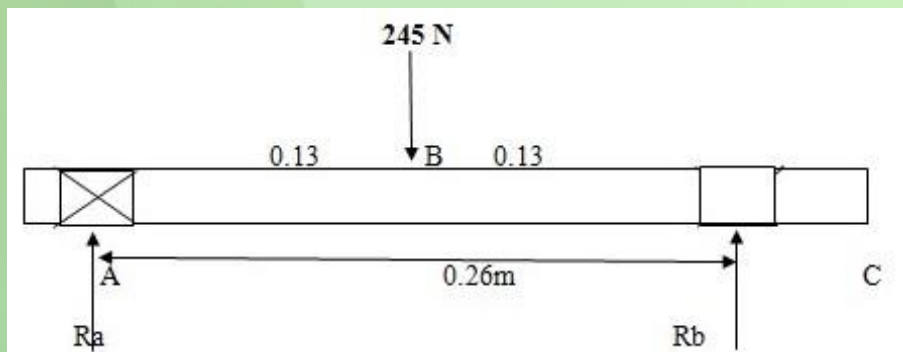
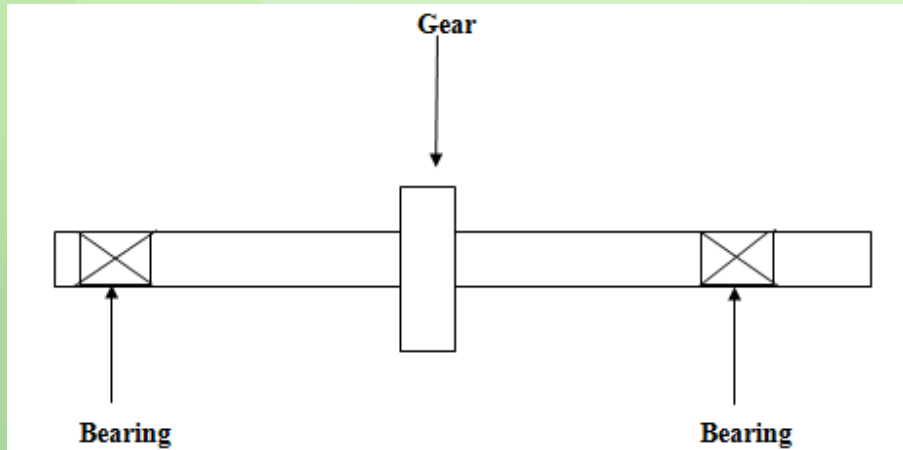
Rb = 122.5N, Ra + Rb = 245, Ra = 122.5N

Bending Moment (Bm)

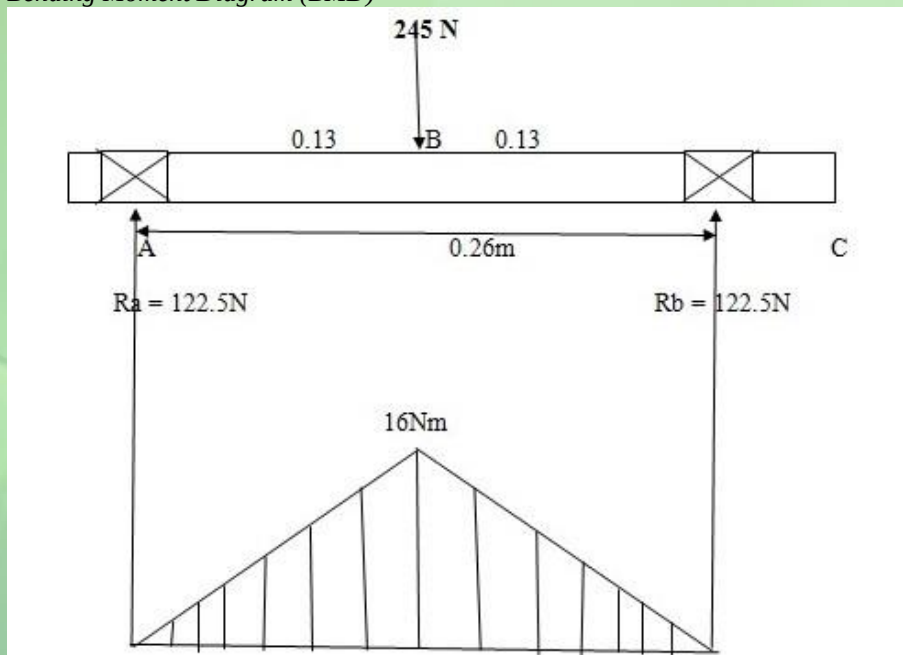
Bm at A= -122.5 × 0 = 0Nm

Bm at B= -122.5 × 0.13 + 245 × (0.26 - 0.13) = 16 Nm

Bm at C= -122.5 × 0.26 + 245 × (0.26 - 0.13) = 0Nm



Bending Moment Diagram (BMD)



Maximum bending moment occur at B = 16Nm

Maximum Torsional Moment:

$$T = \frac{P \times 60}{2\pi N} = \frac{35 \times 1000 \times 60}{2 \times \pi \times 540} = 619 \text{ Nm}$$

Equivalent twisting Moment:

$$\tau_e = \sqrt{M^2 + T^2} = \sqrt{16^2 + 619^2} = 619 \text{ Nm}$$

Equivalent Bending moment:

$$M_e = \frac{1}{2} (M + \sqrt{M^2 + T^2}) = \frac{1}{2} (16 + \sqrt{16^2 + 619^2}) = 317.6 \text{ Nm}$$

$$\text{Shaft diameter, } d^3 = \frac{16}{\pi S_s} \sqrt{(k_b M_b)^2 + (k_t M_t)^2}$$

For rotating shaft with load gradually applied, $K_b = 1.5$, $K_t = 1.0$

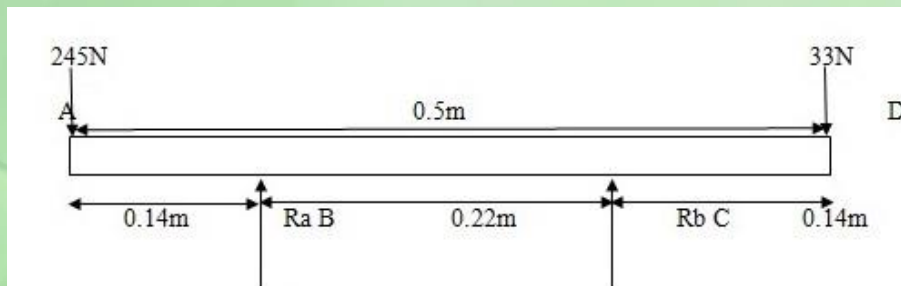
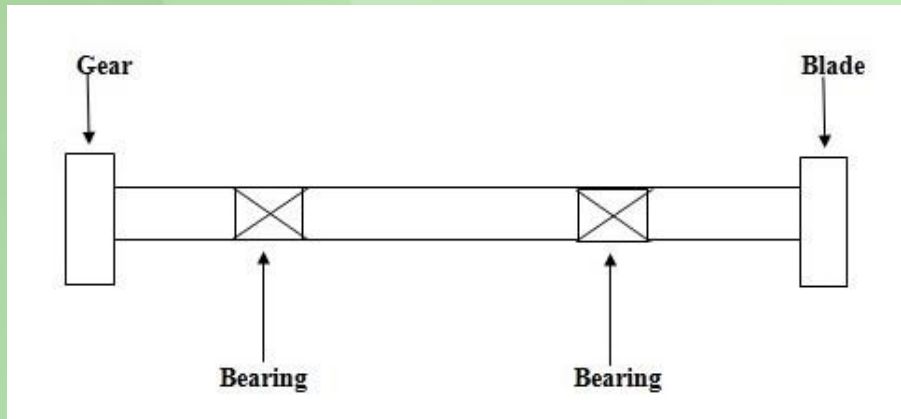
S_s allowable = 55 MN/m² for shaft without keyways

$$d^3 = \frac{16}{55 \times \pi \times 10^6} \sqrt{(1.5 \times 16)^2 + (1 \times 619)^2} = 39 \text{ mm}$$

(Shaft of 40mm diameter is recommended and adopted).

Design for vertical shaft

The vertical shaft connects the driven bevel gear to the blade. It is subjected to combined bending moment and twisting moments. The material selected for the shaft is carbon steel of grade 40C8, with ultimate tensile strength of 560-670 MPa (Khurmi and Gupta, 1997).



Length of the shaft = 0.5m, weight of the blade = 3.3kg, weight of the gear = 25kg

Force at Point A (Gear), $F = Mg = 25 \times 9.81 = 245 \text{ N}$

Force at point D (Blade), $F = Mg = 33 \text{ N}$

Bearing reactions are R_a and R_b , $R_a + R_b = 245 + 33 = 278 \text{ N}$

Taking moment about R_b . Clockwise moment = anticlockwise moment

$$33 \times 0.14 + R_a \times 0.22 = 245 \times 0.36$$

$$R_a = 380.2 \text{ N}, R_a + R_b = 278 \text{ N}$$

Sum of upward forces = sum of downward forces

$$R_a + R_b = 278, R_b = -102.2 \text{ N}$$

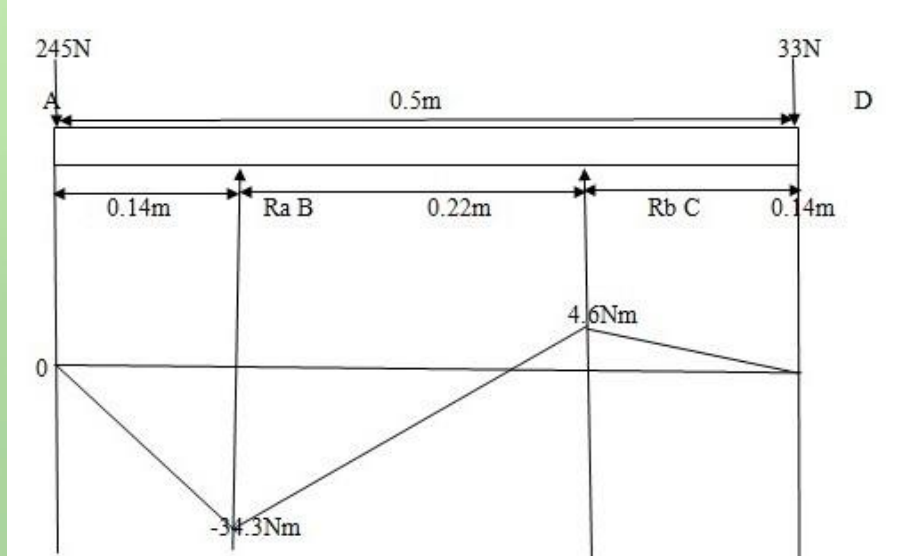
Bending moment (Bm)

$$B_m \text{ at A} = 245 \times 0 = 0 \text{ Nm} \quad B_m \text{ at B} = (245 \times 0.14) = -34.3 \text{ Nm}$$

$$B_m \text{ at C} = -(245 \times 0.36) + (380.2 \times 0.22) = 4.6 \text{ Nm}$$

$$B_m \text{ at D} = -(245 \times 0.5) + (380.2 \times 0.36) - (102.2 \times 0.14) = 0 \text{ Nm}$$

Bending Moment Diagram



Maximum Bending Moment (M_b) is at point B= -34.3Nm

Torsional moment (M_t) = 0.14Nm

Equivalent twisting force:

$$\tau_e = \sqrt{M^2 + T^2} = \sqrt{(0.14)^2 + (-34.3)^2} \tau_e = 34\text{Nm}$$

Equivalent Bending Moment:

$$M_e = \frac{1}{2} (M + \sqrt{M^2 + T^2}) = \frac{1}{2} (0.14 + \sqrt{(0.14)^2 + (-34.3)^2}) = 17.22 \text{ Nm}$$

Diameter of the shaft

$$\text{Shaft diameter is calculated using equation } d^3 = \frac{16}{\pi S_s} \sqrt{(k_b M_b)^2 + (k_t M_t)^2}$$

$$d^3 = \frac{16}{40 \times \pi \times 10^6} \sqrt{(1.5 \times 34.3)^2 + (1 \times 0.14)^2} = 19 \text{ mm}$$

For allowable tolerance, shaft of 20 mm diameter was preferred and used

Tractor mounted rotary slasher designed, fabricated and made available using locally selected materials. The pictorial view of the fabricated slasher is shown in figure 3.



Figure 3. View of the fabricated Tractor-mounted rotary slasher (A) when completed (B) during operation before painting.

Results and Discussion

Table 2 indicates the efficiency of the machine in percentage at different speed on different grasses

	Speed	Grass Type		
	1(Mph)	Elephant	Bermuda	Bonnie
1		40.9	44.5	43.5
1.5		52.0	52.6	53.0
2		59.4	61.9	62.3
2.5		71.3	70.9	70.4
3		87.2	85.7	82.8

Result revealed the area of grass cut was 2023.428 m², the desired height of cut was 20 mm, and the speed of operation was 3 mph, and the averaged time taken was 20 minutes. The area of grass cut to desired height was 1808.33 m², the cutting efficiency of the slasher can be calculated to be 89.3 % from the formula:

$$\frac{\text{Area of cut to desired height}}{\text{Total Area of grass cut}} = \frac{1808.33}{2023.428} \times 100.$$

Figure 4 indicates the effect of tractor working speed on the blade cutting speed, while figure 5 shows the Thickness, moisture content, initial height before cut and after cut of the grasses

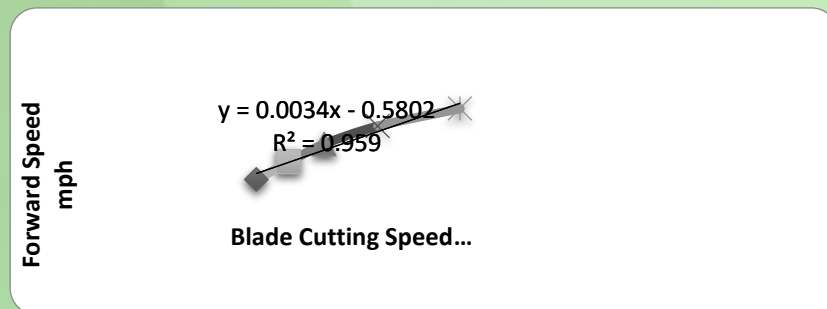


Figure 4. Effect of tractor working speed on the blade cutting speed

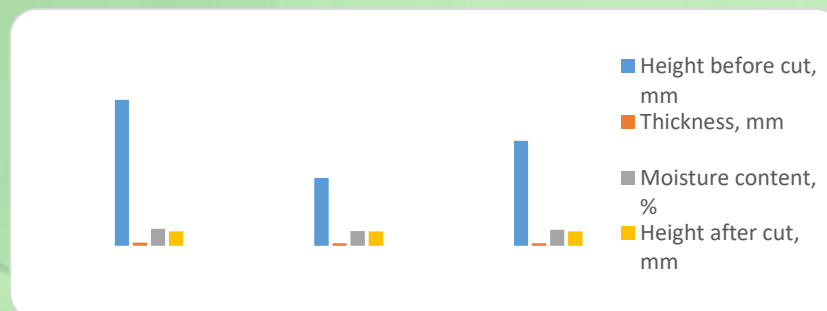


Figure 5. Thickness, moisture content, initial height before cut and after cut of the grasses

Figure 6, 7 and 8 indicates the effect of blade cutting speed on the grasses, this shows that there is significant effect of cutting speed on the grasses at different moisture at $P < 0.05$.

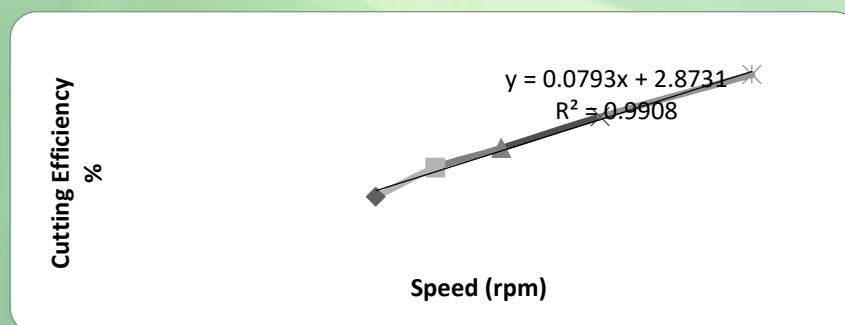


Figure 6. Effect of Blade cutting speed on Cutting Efficiency on Elephant Grass at 70.1% w.b moisture content

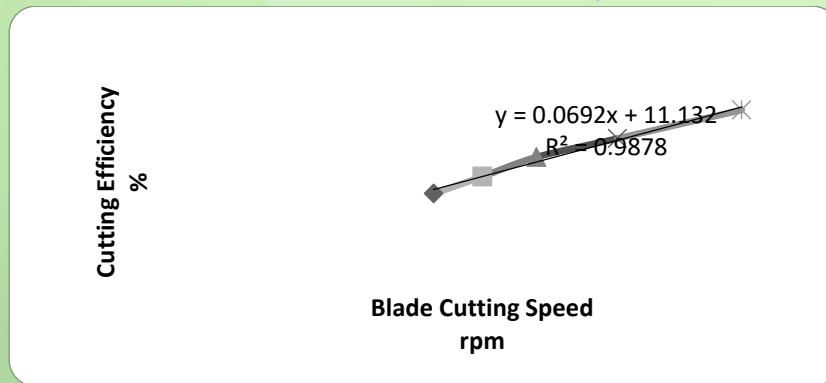


Figure 7. Effect of Blade cutting speed on cutting efficiency of the implement on Bermuda grass at 61% (w.b) moisture content.

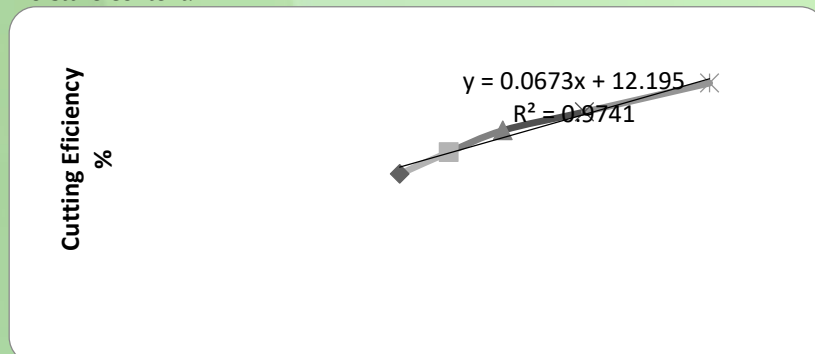


Figure 8. Effect of Blade cutting speed on cutting efficiency of the Implement on Bonnie Grass at 66.3% (w.b). moisture contents.

During the testing of the implement, it was observed that increase in the forward working speed of the tractor increases the speed of cutting blade. Figure 4 clearly shows the linear relationship between the working speed and generated speed by the blade for slashing. When tractor operates at 1 mph, 1.5 mph, 2 mph and 2.5 mph forward speed, the blade cutting speed produced were 510 rpm, 600 rpm, 700 rpm, and 850 rpm respectively; which was not enough to supply the required speed to slash the grass. The grasses cut at these speeds were not regular as some grasses were not cut at all, while others were bluntly cut. But when the tractor operated at 3mph, the cutting speed produced was 1080 rpm. At this speed, fine and uniform cut was produced which was the recommended speed for mower (Young and Chow, 1991). this justify the evaluation by Amer et al., (2013) and Bazil (2013,) on the effect of cutting speeds and moisture content on grass chopping (pulverizing), according to Amer et al., (2013), at the lowest moisture content for the grass and at high mower speed, the grassed has best percentage of the cutting or pulverizing. The 20 mm height of the grass after cut justified the performance evaluation of the self propelled lawn mower designed by Bazil (2013).

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Determination of Plasticity Characteristics of Different *Trichoderma* Species

Elif Canpolat¹, Yunus Bozkurt¹, Ayten Öztürk¹

¹Department of Biotechnology, Faculty of Arts and Sciences, Nigde Omer Halisdemir University, Niğde, Turkey

Abstract

Since chemical pesticides damage the environment it has become an obligation to find alternative methods for control and management of the plant diseases. *Trichoderma* species are known to be the most used antagonists in biological control approaches. Studies with the members of the genus *Trichoderma*, which have a significant importance for agriculture, have been gradually increased in recent years. Morphological characteristics used for the identification of the species have shown high variations based on the type of culture media. This phenomenon creates some difficulties to perform identification by traditional methods. Thus, DNA based methods using molecular markers in addition to the traditional methods using morphological characteristics give more precise results in identification at the species level. In this study two *Trichoderma* species were isolated from soil and identified by molecular methods. Both *Trichoderma* species were cultivated in different culture media (YMA, MEA, PDA, YEA, RBA) and showed variety in morphological development during cultivation period. This indicated that the plasticity of the species due to the ingredient of the culture medium should be investigated. In studies, which molecular identification was not performed, identification based on the morphological characteristics, that showed variety in different culture media, misled researchers. The species used in this study were identified as *Trichoderma citrinoviride* and *Trichoderma pleuroticola* by performing both the traditional and molecular identification methods. It was aimed to contribute to the literature by indicating that variations in morphological characteristics could occur due to the type of the culture medium.

Key Words: *Trichoderma*, biocontrol, morphological identification, plasticity

Farklı *Trichoderma* Türlerinin Plastisite Özelliklerinin Belirlenmesi

Özet

Bitki hastalıklarıyla mücadelede alternatif yöntemlerin bulunması kullanılan pestisidlerin zararlarından dolayı bir zorunluluk haline gelmiştir. *Trichoderma* türleri biyolojik mücadelede en çok kullanılan antagonistler olarak bilinmektedir. Tarım için oldukça önemli olan bu genus üyeleri ile ilgili çalışmalar son yıllarda giderek artmaktadır. *Trichoderma* 'ların tür tayinlerinde besi ortamlarına bağlı olarak morfolojik karakterlerinde yüksek değişiklik gösterdiği bulunmuştur. Bu durum geleneksel taksonomik yaklaşımlarla tür tayini yapmayı zorlaştırmaktadır. Fungal taksonomide kullanılan geleneksel morfolojik kriterlere ek olarak, moleküler markörlerin yardımı ile tür tayinleri daha kesin bir şekilde belirlenebilmektedir. Bu çalışmada iki adet *Trichoderma* türü topraktan izole edilip ve moleküler olarak tür teşhisi yapılarak tanımlanmıştır. Her iki tür *Trichoderma* suşunun farklı morfolojik gelişme gösterdiği ve besinsel olarak plastisite özelliklerinin araştırılması gerektiği ortaya konmuştur. Çalışma kapsamında izole edilen *Trichoderma* türleri çeşitli besiortamlarında (YMA, MEA, PDA, YEA, RBA) geliştirilmiştir. Moleküler olarak tanımlamanın yapılmadığı literatürlerde farklı besi ortamlarında farklı morfolojik gelişme gösteren türlerin farklı türler olacağı düşünülmüş ve farklı isimler verilmiştir. Bu çalışmada farklı besiortamlarının farklı morfolojik karakterler gösterebileceği üzerinde durularak literatüre katkı sağlamak amaçlanmıştır. Morfolojik ve mikroskopik teşhis sonrasında moleküler olarak *Trichoderma citrinoviride* ve *Trichoderma pleuroticola* olarak iki tür teşhis edilmiştir. Farklı besiyerleri denenerek üreme karakteristikleri belirlenmiştir.

Anahtar Kelimeler: *Trichoderma*, biyokontrol, morfolojik tanımlama, plastisite

Determination of Antagonistic Effects of Some *Trichoderma* Species Against *Fusarium oxysporum*

Elif Canpolat¹, Yunus Bozkurt¹, Ayten Öztürk¹

¹Department of Biotechnology, Faculty of Arts and Sciences, Nigde Omer Halisdemir University, Niğde, Turkey

Abstract

Fusarium oxysporum is a fast spreading plant pathogenic fungus which can survive in long periods via its exospores, and cause recurring infections in plants resulting in yield losses up to 90 %. Fungicides used for controlling diseases caused by *F. oxysporum* are not considered as practical since it is a soil-borne pathogen. *Trichoderma* species are wide spreaded throughout the world and are present in almost all soil types and natural habitats. Due to the antagonistic effects of some species against plant pathogenic fungi such as *Fusarium*, *Pythium* and *Rhizoctonia*, the genus *Trichoderma* has become vital in agricultural practices. The aim of this study is to investigate and to select *Trichoderma* sp. strains that have antagonistic effects against *F. oxysporum* which causes root rot in many plants. *Trichoderma* species were isolated from various soil samples and identified. *In vitro* antagonistic effects of identified species against *F. oxysporum* were evaluated afterwards. Four isolates, namely *T. koningiopsis*, *T. citrinoviride*, *T. saturnisporum* and *T. pleurotica* showed antagonistic effect against *F. oxysporum* f.sp. *radicis-lycopersici* (FORL). *T. pleurotica* showed the highest antagonistic effect while *T. koningiopsis* showed the lowest. It is considered that these isolates can be effective against soil-borne pathogens in terms of biological control of the disease agents.

Key Words: *Trichoderma*, antagonistic ability, *Fusarium oxysporum*, biological control

Bazı *Trichoderma* Türlerinin *Fusarium oxysporum*'a Karşı Antagonistik Etkisinin Belirlenmesi

Özet

Fusarium oxysporum çok hızlı yayılan bitki patojeni bir fungus olup, ekzo sporları sayesinde uzun süre hayatta kalmaktadır. Bu sporlarının yayılımı neticesinde bitki bünyesinde tekrarlı enfeksiyonlara sebebiyet vermekte ve % 90'a varan ürün kayıplarına neden olmaktadır. *F. oxysporum* toprak kaynaklı olduğundan, neden olduğu hastalıkların kontrolünde fungusitlerin uygulanması çok pratik bulunmamaktadır. *Trichoderma* türleri, Dünya'nın her tarafında geniş bir şekilde yayılım göstermekte ve hemen hemen tüm toprak ve doğal habitatlarda bulunmaktadır. Bazı *Trichoderma* türlerinin *Fusarium*, *Pythium* ve *Rhizoctonia* gibi birçok bitki patojenine karşı iyi bir antagonistik etkiye sahip olmasından dolayı bu genus tarım açısından önemli hale gelmiştir. Bu çalışmanın amacı, birçok bitkide kök çürüklüğüne neden olan *F. oxysporum* türüne karşı biyokontrol potansiyeli olan *Trichoderma* sp. suşlarının araştırılması ve seçilmesidir. Çeşitli toprak numunelerinden izole edilen *Trichoderma* türleri teşhis edilerek *F. oxysporum*'a karşı antagonistik etki *in vitro* olarak değerlendirilmiştir. *T. koningiopsis*, *T. citrinoviride*, *T. saturnisporum* ve *T. pleurotica* türlerine ait izolatların *F. oxysporum* f.sp. *radicis-lycopersici* (FORL)'ye karşı antagonistik etki gösterdiği görülmüştür. Denenen *Trichoderma* izolatları arasında en iyi antagonistik etkiyi *T. pleurotica* gösterirken, en az etkiyi ise *T. koningiopsis* türünün gösterdiği tespit edilmiştir. Bu izolatların toprak kökenli patojenlere karşı biyolojik mücadelede etkili olabileceği düşünülmektedir.

Anahtar Kelimeler: *Trichoderma*, antagonistik yetenek, *Fusarium oxysporum*, biyolojik kontrol

Impact of Maize Storage Methods on Aflatoxin Contamination In Eight Districts of Southern Province of Rwanda

Erastus Dushimeyesu^{*1a}, Sylvestre Habimana^{1b}, Fabrice Musana Rwalinda^{1c}, Ismael Niyokwizigirwa^{1d}, Theophile Kanyarwanda^{1e}, Evergiste Niyonsenga^{1f}

¹Department of Crop Sciences, University of Rwanda, Musanze, Rwanda

*Corresponding Author's Email: eradus2020@gmail.com

Abstract

Aflatoxin levels were measured in 900 farmer's stores grouped into 18 respective cooperatives throughout the whole parts of the southern region of Rwanda to assess the effects of different approaches of storage on aflatoxin attacks on maize. Questionnaires, maize sampling, and laboratory testing methods were used in this study to find out which storage techniques were linked to greater or lower aflatoxin levels in stored maize in the southern region of Rwanda so that extension services could be recommended on aflatoxin-reducing measures. Farmers were questioned on the structure of their storage, form, period, and pest problems in storage, as well as what they did to battle them and the sample was taken for aflatoxin testing, the presence of aflatoxin in stored corn was negatively associated to pesticide application. Aflatoxin contamination was found to be lower (2.8 parts per billion) when grain was stored in bags with pallets; aflatoxin levels were higher (88.5 parts per billions) in those who stored corn under their roofs. Henceforth, appropriate maize storage, sorting out of damaged cobs, the use of appropriate storage insecticides, storage in well-equipped, hygienic, and aerated stores with pallets, and farmers being aware of the risk that insects and aflatoxins pose to their stored maize, were found to minimize the level of aflatoxin in stored maize.

Key Words: Pallets, roofs, pest, samples, Farmers

Introduction

Maize is the most common crop extensively grown in Rwanda. Due to agricultural intensification measures, rwandan maize production increased by 129 % from 175,000 tons in 2008 to 400,000 tons in 2011. Though Rwanda's maize output has fluctuated greatly in recent years, it has tended to climb from 1971 to 2020, hitting 451,000 tons in 2020 (Pulat *et al.*, 2013). Storage fungus can contaminate maize, and some of them can produce mycotoxins, which are detrimental to animal and human health. Aflatoxins are mycotoxins produced by *Aspergillus flavus* a prevalent postharvest fungus in maize. The level of aflatoxin in a product varies depending on the season, how long it has been stored, and storage variables. Toxin contamination was shown to be higher during the rainy season and increased with storage duration (Abdoulie *et al.*, 2021). Aflatoxin contamination in storage is influenced by the storage system. Maize storage procedures differ based on different farmer's habits; some have warehouses with pallets while others are used to store their maize on the ground. Farmers frequently leave their maize cobs on the floor in a corner of the building or the courtyard, exposing them to the soil and increasing the risk of *Aspergillus flavus* development (Philippe, 2014).

Rwandese farmers frequently altered their storage facilities during the storage period, switching maize from less durable home-based drying facilities or temporary storage to more durable contemporary drying shelters. This study evaluates the best storage method which can be adopted to minimize the level of aflatoxin in maize.

Materials and Methods

Perception of the farmers and farmer's cooperatives

Selected maize farmers and cooperatives in seven districts of Southern province of Rwanda were interviewed from March to July 2021 to assess their stores and warehouses status and types of equipment, to monitor the quantity of maize stored in the warehouse, their safety status, storage procedures, pest, and diseases issues (appendix 1).

During the survey, the Southern region of Rwanda was divided into two Agro-ecological zones such as region located near Nyungwe National parks namely Nyamagabe, Nyaruguru Districts where average temperature ranging from 16-19 degrees Celsius per year and average humidity ranging from 61-78% per year and region located far from Nyungwe National parks such as Huye, Nyanza, Gisagara, Muhanga, Ruhango and Kamonyi Districts where average temperature ranging from 22-26 degree Celsius per year and average humidity ranging from 67-72% per year, rainfall ranging from 222.3mm and 128mm per annum (Anon., 2018).

Samples collection for aflatoxin testing

Maize samples were collected from all maize populations following sampling standards where random sampling method was used to ensure that all maize populations are represented, during sampling. Samples were taken for ground-based storage methods, pallets based storage methods, and storage under roofing of the farmer's houses, 19 samples were taken in selected farmers' cooperatives in eight districts of the southern province of Rwanda (appendix 2).

Laboratory extraction and calculation of aflatoxin

Separation and purification of aflatoxins by centrifugal partition chromatography was used for extraction and calculation of aflatoxin concentration. The samples were pulverized in a Romer1 Mill, extracted with 60:40 v/v methanol/water, and purified using chloroform. Refrigeration was used to keep the extract fresh (58°C). The aflatoxin extract was spotted on pre-coated silica gel plates (sigma chemical) and developed in a TLC tank using a chloroform/acetone (96:4, v/v) solvent mixture. The fluorescence of the sample spot was compared to the fluorescence of the aflatoxin standard under long-wave UV light (365 nm) (Gábor *et al.*, 2019).

Analytical statistics

The parameters that influenced aflatoxin development were identified using stepwise linear regression ($P \leq 0.005$). Before analysis, the results of aflatoxin test were $\log(x+1)$ transformed to normalize the data. Binomial values were used to represent the answers to yes or no questions. Categorical questions were answered with numbers. Statistical package for the social scientist as the statistical software used (Petros, 2019).

Results and Discussion

Impact of storage structures on aflatoxin contamination

Maize stored under the roof of the home was linked to a higher level of aflatoxin as well as storage maize on the soil (without pallets) is also linked with higher aflatoxin contamination. This storage strategy was only observed in the southern zones, $N^1N^2H^1$ and M^1K^1 , where at least part of the harvest may occur during a rainy season due to the bimodal rainfall pattern. When these structures were filled, aeration was insufficient, and maize stored with the husk or not thoroughly dried resulted in increased fungus proliferation. (Maravelakis, P. 2019)

Later in the storage season, storing maize in cleaned bags on pallets was linked to reduced toxin levels. In Rwanda, the shift in storage structure is frequently accompanied by maize processing, which includes dehusking or degrading. At this time, most farmers also sift maize: discolored grains that may have been contaminated with fungi are picked out, lowering the risk of aflatoxin production.

Convection may cause humidity to build up in clay stores, which could explain why aspergillus spores can stay for longer in certain environments, raising the risk of aflatoxin contamination. Farmers have been known to ignite fires beneath storage facilities to reduce humidity and control insects.

Maize was kept in storage for 8 to 10 months. Maize stored in the $N^1N^2H^1$ was more likely to generate aflatoxin. The data from sampling 6 months after harvest revealed a significant positive connection in the $G^1N^1R^1$ and maize aflatoxin levels in a region-wide regression analysis. Farmers who were aware of their storage issues had a lower risk of developing aflatoxin in their maize. Higher levels of aflatoxin were found in $N^1N^2H^1$ maize that was stored on the ground and under the roof of their houses. Cleaning the store before storing the new harvest was linked to lower levels of aflatoxin in the G^1N^1R and M^1K^1 . When grain maize was stored on pallets, less aflatoxin development was found. Insect damage to corn stored without the use of storage fumigants was linked to high amounts of aflatoxin especially in $N^1N^2H^1$.

Table 1. Storage factors that are significant when regressed against aflatoxin levels (93=94) (Y) at different storage practices across all districts of southern Districts of Rwanda

Zone	Regression analysis	R ²	n	F-value
$N^1N^2H^1$	$y=0.63+0.71 x^2$	0.23	130	6.32
$G^1N^1R^1$	$y=0.31+2.13x^8-0.45x^9+0.73x^{10}$	0.27	30	4.05
M^1K^1	$y=1.23-63x^2+1.25x^{13}$	0.2	30	9.4
x1 Maize stored for 3-5 months		$t = 2.21^*$		
x3 Maize store as shelled grain		$t = 2.70^*$		
x4 Maize stored on ground		$t=2.8^*$		
x5 Maize stored on pallets		$t=2.5^{**}$		
x6 Maize stored under roof of house		$t = 2.24^*$		
x7 Use of Aluminium phosphide as storage protectant		$t=3.73^{**}$		
x8 Use of bags as secondary storage		$t = 2.7^{**}$		
x9 Maize stored in conical stores		$t=4.16^{**}$		
x10 Farmers aware of insect damage in store		$t = 2.51^*$		
x11 Maize stored on the roof of the house		$t = 2.85^*$		

*Significant at <0.05 , **significant at <0.01 ; $N^1N^2H^1$: Nyamagabe, Nyaruguru, Huye Districts; $G^1N^1R^1$: Gisagara, Nyanza, Ruhango Districts; M^1K^1 : Muhanga, Kamonyi District

Effect of storage parameters on aflatoxin levels in maize

Aflatoxin concentrations

At the start of storage, after 4 and 6 months respectively more than 174 maize samples were tested for aflatoxin levels. The majority of samples showed less than 5ppb aflatoxin throughout the whole districts of southern province and sampling occasions. Between 2.2 and 5.8% of the samples had toxin levels of more than 100ppb at the start of storage. Four months later, the percentage of samples with such high levels was between 7.5 and 24 %. There was an increase in aflatoxin levels in samples from the N¹N²H¹ and G¹N¹R¹ after 6 months of storage when comparing levels at the start of storage .after 6 months of storage, The fraction of samples with concentrations higher than 30 ppb.

From the commencement of storage until 4 months later, the percentage of samples with high aflatoxin levels increased. At the start of storage, the means of these aflatoxin positive samples were between 22 and 190ppb, and 4 months later, they were between 31 and 221 ppb. As a result, the risk of chronic aflatoxin exposure in the southern region of Rwanda is significant, given that the majority of maize is grown for human consumption, and Rwandese are known to eat maize-based meals up to three times per day,(Anon,2016)^b.

Table 2. Percentage of samples in aflatoxin classes by District at the start of storage

District	<5 ppb	5-10 ppb	10-20 ppb	20-50 ppb	50-100 ppb	>100ppb
Nyamagabe	2.6	0.9	3.6	1.8	2.7	4.5
Nyaruguru	4.8	5	5.8	7.3	7.4	5.8
Huye	80.8	2.5	6.7	3.6	4.5	2.5
Gisagara	4.1	1.1	2.2	4.4	2.2	3.6
Nyanza	6.6	0.9	3.6	1.8	2.7	6.5
Ruhango	4.6	0.9	3.6	1.8	2.7	3.5
Muhanga	5.6	0.9	3.6	1.8	2.7	2.5

Ppb: parts per billions

Table 3. Percentage of samples in aflatoxin classes per district after 4 months of storage

District	< 5 ppb	5-10 ppb	10-20 ppb	20-50 ppb	50-100 ppb	>100ppb
Nyamagabe	85	3.8	2.5	1.3	-	7.5
Nyaruguru	68.4	1.3	7.6	7.6	7.6	-
Huye	71.3	5	-	11.3	5	8.8
Gisagara	67.8	-	4.8	1.6	24.2	-
Nyanza	85	3.8	2.5	1.3	7.5	-
Ruhango	85	-	3.8	2.5	1.3	7.5
Muhanga	85	3.8	2.5	1.3	7.5	-
Kamonyi	85	3.8	2.5	-	1.3	7.5

Ppb: parts per billion

Table 4. Percentage of samples in aflatoxin classes per district after 6 months of storage

District	< 5 ppb	5-10 ppb	10-20 ppb	20-50 ppb	50-100 ppb	>100ppb
Nyamagabe	95	4.8	3.5	2.3	-	8.5
Nyaruguru	78.4	2.3	8.6	8.6	8.6	0
Huye	81.3	6	-	21.3	6	8.8
Gisagara	77.8	-	5.8	2.6	34.2	0
Nyanza	95	4.8	3.5	2.3	8.5	0
Ruhango	95	-	4.8	3.5	2.3	7.5
Muhanga	85	3.8	2.5	1.3	7.5	0
Kamonyi	85	3.8	2.5	-	1.3	7.5

Ppb: parts per billion

Problems with storage

More than 80% of farmers in the eco-region expressed dissatisfaction with their storage facilities. At the start of storage, farmers observed mostly flies and rodents. Insect damage to stored maize was reported by 87 percent of farmers (NNZ), 90 percent (AZ) Lepidopterous pests were reported by 20% of NNZ respondents and 13% of AZ respondents. Fungi were an issue for 17 percent of the AZ in the driest area, whereas fungi were a concern for 6.7 percent of the farmers in the humid zone (NNZ).

NNZ: Near Nyungwe national park zone (Nyamagabe, Nyaruguru, and Huye Districts)

AZ: Amayaga Zone (Gisagara, Nyanza, Ruhango, Muhanga, Kamonyi districts)

Table 5. Farmers' reactions to storage issues at the start of the season (%)

Storage period	N ¹ N ² H ¹	G ¹ N ¹ R ¹	M ¹ K ¹
No problem	13.3	18.7	8.8
Molds	5.5	47	7.4
Insects	37.5	18.7	43.6
Rats	18.6	18.6	15
Rats + Termites	0.0	2.4	1.2
Rats+insects	25.4	35.6	26.4

N¹N²H¹: Nyamagabe, Nyaruguru, Huye Districts; G¹N¹R¹: Gisagara, Nyanza, Ruhango Districts;

M¹K¹: Muhanga, Kamonyi Districts

Impact of form of storage

A large number of farmers in Rwanda's southern zones preserved maize with the husk. Before storing corn, farmers chose cobs with good husk cover. Insect assault and water seepage are both thwarted by good husk cover. The impact of husk or no husk storage on aflatoxin generation was zone-specific and dependent on the incidence and type of insect pest. There have been reports of greater insect development rates on maize stored in loose grains, which could lead to an increase in aflatoxin levels. In Rwanda, some farmers in the southern agro-ecological zones preferred to store maize with husk for coleoptera protection.

Impact of storage duration

The duration of storage differed per districts ecological -zone. In the N¹N²H¹ and G¹N¹R¹, storage for 5 to 12 months as usual. In the M¹K¹, 13.7 percent of maize was held for more than a year, indicating that maize is preserved after the new harvest arrives. The size of corn stockpiles is used to determine the wealth and social status of their owners in this area, and maize can be stored for up to three years. In the M¹K¹, maize was often kept for 3 to 8 months. A storage time of 7-12 months was used in the N¹N²H¹.

Table 6. Farmers' responses to the amount of time they keep their crops in storage (%)

Storage period	N ¹ N ² H ¹	G ¹ N ¹ R ¹	M ¹ K ¹
3-5 months	32.1	12.5	11
6-7 months	23.8	10.5	9.8
8-10 months	20.5	83.2	7.8
11-12 months	15.8	11.8	6.8
> 12 months	6.7	0	0

N¹N²H¹: Nyamagabe, Nyaruguru and Huye Districts respectively; G¹N¹R¹: Gisagara, Nyanza, Ruhango Districts respectively; M¹K¹: Muhanga, Kamonyi Districts respectively.

Effects of treatments for storage

Farmers' reactions to storage issues were diverse. Approximately half of the farmers polled said they did nothing to address storage issues. Aside from that, storage methods differed from farmer to farmer and within areas. Commercial pesticides, either a specific formulation for stored grains such as aluminum phosphide (58g) and malathion), or insecticides frequently used against maize pests, were utilized by those who treated their maize; rodenticides were utilized by a small number of Rwandese farmers. Another option for dealing with storage issues was to sell the corn. Farmers also employed neem leaves (*Azadirachta indica*), pepper (*Capscicum frutescens*), ash, ash combined with sand, kerosene, smoke, or dry manure as storage protectants. In the AZ, 51% of respondents were satisfied with the efficacy of their storage treatment, whereas, in the NNZ, 49% were satisfied. Only 27.5% of N¹N²H¹ respondents and 30% of G¹N²R¹ respondents thought their control solution solved their storage issues. Before stocking their stores with new corn, farmers usually cleaned them and removed old stock. Maize could germinate in Rwanda under specific conditions, such as high rainfall or poor roofing. In Nyamagabe, Nyaruguru and Huye had an 8.9% level at the start of storage, 21.5 % in Gisagara, Ruhango, and Nyanza, 9.6% in Muhanga and Kamonyi Districts. This limit was surpassed by 7.8% of Nyamagabe, Nyaruguru, and Huye Districts samples, 20.8 % of Gisagara, Nyanza, and Ruhango Districts samples, and 12.8 % of Muhanga and Kamonyi districts of samples four months later as shown in Table 7.

From the commencement of storage until 6 months later, the percentage of samples with high aflatoxin levels increased. At the start of storage, the means of these aflatoxin positive samples were between 22 and 190 ppb, and 6 months later, they were between 31 and 221 ppb. As a result, the risk of chronic aflatoxin exposure in Rwanda is significant, given that the majority of maize is grown for human use, and Rwandese are known to eat maize-based meals up to three times per day. The information gathered during this investigation backs up prior findings of how *A. flavus* interacts with storage variables. Aflatoxin was previously linked to storage structure, according to research (Niyibituronsa *et al.*, 2021).

Table 7. Farmers' reactions to storage treatments (%).

Storage Conditions	N ¹ N ² H ¹	G ¹ N ² R ¹	M ¹ K ¹
No treatment	50	63.8	43.8
Storage insecticides	18.7	26.3	26.3
Rodenticides	7.5	2.5	2.5
Traditional means	21.3	28.8	21.3
Sale	25	20	21.3
Sorting	22.5	50	55.3
Mechanical means	30.8	36.3	46.3

N¹N²H¹: Nyamagabe, Nyaruguru, Huye Districts respectively; G¹N²R¹: Gisagara, Nyanza, Ruhango Districts respectively, M¹K¹: Muhanga, Kamonyi Districts respectively, **Whereas:** N¹ stands for Nyamagabe District; N² stands for Nyanza District; G¹ stands for Gisagara District; R¹ stands for Ruhango District; M¹ stands for Muhanga District; K¹ stands for Kamonyi District; H¹ stands for Huye District.

Structure of storage

A higher aflatoxin level was connected with maize stored under the roof of a house in Rwanda. This storage strategy was only observed in the southern zones, where the bimodal rainfall distribution means that at least part of the harvest may take place during a rainy time (Ankwaswa *et al.* 2021). Bringing partially dried maize ears into a dark location away from any sunlight or air movement would not be a desirable practice because *Aspergillus flavus* does not show protracted growth below the aw of 0.85 or 17 percent grain moisture. High temperatures, which are known to be beneficial to *Aspergillus flavus* and aflatoxin formation, could also be a predisposing factor impacting maize below metal sheeting (Benkerroum, 2020).

Storage period

In this investigation, it was discovered that there was a regional difference in the length of storage in Rwanda's southern region. People in southern regions probably preserved their maize for lengthy periods for sociological reasons, as vast and many maize stores confer social esteem on their owners. In general, however, storage times in the south were shorter since farmers were not required to store maize for as long as they were in the north because the second season crop was harvested in January. Farmers in the south farmed more maize land and typically utilized superior kinds, resulting in more corn per hectare that lasted for longer periods. (Nabwire *et al.* 2020)

Only during a storage length of 3-5 months did the effect of storage time on aflatoxin content become apparent, resulting in a greater aflatoxin level in the preserved maize samples. Farmers who keep maize for a short time appear to take fewer measures and are careless than those who store maize for a long time. Farmers who expected to sell maize after a longer storage period were more likely to dry meticulously, sort out broken cobs, and use insecticides, whereas the former consumed the maize as rapidly as possible. (Masomo. 2020)

Form of storage

A large number of farmers in Rwanda's southern zones preserved maize with the husk. Before storing corn, farmers chose cobs with good husk cover. Insect assault and water seepage are both thwarted by good husk cover. Aflatoxin levels were lower in maize with high husk cover in India. They discovered decreased aflatoxin contamination in maize types with a tight husk cover in two out of three years. In Rwanda, the impact of husk or no husk storage on aflatoxin generation was zone specific and dependent on the incidence and type of insect pest. There have been reports of greater insect development rates on maize stored as loose grains, which could lead to an increase in aflatoxin levels (Wenndt *et al.* 2020).

Treatments for storage

Insecticides are widely used on stored grains in Rwanda, which is one of the difficulties with pesticide use. Up to 18.3 percent of farmers in this study utilized aluminum phosphide (58g) to safeguard their stored wheat. Pesticides are distributed by agro-dealers through the state extension office in Rwanda, and they are more widely available than recommended. Insecticides have higher toxicity and durability, posing a risk to consumers, particularly when consumed immediately after treatment. The misuse of very hazardous pesticides for the control of storage pests is a recurring issue in developing countries (Zikankuba *et al.* 2019).

Insect damage is frequently followed by mold growth because insects create a micro-environment conducive to the growth of storage fungi. Actellic was found to have no direct influence on *Aspergillus flavus* formation in maize grains in research, leading to the conclusion that the aflatoxin-reducing effect of insecticides is a secondary effect through the reduction of insect infestation. Aflatoxin concerns were less common among farmers who used insecticides to safeguard their stored corn.

The use of local plant substances to protect against storage insects increased aflatoxin levels in stored maize samples in this study. Many studies have shown that plant compounds can be employed in vitro to limit the growth of *Aspergillus flavus*. It appears that achieving the in vitro impact by applying plant components directly to the preserved cobs is not always possible. Many of the plant ingredients utilized in the store are also used in traditional medicine (Anon, 2016)^a.

As a result, mixing plant chemicals with preserved corn cobs may increase the risk of aflatoxin formation rather than reducing it. Plant elements, such as leaves, can also raise the relative humidity inside the grain store. Farmers in Rwanda consistently evaluated indigenous solutions as less effective than commercially available items, but

they employed these substances because they did not have access to or could not afford chemical products (Yaolei *et al.* 2020).

Conclusion

This study was conducted in eight districts of the southern province of Rwanda to assess the impact of maize storage methods on aflatoxin contamination, different methods were used to reach the study objectives such as interviews with the farmers, sample collection for aflatoxin testing, laboratory analysis of aflatoxin. The current study identified several storage factors that may help to reduce aflatoxin levels in stored maize in Rwanda, including storage insect control through the sorting out of damaged cobs, the use of appropriate storage insecticides, storage in well-equipped, hygienic, and aerated stores with pallets and farmers aware of the risk that insects and aflatoxins pose to their stored maize. The recommendation drawn from this research is that toxin levels can also be controlled by using a storage container that is appropriate, hygienic, and not storing maize on the ground but pallets. Further research is needed to determine how storage methods affect aflatoxin levels in Rwanda's various agro-ecological zones.

Acknowledgement

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Appendixes

Appendix 1. Perceptions of farmers on corn storage procedure

I. METHODS OF STORAGE	
Questions	Areas
When the maize is harvested stored	Selected maize cooperatives/All districts
Why do you store maize ahead of time?	Selected maize cooperatives/All districts
Where do you keep your maize grains before storage	Selected maize cooperatives/All districts
How long do you keep your maize?	Selected maize cooperatives/All districts
What method of storage do you employ during storage	Selected maize cooperatives/All districts
What is the location of your storage facility?	Selected maize cooperatives/All districts
What kind of building materials did you use?	Selected maize cooperatives/All districts
How many seasons have you used pallets in the stores	Selected maize cooperatives/All districts
How many seasons have you stored on the ground?	Selected maize cooperatives/All districts
Do you keep maize in the store all year?	Selected maize cooperatives/All districts
What is the location of your storage facility?	Selected maize cooperatives/All districts
II. PROBLEMS WITH STORAGE	
Do you have a storage issue? No-yes	Selected maize cooperatives/All districts
Which of the storage issues is the most critical?	Selected maize cooperatives/All districts
Insects- Rodents- Birds- Mould	Selected maize cooperatives/All districts
· After a few months	
· When the storage period is over	
What steps did you take to resolve this issue?	Selected maize cooperatives/All districts
Is it true that the grain germinates in stores yes or no	Selected maize cooperatives/All districts
Do you sanitize the storage facility before putting it away? No or Yes	Selected maize cooperatives/All districts
What else did you do to get the store clean before putting it away?	Selected maize cooperatives/All districts
List	
What measures did you employ to treat the store room before storing it? Ash or Sand	Selected maize cooperatives/All districts
Insecticides (specify): Smoke -Manure -Neem?	Selected maize cooperatives/All districts
What nature did you use to keep your maize? In the husk ,as grain, dehusked	Selected maize cooperatives/All districts
Were pesticides used during storage? If yes, please provide its name	Selected maize cooperatives/All districts
Have you taken any additional precautions? List	Selected maize cooperatives/All districts

Appendix 2. Samples collected from the southern province of Rwanda

No	District Name	Cooperative Names	Maize Population Size (Kgs)	Sample Size(Kgs)	Storage Status	Sample Collected
1	Kamonyi	Coamaleka	50000	2	Ground-Based Storage	Sample Was Taken
		Kabiyaki	40000	2	Ground-Based Storage	Sample Was Taken
		Kabiyaki	45000	2	Ground-Based Storage	Sample Was Taken
2	Muhanga	Tuzamurane	25000	2	Pallets Based Storage	Sample Was Taken
		Dufatanye	40000	2	Ground-Based Storage	Sample Was Taken
		Kokari	40000	2	Ground-Based Storage	Sample Was Taken
3	Ruhango	Abiyunze	27000	2	Pallets Based Storage	Sample Was Taken
4	Nyanza	Abahujintego	40000	2	Ground-Based Storage	Sample Was Taken
		Duhujimbaraga	27000	2	Ground-Based Storage	Sample Was Taken
		Abahujintego	20000	2	Ground-Based Storage	Sample Was Taken
5	Huye	Kopiaka	8000	1	Ground-Based Storage	Sample Was Taken
6	Gisagara	Koabidu	11000	1	Ground-Based Storage	Sample Was Taken
		Korwamuki	5000	1	Ground-Based Storage	Sample Was Taken
		Coopagka	60000	2	Ground-Based Storage	Sample Was Taken
7	Nyaruguru	Jyamberemuhinzi	10000	1	Ground-Based Storage	Sample Was Taken
		Abesamihigo	600	1	Ground-Based Storage	Sample Was Taken
		Abishyizehamwe	30000	2	Ground-Based Storage	Sample Was Taken
8	Nyamagabe	Jyamberemuhinzi	40000	2	Ground-Based Storage	Sample Was Taken

Effects of Short Period of Incubation during Egg Storage and Pre-warming on Hatchability, Hatch Time and Gosling Quality Traits of Eggs from Turkish Geese

Ahmet Uçar¹, Mehmet Akif Boz², Kadir Erensoy³, Musa Sarıca³

¹Department Of Animal Science, Faculty Of Agriculture, Ankara University, Ankara, Turkey

²Department Of Animal Science, Faculty Of Agriculture, Bozok University, Yozgat, Turkey

³Department Of Animal Science, Faculty Of Agriculture, Ondokuz Mayıs University, Samsun, Turkey

Abstract

The study aimed to investigate the effects of short period of incubation during egg storage (SPIDES) and pre-warming on hatchability, hatch time and gosling quality traits of eggs from domestic Turkish Geese. The present study was a 2 × 2 factorial design with two SPIDES (Yes-No), two pre-warming (Yes-No) treatments. Data were analyzed via a factorial ANOVA using the GLM procedure in the SPSS software program. With regard to hatchability of fertile eggs (HoF), both SPIDES and non-prewarming groups had an advantage of about %5 compared to non-SPIDES and prewarming groups ($p < 0.05$). When all sub-groups were evaluated together, SPIDES + non-prewarming group increased HoF by 9-10% compared to the others ($p < 0.05$). Early embryo death was the main cause of the loss of HoF in eggs non-SPIDES, while the main reason of the loss in the groups that pre-warmed is determined to be late embryo death ($p < 0.05$). While the effect of pre-warming on pip and hatch time was not significant, both pip and hatch time were approximately 3.5 h earlier in eggs treated with SPIDES ($p < 0.05$). There was no difference between the groups regarding gosling quality score, gosling weight, gosling yield, gosling length and shank length ($p > 0.05$). However, male goslings had thicker shank diameter compared to females ($p < 0.05$). In conclusion, SPIDES treatment increased HoF while pre-warming decreased. In addition, SPIDES shortened the hatch time by an average of 3.5 h.

Key words: Gosling Quality, Hatchability, Hatch Time, Pre-warming, SPIDES.

Evaluation Of Carbon Microparticles On Foraging Behavior Of Honey Bees Exposed To Sublethal Dose Of Imidacloprid

Saffet Sansar¹, Walter S. Sheppard²

¹Apiculture Research Institute, Ordu, Turkey

²Washington State University, Department of Entomology, Pullman, WA 99164-6382, USA.

Abstract

Honey bees (*Apis mellifera*) are valuable insect species for pollination and an insect of vital importance to agricultural crops. They are the most commonly used species to provide pollination service in agriculture because of the ease of transportation and ability to place large number of bees in the field during crop bloom. However, pesticides widely used in farmlands to control or reduce pests pose a potential risk to honey bees. Multiple research observations have demonstrated the adverse effect of pesticides on honey bee foraging activity. I used a radiofrequency identification (RFID) system to monitor the effect of feeding sublethal doses of imidacloprid to bees on individual forager behavior. The experiment tested whether carbon microparticles, incorporated into a sugar syrup and fed to bee colonies, reduced the impact of forager exposure to imidacloprid. Sublethal doses of imidacloprid led to a significant reduction in foraging activity in colonies, regardless of prior consumption of carbon microparticles. The RFID- method facilitated tracking individual foraging bee activity.

Key words: Honey Bee, Imidacloprid, Carbon Microparticles, RFID

Karbon Mikropartiküllerin Imidacloprid'in Sublethal Dozuna Maruz Kalan Bal Arılarının Tarlacılık Davranışı Üzerinde Değerlendirilmesi

Özet

Bal arıları (*Apis mellifera*) polinasyon için değerli bir böcek türüdür ve ziraai ürünler için büyük bir öneme sahiptir. Tarım ürünlerinin çiçeklenme dönemi boyunca çok sayıda bal arılarının nakliyesi ve araziye yerleştirilmesindeki kolaylık nedeniyle tarımda polinasyon hizmetini sağlamak için en yaygın olarak kullanılan bir türdür. Fakat, tarım arazilerinde zararlı böceklerin azaltılması veya kontrol altına alınması için yoğun olarak kullanılan pestisitler bal arıları için potansiyel bir risktir. Birçok araştırmada bal arıların tarlacılık faaliyetleri üzerinde pestisitlerin olumsuz etkilerini göstermiştir. Arıların sublethal dozda imidaclopride maruz bırakılarak bireysel tarlacılık davranışı üzerine etkisi radyo frekansı ile tanımlama (RFID) sistemi kullanılarak izlenmiştir. Yapılan bu çalışmada, arı kolonilerini beslemede karbon micaropartikül içeren şurupların kullanılması, imidacloprid'e maruz kalan tarlacı arılar üzerinde etkisini azaltıp azaltmadığı test edilmiştir. Imidaclopridin sublethal dozu karbon micropatikül tüketimine bakılmaksızın colonilerdeki tarlacılık faaliyetini önemli derecede azaltmıştır. RFID metodu arıları bireysel olarak tarlacılık faaliyetini izlenmesini kolaylaştırmıştır.

Anahtar Kelimeler: Bal Arısı, Imidacloprid, Karbon Mikropartikül, RFID

Effect of Industrial and Domestic Processing Techniques On the DNA Degradation of Anchovy

Elif Tuğçe Aksun Tümerkan¹

¹Department of Food Processing, Vocational School of Technical Sciences, Ankara Yıldırım Beyazıt University, 06760/ Ankara, Turkey

Abstract

Food fraudulent activities have become a serious issue over the world recently. Seafood products have trading and profitable potential in Turkey owing to the abundance of fisheries and other species. While morphological features are commonly used for species identification in raw seafood products, this identification does not meet the correct classification in cryptic species and processed seafood products. Molecular techniques have been utilized for species authentication in processed seafood items successfully. In this study, the effect of different processing techniques on the DNA quality and DNA degradation isolated from raw and processed anchovy was investigated. Anchovy is one of the important species in both fisheries activities and processing and consumption in Turkey. For this aim, DNA was isolated from processed anchovy groups and un-processed anchovy groups as control by the same extraction methods and the quality of DNA was compared among the groups. The most common processing techniques, frying, baking, smoking, roasting, baking and grilling were applied to anchovy. The results revealed that not only different thermal processing but also treatment with acid and salt cause DNA degradation and quality loss of DNA parameters which are essential for authentication of species and traceability for public health.

Key Words: *Processing techniques, Anchovy, DNA degradation, Species fraud, Food safety*



Occupational Health and Safety in Agricultural Production

Yaşar Serhat Saygılı¹, Bülent Çakmak²

¹Biosystem Engineering Department, Faculty of Agricultural Sciences and Technologies, Niğde Ömer Halisdemir University, Niğde, Turkey

²Agricultural Machinery and Technologies Engineering Department, Agriculture Faculty, Ege University, İzmir, Turkey

Abstract

Agricultural production is one of the leading sectors in the world and our country with the most employment. Agricultural production activities, the importance of which is increasing day by day due to the increasing world population, is an important strategic element for every country. The economy of many countries, including our country, still depends on the products they obtain because of agricultural production. Appropriate agricultural policies should be implemented to increase the productivity in agricultural production, to protect the employed workforce and to ensure its continuity. In addition to establishing appropriate agricultural policies, employed workers should also be protected by laws, regulations and directives. It is a fact that most of the people employed in agricultural production in our country have to work under dangerous and harsh conditions without being under legal protection, without union formation and union rights, as in other sectors. Protecting the health of agricultural production workers working under very difficult conditions due to variable climatic conditions, ensuring safe production and ensuring that the necessary OHS measures are taken should be among the priority items when forming our state's policies.

In this study, the situation in the world and in our country was examined under the title of occupational health and safety in agricultural production. The hazards and risk factors to be encountered in agricultural production have been determined and the OHS measures to be taken against them have been tried to be explained.

Key Words: Agriculture, Occupational Health and Safety, Risk Factors, Occupational diseases, Prevention

Screening of antibiotic residues in chicken meat in Bordj Bou Arreridj, Algeria

Abed Hanane ¹, Nasri Meriem ¹, Rouag Noureddine ²

¹Department of Biology Sciences, Faculty SNV-TU, University Bordj Bou Arreridj, Algeria.

²Department of Agronomy Sciences, Faculty of Nature and Life Sciences, University Ferhat Abbas - Sétif1, Algeria.

Abstract

Antibiotics are efficiency substances for the treatment and improvement of animal production yields. However, their irrational and non-moderate using can cause serious problems for the consumer and the manufacturer. The use of these antibiotics in breeding can leave traces of antibiotics called antibiotic residues, which can be found in the products of consumed animals. Antibiotic residues can represent a significant risk for consumers, among other things, allergies, cancers, changes in the intestinal flora, fetotoxicity. In addition, they can favor the selection of resistances in natural environments attacked. The aims of this study are to check their presence in the poultry meat by microbiological methods. A survey was carried out among sixty practicing veterinarians relating to the use of antibiotics in poultry farming and sixty questionnaires for chicken consumers in the city of Bordj Bou Arreridj. The results revealed that 20,83% poultry meat samples were positive to antibiotic residues. However, most of them contained 73.41% of Tetracyclines. The majority of respondents reported the consumption of chicken meat several times a week, while children (58%) were the most consumers in first position. The predominant places of purchase of this meat are butcher shops (95%). The majority of the subjects questioned (98%) declared not to have had any illnesses linked to the consumption of chicken meat. Clamoxyl is the most frequently prescribed antibiotic with percentage equal to 66, 66%. Our results showed that 72% of breeders meet the antibiotic waiting times. The study confirms the misuses and non compliance of the withdrawal period between the administration of antibiotic in animal and its slaughter. Therefore, control of antibiotic residues should be a future concern for both producers and processor in order to protect health's consumers.

Key Words: Antibiotic residues, Meat, Broiler, Microbiological methods, Survey.

Development Of Chicken Sausages Enriched With Resistant Starch And Coated With Cinnamon Essential Oil

Tayyaba Gull¹, Waqar Akram², Maira Anam¹, Kunlun Liu³, Amna Sahar^{1*}

*corresponding author: amnasahar@uaf.edu.pk

¹National Institute of Food Science and Technology, University of Agriculture, Faisalabad, Pakistan

²Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

³College of Food Science and Engineering, Henan University of Technology

Abstract

Chicken sausage is one of the popular foodstuffs among meat products due to its unique flavor and texture. However, regular consumption of sausages causes some non-communicable diseases due to their high fat and low fibre content. The portion of starch which is non-digestible is called as resistant starch. It acts like dietary fibre in preventing bowel inflammatory diseases and colorectal cancer and promoting gut health. Unripe banana contains high amount of resistant starch. Chitosan film and coating has various applications due to its antimicrobial and antioxidant activities. Cinnamon essential oil also has antimicrobial and antioxidant properties and its incorporation may slow down the lipid oxidation of the product. In the present study, green banana powder was added at a level of 10%, 15% and 20% in chicken sausages for resistant starch enrichment and 2% of cinnamon oil coating was applied to enhance shelf life of the product. Proximate analysis of the product was performed to measure moisture content, crude fibre, crude fat, crude protein and ash content of sausages. Physiochemical and sensory analysis was performed. Each parameter was analyzed in triplicates and collected data was statistically analyzed. According to proximate analysis, T₀ at 0 day contains the highest amount of moisture content i.e., 71.10 and T₃ at 14 day contains the lowest amount of moisture content i.e., 58.02. Crude protein of T₃ during the storage time of 14 days is lowest i.e., 12.25 and of T₀ during the storage time of 0 days is highest i.e., 16.60. Resistant starch content was also examined and found that resistant starch content of T₀ during the storage time of 0, 7 and 14 days is lowest i.e., 0.00 and of T₃ during the storage time of 0 days is highest i.e., 8.16. pH was also calculated and found that T₃ at day 14 contains the lowest amount of pH i.e., 6.01 and T₀ at day 0 contains the highest amount of pH i.e., 6.34. TBARS value of T₁ during the storage time of 0 days is lowest i.e., 0.15 and of T₀ during the storage time of 14 days is highest i.e., 0.50. The panelists were asked to rate the color, taste, odor, texture, and overall acceptability of formulated sausages. In term of overall acceptability treatment T₂ (15% green banana powder) was preferred. Finally, it can be claimed that developed chicken sausages can be called as resistant starch enriched sausages with enhanced shelf life because of using cinnamon essential oil coating.

Key words: Non-digestible, Antioxidant, Antimicrobial, Sausages.

Interactive Effect of Foliar Spray of Salicylic Acid and Gibberellic Acid on Growth, Yield and Quality of Green Gram

Iqra Akram¹, Muhammad Tahir², Muhammad Abdullah Saleem^{*2}, Taseer Ahmad³, Misbah Naz¹, and Nazahat Nisa¹

¹Department of Botany, University of Agriculture, Faisalabad

²Department of Agronomy, University of Agriculture Faisalabad

³Department of plant production and technologies, Faculty of Agricultural Sciences and Technologies, Nigde Omer Halisdemir University, Nigde, 51240 Turkey

*Correspondence: abdullahsaleem65@gmail.com

Abstract

Green gram is a kharif pulse with massive potential of nutrition including carbohydrates, proteins, fats, vitamins, microelements, polysaccharides and anti-oxidative enzymes. Besides the growing demand of mung bean, its production is low due to drought stress, poor seed quality, pathogens attack and limited sources of labor. Salicylic acid and gibberellic acid are the most imperative plant regulators that are involved in the improvement of yield and quality of the crop. A field experiment at University of Agriculture Faisalabad was designed to inspect the effects of salicylic acid and gibberellic acid on growth characteristics, yield traits and quality contents of green gram. Randomized complete block design (RCBD) with factorial arrangement was used for allocation of treatments. Treatments included were two levels of salicylic acid (0, 75 ppm) and five levels of gibberellic acid (0, 30 ppm, 60 ppm, 90 ppm and 120 ppm) which were applied as foliar spray. Data was analyzed at 5% probability of LSD test to compare treatments means. The maximum crop growth rate (CGR), net assimilation rate (NAR), plant height, yield components and harvest index (H.I) were recorded when salicylic acid (75 ppm) was applied in combination with gibberellic acid (120 ppm). Chlorophyll pigments, carotenoids and protein were also escalated with similar treatment. It was concluded from results that combined treatment of salicylic acid and gibberellic acid remarkably improved the growth, quality and yield components of the mung bean plants.

Key words:

Comparative performances of new wheat lines under different irrigation regimes

Tasleem Kanwal¹, Muhammad Abdullah Saleem^{2,*}, Abid Shehzad², Taseer Ahmad³, Iqra Akram¹ and Waqar Akram⁴

¹Department of Botany, University of Agriculture Faisalabad

²Department of Agronomy, University of Agriculture Faisalabad

³Department of plant production and technologies, Faculty of Agricultural Sciences and Technologies, Nigde Omer Halisdemir University, Nigde, 51240 Turkey

⁴Department of Plant Pathology, University of Agriculture Faisalabad

Corresponding author: abdullahsaleem65@gmail.com

Abstract

An equitable water supply is pre-requisite under limited water availability. The varying irrigations have diverse impact on growth behavior of wheat crop (*Triticum aestivum* L.) under site specific environments. Research was conducted in the University of Agriculture in Faisalabad, Pakistan in the student sector to compare the output of the wheat lines under various irrigation regimes in 2018-2019. Five wheat lines (9496, ZA-10, Galaxy-2013, ZA-6, 9493), were tested against various irrigations (2, 3 and 4 irrigations) in their growth period. Treatments were organized in randomized complete block design (RCBD) in factorial arrangement. Data recorded was analyzed at 5% probability of LSD test. Analysis of genotypes under different irrigations revealed that, the wheat line ZA-6 has better growth performance and highest yield than others under three irrigations. Moreover, this line showed highest economic benefits (Rs.63892) than all other genotypes when supplied with three irrigations. In conclusion ZA-6 was the potential line of wheat under Faisalabad conditions and can be recommended to farmers for cultivation with three irrigations.

Key words:

Impact of Cadmium Toxicity on Growth attributes of Green Gram

Nazahat Nisa¹, Muhammad Tahir², Iqra Akram¹, Muhammad Abdullah Saleem^{2*}, Taseer Ahmad³, Abid Shehzad² and Waqar Akram⁴

¹Department of Botany, University of Agriculture, Faisalabad, Punjab, Pakistan

²Department of Agronomy, University of Agriculture, Faisalabad, Punjab, Pakistan

³Department of plant production and technologies, Faculty of Agricultural Sciences and Technologies, Nigde Omer Halisdemir University, Nigde, 51240 Turkey

⁴Department of Plant Pathology, University of Agriculture Faisalabad

*Author for Correspondence; Email: abdullahsaleem65@gmail.com

Abstract

Cadmium (Cd) is a lethal element for plant growth which should be managed before plantation. Green gram is a crop which is sown by the farmers mostly on marginal lands, therefore, a pot experiment was executed to assess the deleterious impacts of cadmium on green gram during spring 2020. Eight levels of Cd (0, 2, 4, 6, 8, 10, 12, 14 mg/Kg) were applied as treatments. Data concerning growth attributes was collected on regular basis and analyzed using HSD test at 5% probability level. Results from the experiment explained the significant decrease in green gram growth with increasing Cd concentration in soil. All the growth attributes tend to decrease with prevailing Cd in soil.

Key words:

Mitigation of Cadmium Toxicity in Mung Bean by the Foliar Application of Gibberellic acid

Nazahat Nisa¹, Muhammad Tahir², Muhammad Abdullah Saleem^{2,*}, Iqra Akram¹, Taseer Ahmad³, Abid Shehzad² and Waqar Akram⁴

¹Department of Botany, University of Agriculture, Faisalabad, Pakistan,

²Department of Agronomy, University of Agriculture, Faisalabad, Pakistan.

³Department of plant production and technologies, Faculty of Agricultural Sciences and Technologies, Nigde Omer Halisdemir University, Nigde, 51240 Turkey

⁴Department of Plant Pathology, University of Agriculture Faisalabad

*Author for Correspondence; Email: abdullahsaleem65@gmail.com

Abstract

Cadmium (Cd) toxicity showed harmful impacts on living organisms and phytohormone gibberellic acid (GA) played pronounced role to ameliorating the cadmium stress. Field trial was executed to evaluate the ameliorating effects of GA under Cd stress. The trial was arranged in randomized complete block design with factorial arrangements and three replications at University of Agriculture Faisalabad. Mung bean seeds were primed in 4mM and 8mM Cd solution for 12h, shade dried and then sown in the field. Gibberellic acid (75µM and 150µM) was applied as foliar spray at pre flowering stage of crop. Results explicated a significant decline in all yield and biochemical parameters in Cd treated plants except MDA and H₂O₂ concentration. In contrast, Cd application showed increase in MDA, H₂O₂ concentration and POD activity. However, GA application to Cd treated plants showed improvement in all yield and biochemical parameters. Antioxidant enzyme (POD) appeared to aid in lessening H₂O₂ and MDA contents which cause membranes destruction. Conclusively these results indicated that GA can be used to mitigate the drastic effects of cadmium stress.

Key words:

Response of mung bean germplasm against root knot nematode, *Meloidogyne incognita* (Kofoid & white) Chitwood and its management through resistance inducers

Misbah Naz^{*1}, Huma Abbas², Nazir Javed², Iqra Akram¹, Hamza Sarfraz¹, Hira Abbas³, Muhammad Kamran⁴, Qurat ul Ain Ilyas⁵, Akbar Sajjad² and Muhammad Abdullah Saleem⁶

¹Department of Botany, University of Agriculture Faisalabad

²Department of Plant Pathology, University of Agriculture Faisalabad

³Department of Biotechnology, Govt. College University Faisalabad

⁴Plant Pathology Research institute, Ayub Agricultural Research Institute Faisalabad

⁵Department of Mass Communication, Hailey College of Commerce Lahore

⁶Department of Agronomy, University of Agriculture Faisalabad

*Corresponding author's email: abudllahsaleem65@gmail.com

Abstract

Root knot nematodes are among the most destructive pathogens as they decrease the yield and quality of host crop. A study was conducted to determine the response of mung bean germplasm against root knot nematode (*Meloidogyne incognita*) and its management through resistance inducers. Fifty different varieties of mung bean were planted. Root knot nematode inoculum was prepared on eggplant seedlings and 1000 freshly hatched juveniles of *Meloidogyne incognita* (Kofoid & White) Chitwood were applied on mung bean seedlings. There were five replications for each variety along with control. Effect of resistance inducers was assessed on the most susceptible variety under green house conditions. Different resistance inducers i.e. salicylic acid, di-potassium mono hydrogen phosphate ($\text{HK}_2\text{O}_4\text{P}$ and Potassium di-hydrogen phosphate (KH_2PO_4) with the concentrations of 10mM, 20mM and 30mM, respectively. The recorded data was analyzed at 5% probability of LSD test. All the cultivars showed variable responses against root knot nematode but the germplasm 37-NM-51 was found to be the most susceptible. The highest number of galls, egg masses and number of females were observed in nematode inoculated plants. Whereas, salicylic acid (30 mM) was the most effective in the control of root knot nematode as it had significantly decreased these nematode reproductive parameters. Growth characteristics included shoot and root length, shoot and root weights, number of leaves, nodules and pods per plant were greatly enhanced by the treatment of salicylic acid followed by $\text{HK}_2\text{O}_4\text{P}$ and KH_2PO_4 , respectively.

Key words:

The response of maize to combined application of nitrogen and phosphorous fertilizers in the semi-arid conditions of Faisalabad

Anam Ismail¹, Muhammad Abdullah Saleem^{2,*}, Abid Shehzad², Pakeeza Ahmed Khan¹, Waqar Akram³ and Iqra Akram¹

¹Department of Botany, University of Agriculture Faisalabad

²Department of Agronomy, University of Agriculture Faisalabad

³Department of Plant Pathology, University of Agriculture Faisalabad

*Corresponding author's email: abdullahsaleem65@gmail.com

Abstract

Changes in climate, development of new hybrids and soil fertility status has influenced nutrient application rates worldwide. A field experiment was carried out to determine the response of maize to combined application of nitrogen (N) and phosphorus (P) in the semi-arid conditions of Faisalabad. Research was planned at Agronomic Research Area, University of Agriculture, Faisalabad. The experiment was replicated three times and laid out in randomized complete block design with split plot arrangement keeping a net plot size of 8 m x 3 m. The experiment was comprised of two main factors (i) Nitrogen levels (100, 200 and 300 kg ha⁻¹) and (ii) Phosphorus levels (50, 100 and 150 kg ha⁻¹). Nitrogen doses were kept in main plots, while phosphorous doses in subplots. During experimentation, observations regarding phenology, growth, yield and yield related traits were recorded. Collected data was analysed using Fisher's analysis of variance technique. MSTAT-C was used for statistical analysis and means were compared at 5% probability level of HSD test. Highest values for parameters were attained where N and P were applied with dose 200 and 150 kg ha⁻¹, respectively. While, minimum values attained where with 100 and 50 kg ha⁻¹ N and P, respectively. Interaction of both remained non-significant.

Key words:

Sensitivity of *Alternaria* spp. isolates to some fungicides used on Sultana seedless grapes in Aegean region vineyards

Nurdan Güngör Savaş¹, Figen Yıldız², Nafiz Delen³

¹Manisa Viticulture Research Institution 45040 Horozköy, Manisa -Turkey

²Department of Plant Protection, Faculty of Agriculture, Ege University, Bornova-İzmir 35100 Turkey.

³Retired Lecturer of Department of Plant Protection, Faculty of Agriculture, Ege University, İzmir 35100 Turkey

Abstract

This study aimed to characterize *Alternaria alternata*, the pathogen of postharvest rot in vineyards, morphologically and molecularly for the first time and investigate the effectiveness of some fungicides in *in vitro* conditions. Isolates obtained from leaves, flowers, stems and shoots of Sultana vineyards in almost every development period from Manisa province in the Aegean region in 2009 and 2010 were determined as *Alternaria alternata* (Fr.) Keissler based on morphological and molecular methods. In molecular diagnosis, the ITS (Internal Transcribed Spacer) gene region was amplified by Real-Time PCR, and the nucleotide sequences of this gene region were obtained from the National Center for Biotechnology Information Search database (NCBI) GenBank. ITS sequences were aligned using Mega X software, and a phylogenetic tree was drawn. Sensitivity levels of isolates to cyprodinil+fludioxonil, pyrimethanil, iprodione, kresoxim-methyl+boscalid, azoxystrobin, and basic copper sulfate were tested under laboratory conditions. *In vitro* antifungal effects of different concentrations of seven fungicides, i.e. basic copper sulfate (3-3000 µg ml⁻¹), mancozeb, cyprodinil+fludioxonil, azoxystrobin, pyrimethanil, kresoxim-methyl+boscalid, and iprodione (0.01-100 µg ml⁻¹), against 24 *A. alternata* isolates were evaluated. The mean effective concentration (EC₅₀) values were determined by Probit analysis. Cyprodinil+fludioxonil was recorded as the most effective fungicide according to the EC₅₀ value, and 23 isolates of the EC₅₀ value were in the range of 0.01-0.1 µg ml⁻¹, and it was followed by kresoxim-methyl+ boscalid and iprodione with ten isolates between same values. BAC 1/2 and GMK 2/1 isolates indicated the highest virulence with values of 100% and 86.67%, respectively.

Key Words: *Alternaria alternata*, Fungicides, Grapevine, Real-time PCR, Sensitivity, Sultana

Wheat Bread Enriched with Chickpea Flour

Damla Baş¹, Mahir Turhan²

Department of Food Engineering, Mersin University, Ciftlikköy Campus, 33343 Mersin, Turkey

Abstract

Despite the fact that the food industry is progressing and modernizing day by day in the world, and many new foods with different qualities are being developed and produced, bread is the only food item that maintains its place and importance among them, and which especially the people of our country cannot give up and cannot replace with anything as an alternative. In addition, billions of breads are wasted every year like many other foodstuffs. With bakery products enriched with pulse flour, many benefits are aimed, from increasing their nutritional value to delaying staling. By adding chickpea flour in different proportions (5-10-15%) to wheat flour, it is aimed to observe the changes that will occur in the bread and to obtain a higher quality product.

Key Words: Bread, Wheat, Wheat Flour, Chickpea Flour, Chickpea, Chickpea bread

Introduction

Various additives are widely used in bread making in order to increase the nutritional content of the bread, to improve the crust and inner color of the bread, to provide the development of aroma, to improve the quality by eliminating some defects and deficiencies arising from the composition and characteristics of the flour, to increase the profitability of the enterprises by saving time and labor. The main reason for using chickpea flour is chickpea flour; protein (22.39g/100g), fiber (10.8g/100g) and mineral content (Ca, Fe, Mg, P, K, Na, Zn amounts respectively 45mg; 4.86mg; 166mg; 318mg; 846mg; 64; 2.81mg/ 100g) is rich in With the addition of chickpea flour, it is aimed to improve the nutritional values and rheological properties of standard white bread, at the same time to reach wider masses by complying with the classical bread culture and to increase the consumption of pulses.

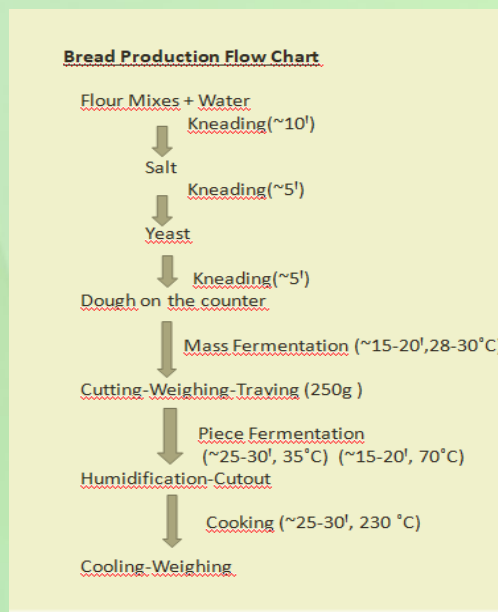
Material And Method

Material

In the study, for bread production; Your brand Type 550 and Type 650 wheat flours with 10.5% protein and 14.5% moisture content, Mauri brand fresh press yeast (*Saccharomyces cerevisiae*) used in the bread production of Mersin University Food Research Laboratory, obtained from the local market. Table salt and chickpea flour were used. Our local chickpea cultivar, Kabuli, is Yellow-98 9 MM chickpea; The chickpea flours were ground in the mill in Mersin University Food Engineering Department Laboratory (ZM 200, Retsch, Haan, Germany) as raw and raw-wetdried (In oven 70°C 16 hours) and the obtained chickpea flours were used in bread making. Flours and yeast were kept at +4 until bread making.

Methods

- Obtaining Chickpea Flours
- Bread Production [1]
- Wheat Bread Production [1]
- Enriched with Chickpea Flour Analysis of Bread [1] Production of Wheat Bread [2]
- Ash Analysis [3]
- Moisture Analysis [4]
- Determination [5]
- pH Analysis [6].
- Texture Analysis [7]
- Weight Loss [8].
- Sensory Analysis
- Statistical analysis



Results And Discussion

Evaluation of Bread Samples

- No significant difference was observed in the doughs and breads produced as a result of the processes followed separately with Type 550 and Type 650 for white flour. Although the water absorption, swelling and baking conditions were almost the same, it was observed that the pore structure and brightness were slightly better in the breads obtained from Type 650, and the trials were continued with this variety.
- It was observed that the bread samples containing more than 10% chickpea flour in raw chickpea flour and soaked chickpea flour breads compared to wheat bread were noticeably different from standard bread in terms of color and smell. In addition, the volume insufficiency and the lack of porosity observed in the breads led to the conclusion that the amount of raw chickpea flour and soaked chickpea flour should be max. 10%.
- In the gelatinized chickpea flour breads compared to the wheat bread, although no problem was observed in the 20% chickpea flour breads, yellowness was observed in the color. However, the color darkening problem was also observed in the shelled samples. As the dough kneading quality, it was observed that as the amount of chickpea increased, the dough hardened and had difficulty in shaping. As the amount of chickpeas increased, it was observed that the crust of the bread thickened.

Conclusion

- In order to interpret the results correctly, the fermentation and oven temperatures and times, and variations between 5 and 15 were tried, and it was concluded that the most ideal process was the same process as white bread, whose diagram was given above. Considering the fermentation feature of chickpeas, different ratios were tried in the yeast ratio. It was concluded that 4g yeast is sufficient in chickpea flour added breads.

- As a result of preliminary evaluations, it was decided that the breads obtained from 10% soaked chickpea flour and 7% and less raw chickpea flour breads are the closest breads to standard bread and the analyzes were continued on these varieties.
- Although 10% is ideal in gelatinized chickpea flour breads, since we can achieve the ideal in other varieties, it has also been decided not to continue with these varieties in the continuation of the study due to excess process and cost.

Acknowledgment

This study was supported by Mersin University Scientific Research Projects Coordination Unit as 2021-1-TP2-4374 project.

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Determination of Quality Properties in Mushroom Slices Dried by Different Drying Techniques

Merve Seçil Bardakçı¹, Erkan Karacabey¹

¹Department of Food Engineering, Faculty of Engineering, Süleyman Demirel University, Isparta Turkey

Abstract

The cultivated mushroom (*Agaricus bisporus*) is the most consumed mushroom species in the world in terms of amino acids, vitamins, and minerals it contains. However, significant losses occur in fresh mushrooms after harvested. Therefore, it should be consumed or processed immediately after harvest. Drying is one of the important preservation methods used for the preservation of mushrooms. In this study, mushroom slices were dried with a refractance window drying (RWD) system, which is a new film drying technique. In a typical RWD technique, the product to be dried (slice, puree, or juice) is spread on a plastic film that transmits infrared radiation. The film contacts water at 95-97 °C. However, in this study, heat transfer oil was used as a heating medium in order to dry at temperatures above the boiling point of water. Additionally, drying medium was applied as open to the atmosphere or under vacuum. Sliced mushrooms were dried under atmospheric conditions with RWD (90, 100 and 110 °C), under vacuum conditions with RWD (90 °C and 110 °C) and as a control oven drying (50, 60 and 70 °C). The average drying times of the dried mushroom slices were determined and the changes in their physicochemical properties were examined. Findings showed that the lowest drying time was achieved in mushroom slices dried with RWD at 110 °C for atmospheric and vacuum conditions. It was found that these determined times were 71.88% and 72.71% lower than the samples dried at 50 °C in the oven, respectively. The differences between total phenolic content of control samples and dried mushroom slices with RWD under vacuum were almost insignificant, whereas it was found that the corresponding values for drying processes with RWD under atmospheric condition were lower at all studied temperature levels. On the other hand, the antioxidant potential of dried mushroom slices was close each other for drying processes with RWD under atmospheric condition and control one. However, it reduced with RWD under vacuum at both studied temperature levels. Ascorbic acid content was also examined. The results indicated that its corresponding levels for RWD under vacuum or atmospheric conditions were almost identical to ascorbic acid content determined for dried samples as a control at 50 and 60 °C, and superior to the results for control at 70 °C. The differences between physiochemical properties of samples dried by RWD under atmospheric or vacuum conditions were insignificant irrespective of temperature values of all trials ($P \leq 0.05$). As a result, this new technique, RWD can be accepted as a promising drying method due to its low drying time without any apparent loose in product quality.

Key Words: mushroom, *agaricus bisporus*, refractance window drying, vacuum

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Genome-wide characterization of *TALE* gene family in *Pisum sativum* L

Anum Mushtaq¹, Ayesha Razzaq¹ and Waqas Malik^{1*}

¹Genomics Lab, Department of Plant Breeding and Genetics, Bahauddin Zakariya University, Multan

*Corresponding author: waqasmalik@bzu.edu.pk

Abstract

Three Amino-acid Loop Extension (TALE) family homeoproteins are essential for the reconstruction of transcriptional regulatory networks in response to biotic and abiotic stimuli, and intrinsic developmental processes. This class of proteins has been extensively studied in various plant species, however, its role in pea is still a mystery. In this study, different in-silico analyses were performed using bioinformatics tools. In this study, a total of 280 *TALE* members were identified in *Arabidopsis*, *P. sativum*, *G. max*, *V. radiata*, *M. trunculata*, *T. pratense*, and *P. vulgaris* and their subcellular localization and different physiochemical parameters were predicted. Out of total 280 proteins, 26 were identified in *P. sativum* which were further classified into 17 subfamilies on the basis of phylogenetic analysis, common species tree and sequence logos analysis. Furthermore, chromosomal mapping revealed that 26 *TALE* genes were randomly distributed on all seven chromosomes of *P. sativum* and segmental duplication was the major impetus toward *TALE* gene family expansion besides, all *P. sativum* *TALE* genes *Ka/Ks* values indicated the presence of purifying selection pressure. Moreover, synteny analysis represented the syntenic and asyntenic relationship and diverse gene structure while conserved protein motifs distribution pattern was observed in *P. sativum* *TALE* genes. Additionally, many *TALE* genes promoter possessed light responsive, phytohormonal, stress related, and growth and development related *cis*-regulatory elements in *P. sativum*. Expression analysis confirmed up-regulated expression of pea *TALE* members in apicnode, leaf, peduncle and nodules at low nitrogen levels, suggest their acknowledged role in nitrogen fixation through promoted nodulation in pea. These results illustrated the key role of *TALE* proteins in promoting plant growth and intensifying plant tissue development in peas. In conclusion, comprehensive analysis of *TALE* transcription factor family revealed its potential candidature for breeding of more productive pea genotypes with enhanced nodule formation.

Keywords: Pea, Transcription factors, Phylogenetic analysis, Expression profiling, Nodulation, *cis*-elements

Determination Of The Physical, Physio-Chemical And Chemical Properties Of Gilaburu Fruits (*Viburnum Opulus*) Dried By Convectional Drying Techniqu

Fatma Fulya Dal¹, Erkan Karacabey¹

¹ Food Engineering Department, Engineering Faculty, Süleyman Demirel University, Isparta, Türkiye

Abstract

Our country has many species in fruit and vegetable cultivation. One of them is Gilaburu fruit (*Viburnum Opulus*), which has spread to different regions, especially in Kayseri. Due to the valuable nutrients it contains, Gilaburu fruit finds use in different industries such as fruit juice, nectar, vinegar, jam. Thanks to the nutrients it contains, Gilaburu fruit is used in traditional medicine to dissolve kidney and sandstones, strengthen the immune system, lower cholesterol, and treat high blood pressure and heart diseases. Longer preservation of products in fruits and vegetables; Drying process has been applied since ancient times to prevent deterioration caused by microbial and/or biochemical changes. Sun drying is one of the traditional drying methods used by manufacturers. Besides of advantages like being low cost and practical application, this method leads to nutrient and quality losses in the dried product. Thus manufactures focus on alternatives. One of them and the most common one is convectional drying in other words drying in a drying chamber under controlled hot air stream. In this study, Gilaburu fruits were obtained from a local producer in Kayseri. Drying processes were carried out in a convectional oven at 60, 70 and 80 °C in three repetitions. The effects of different drying conditions on the drying characteristics of Gilaburu fruits were examined. The physical, physico-chemical and chemical properties of dried Gilaburu fruits were determined. Drying time for Gilaburu fruits decreased with increasing temperature. As a color parameter total color change with respect to fresh fruit (ΔE) was investigated. The results indicated that it remained almost identical with temperature change. Similar trend was observed for rehydration rate. Titration acidity and pH values showed compatible changes. With temperature increase, titration acidity increased, as pH decreased. As textural properties, skin-hardness and elasticity of dried fruits were measured. As hardness increased, elasticity decreased with temperature elevation. Total phenolic content and antioxidant activity of dried samples were also examined. The results showed that there were increases in both of them with an increase in temperature.

Key Words: Convectional drying, temperature change, total phenolic, antioxidant activity, texture, color

The impact of formal agriculture credit on farm productivity and its utilization in Khyber Pakhtunkhwa, Pakistan

Sanaullah Panezai¹, Sikandar Sikandar², Shahab E Saqib³, Said Muhammad⁴

¹Abdul Wali Khan University, Mardan, Pakistan

²Department of Geography and Regional Planning, University of Balochistan Quetta Pakistan.

³Department of Commerce and Management Sciences, Higher Education Archives and Libraries Department, Government of Khyber Pakhtunkhwa, Pakistan.

⁴School of Business, Zhengzhou University China.

Abstract

This study aims to explore the impact of credit, its utilization, misuse, and factors determining the extent of agricultural credit in Pakistan. A semi-structured questionnaire was developed to collect data from 316 farmers in Mardan District. The study was analyzed through statistical tools such as a paired t-test, ANOVA, and multiple regressions. Results showed that agricultural credit enhanced crops' production. However, according to percentage use, the misuse of the credit was more than its proper utilization. Farmers utilized credit in land preparation, fertilizers, seeds, pesticides, and daily labor. They misused agricultural credit in healthcare, education of children, domestic needs, and business. Results of the regression model showed that farmers' age, experience, farm size, farm income, farm labor, and land ownership were determinants of the extent to agricultural credit. Policy measures should be taken to stop the misuse of agricultural credit to achieve the target set for agricultural productivity.

Keywords: *Agricultural credit, formal credit; productivity, utilization, misuse, Pakistan.*

Introduction

Agriculture is one of the important sectors in Pakistan's economy. It contributes 26% to the gross domestic product (DDP) of the country (Rehman et al. 2015). Moreover, it engages 45% of the labor force and 67% of the population directly or indirectly depends on this sector (Bashir et al. 2010; Saqib 2015). The internal and external shocks that affect the agriculture sector are likely to affect the country's national income and a large segment of the population (OECD 2020). This volatility led the government to frame policies to combat these shocks and promote the agriculture sector. For instance, the government has implemented a policy of food security through the provision of agricultural credit for purchasing farm machinery, fertilizers, and seeds, etc. (Hussain and Thapa 2012).

Agricultural mechanization and the use of mixed inputs ensure higher productivity. However, it needs funds for the farmers' community (Bashir et al. 2010). Farmers use their savings or they have to borrow to meet these needs. Thus, to meet the required investment, agricultural credit is an important element (Hussain and Thapa 2012; Saqib et al. 2016; Saqib et al. 2018a). According to binti Abdullah (2009), agricultural credit is significant for the modernization and commercialization of farming in the advancement of recessive economies. A review conducted by Nielson and Tierney (2003) revealed that agricultural credit gives the chance to farmers, to utilize effective innovations and use the resources more efficiently to enhance food security. Farmers acquire credit from different sources, both formal and informal. Formal sources include; banks, micro-credit organizations, and nongovernmental organizations (NGOs). Informal sources include; borrowing from fellow farmers, family members, vendors, and private cash loan providers (Bashir et al. 2010; Saqib et al. 2018b). Among these sources, informal credit is very common among farmers who do not have access to formal credit. For example, Amjad and Hasnu (2007) revealed that small farmers are increasingly subject to informal sources compared to formal sources. However, informal credit sources cannot satisfy farmers' needs (Basu 2009).

In Pakistan, the government has agricultural credit policy to help the smallholders in enhancing their agricultural production and food security. For example, the former Zari Tarqiati Bank Limited (ZTBL), now called the Agriculture Development Bank, and some other business banks such as Khushali Bank, Bank of Khyber, The Bank of Punjab, Allied Bank, United Bank, MCB Bank are providing formal credit to farmers (Saqib et al. 2016; Saqib et al. 2018a). These banks are working under the supervision of the State Bank of Pakistan. In the year 2014-15, according to the State Bank of Pakistan, it has assigned characteristic agriculture credit dispensing of PKR.500 billion to seven microfinance banks, 20 business banks, four Islamic banks, and two particular banks, which are associated with an arrangement of creation and improvement advances to farmers (GoP 2015). Recently, the banks had lent PKR.1.174 trillion in 2020 to over 4 million farmers during the last fiscal year (The News 2020). The different farmers have different access to these loans, in which the smallholders are always less

advantaged (Hussain and Thapa 2012). According to The World Bank's Rural Development Strategy, smallholders are individuals who have a low resource base and have under 2 acres of cropland (Nielson and Tierney 2003). Around 87% of the world's small farmers (500 million) are living in Asia and the Pacific (IFPRI and Prices 2008). Moreover, in China, the number of small farmers is 193 million. In India, small farmers represent 93 million, Indonesia: 17 million, Bangladesh: 17 million, and Vietnam: 10 million. In Pakistan, 58% of the farmers are smallholders who have less than 2 acres of landholding. These smallholders develop just 16% of the complete household region, while farmers with more than 10 acres involved 37% of the all-out farmer region (Sarin et al. 2009).

Farmers' landholding is a key determinant in their access to formal credit. For instance, Saqib (2015) revealed that landholding and access to credit are interlinked. Furthermore, Akram et al. (2008), report that small farmers have an absence of guarantees, such as a small landholding size, that limits their access to formal credit. Besides, the land was the most significant quickly acceptable type of guarantee, which denied an enormous number of landless farmers from partaking informal credit markets. For example, farmers with small landholdings have restricted access to rural credit (Hussain and Thapa 2012). Likewise, Dzadze et al. (2012); Azam et al. (2020), Amjad and Hasnu (2007), Akram et al. (2008), and Onyango et al. (2012) reported that large landholding size prompts expanded access to credit. Moreover, the latest examination has discovered that landholding size affects agriculture credit requests (Hananu et al. 2015). Additionally, (Kosgey et al. 2013) referenced the positive effects of land ownership status on access to agricultural credit. The entirety of the above investigations utilized landholding size as a comprehensive determinant among a few other financial components influencing access to agricultural credit, which could undermine the significance of credit programs.

In Pakistan, farmers are divided into three groups based on their landholdings: small, medium, and large farmers. Nielson and Tierney (2003), revealed that farmers who have landholding up to 12.5 acres are small, economic landholdings farmers have above 12.5-50 acres while above economic landholdings farmers have above 50 acres. To help the small farmers, the State Bank of Pakistan has apportioned 70% of the credit to them. Out of total credit, 20% is apportioned to economic landholdings farmers and 10% is assigned to above economic landholdings farmers (Akram et al. 2011). Similarly in the same group of farmers, they may have different access and needs of water, manures, agriculture machinery, different information sources, land use, and even access to agricultural credit (Akram et al. 2011). Likewise, the same group of farmers is having different landholding sizes; yet they are treated under a similar credit policy. The small farmers having landholding sizes of more than 1 acre are getting more credit under the policy than farmers less than 1 acre (Hussain and Thapa 2012).

Ample of the literature has assessed farmers' access to agricultural credit, its utilization, and misutilization. However, limited studies have explored the impact of agricultural credit on agricultural production. Besides, the studies have assessed the utilization and misuse of credit in percentage. Moreover, previous studies have revealed, access or no access to credit. This study has explored factors determining the extent of credit. This study has first explored the impact of the agricultural credit on agricultural production taking data at the farm level. Second, the credit utilization in farming and non-farming activities. Third, the influencing factors in the amount of credit obtained by farmers.

Materials and methods

Study area

Mardan is geographically situated between 71° 48' to 27° 25' east longitude in 34°05' to 34° 32' north side and is the focal region of Khyber Pakhtunkhwa. Mardan can be ranked the nineteenth biggest city in Pakistan. Furthermore, the second biggest of the region of Khyber Pakhtunkhwa. It was conveniently chosen on account of being in the central zone of the province, and about 80% of its population directly or indirectly relies upon farming (Saqib et al. 2018b). The overall population is 1.45 million, having a population density of 888.5/sq. km. As per land-use statistical measures, 76% of the overall region of the district is utilized for agriculture, 22% has no cultivation, while just 2% accounts for forestry. Out of the complete cultivable region, 75% has a good irrigation system and 24.6% is open to rainfalls, while up to 0.4% has no agriculture value (Saqib et al. 2018a).

Sampling

A multi-stage sampling technique was brought under practice for the study. At first, the province of Khyber Pakhtunkhwa was selected as a sample of the study throughout the country. Then another selection was made and from within the Khyber Pakhtunkhwa, Mardan district was selected as the sample district of the study. Subsequently, Mardan tehsil was selected due to the high distribution of agricultural credit. The whole agriculture-related families that received the credit in 2019 were 2430. From this population, a sample of 343 was taken through (Yamane 1967) Eq.1. The list of farmers was obtained from ADB Mardan with their phone numbers and addresses. From the farmers' list, through random sampling, the respondents were selected for the interviews. After the data collection, the data of 316 respondents were obtained and analyzed. Seven respondents were not

available at the time of the interview and the data of 20 respondents were incomplete, therefore, were excluded from the analysis.

$$n = N / (1 + Ne^2) \quad \text{Eq. 1}$$

Where,

n= test size in every territory;

N=complete quantities of cultivating family units in a region;

e=accuracy esteem, set as 10% (0.10)

Data collection and analysis techniques

The data were collected through a semi-structured questionnaire. The data about the socioeconomic and demographic profile of the respondent, about the crops data before and after the credit, and about the credit utilization in different farm and off-farm activities.

The data were analyzed through IBM-SPSS version-26. The paired T-test was used to analyze the difference between crops' productivity before and after the credit. The one-way ANOVA was used to check the differences in utilization of credit in different activities. However, the utilization in the category "others" show that amount the farmers were not sure where they have utilized. Furthermore, multiple-regression (Eq.2) was employed to explore the association between the socioeconomic characteristics of farmers and the amount of credit obtained.

$$y = \alpha + \beta_i x_i + \varepsilon \quad \text{Eq.2}$$

Where y is the dependent variable, α is constant, β_i represents the estimated parameters of independent variables, x_i shows the independent variables, ε for the error term of the regression and i ranges from 1 to 10.

Results

Descriptive statistics of socio-economic factors

Results in Table 1 show that the minimum age was 40 and the maximum was 80 years. Education shows that the average education level of farmers was 2.84 years. Their average experience was 17.95 years. The average landholding size was 2.58 acres. It implies that the farmers were having landholding equivalent to medium farmers. There were on average 6.58 members per family. Most of the farmers had irrigated land (0.97). Farmers' annual farm income was PKR. 94580.69.

Table 1. Descriptive Statistics

Socioeconomic Factors	Min.	Max.	Mean	SD
Age	40.0	82.0	58.80	7.07
Education	0.0	16.0	2.84	5.00
Experience	4.0	60.0	17.95	6.51
Landholding Size	0.5	25.0	2.58	3.98
Family Size	3.0	35.0	6.58	2.44
Family Member Involved farming	0.0	8.0	1.15	0.73
Nature Land	0.0	1.0	0.97	0.17
Farm Income	40000.0	300000.0	94580.69	67827.63

Source: Field survey, 2019

The farmers were classified into three groups: small farmers <1 acre, medium farmers 1 to 5 acres, and large farmers >5 acres. The paired T-test results for wheat crop production show that before the agricultural credit, the production was 414.68 mounds (One mound is equivalent to 40Kg.) and after 456.49 (Table 3). The differences in the mean values of small, medium, and large farmers were significant at p-value<0.01 in wheat production before and after. However, mean differences were significant for medium and large farmers in the case of sugarcane. Similarly, all the three farmers' groups mean values in before and after situations were significant for maize crop. However, the difference between the mean values for Tobacco crop production was significant for medium and large farmers. The mean values of vegetable crops display differences in small farmers, medium and large farmers. The analysis showed that all the crops' production has been improved after the credit.

Table 2. Agriculture credit before and after Utilization on productivity

	Groups of Farmers		
	Small (< 1 Acre)	Medium (1-5 Acres)	Large (>5 Acres)
Wheat-Before	Mean (SD)	Mean (SD)	Mean (SD)
	414.68 (1128.04)	6599.08 (20493.53)	42333.33 (17614.54)
Wheat-After	456.49 (1222.82)	7242.47 (22472.87)	48666.66 (110881.52)
p-value	0.000**	0.001**	0.028*
Sugarcane Before	1646.53 (14460.73)	13966.97 (30634.09)	21900.00 (32583.38)
Sugarcane After	1983.35 (13906.11)	21966.97 (47656.45)	40866.66 (56593.39)
p-value	0.642	0.000**	0.012*
Maize Before	185.70 (377.38)	969.26 (3004.60)	19800.00 (43349.74)
Maize After	209.54 (430.96)	1216.14 (3810.19)	21783.33 (47552.31)
p-value	0.000**	0.003**	0.016*
Tobacco Before	160.22 (382.66)	753.39 (1272.21)	30.00 (68.22)
Tobacco After	1425.42 (16528.73)	825.77 (1386.44)	33.06 (75.20)
p-value	0.310	0.000**	0.023*
Vegetables Before	43163.84 (78883.48)	75809.17 (173313.61)	199133.33 (238726.17)
Vegetables After	49802.25 (90981.64)	84587.15 (190000.15)	223333.33 (263348.24)
p-value	0.000**	0.000**	0.000**

Note: * =significance at 5%, **=significance at 1%, figures in parentheses are values of standard deviation

Utilization of agriculture credit

Results in Table 3 show that small farmers had average households' annual income, PKR. 69336.15, medium farmers had PKR.92880.73, and large farmers PKR. 189066.66. The difference in the mean average income was highly significant at p-value<0.01. Likewise, the mean difference of agriculture credit among different farmers' groups was significant at p-value<0.01. The utilization of credit was divided into the different farm and off-farm activities. In the utilization amount of credit, the mean difference among the groups of farmers in land preparation was significant at p-value<0.01. Likewise, mean differences in utilization of credit in other farm activities such as fertilizers, seeds, labor, and pesticides were also significant at p-value<0.01. In percentage utilization of the credit, the small farmers reported 28.67% of the total credit in farm activities. The large farmers were using 32.25% in farm activities out of total credit. The smallest percentage (22.9%) was reported by medium farmers. In off-farm activities, 27.54% of the credit was used by medium farmers. The percentage utilization was also calculated in different farm activities for all farmers' groups. Results show that small farmers were utilizing 9.71%, 7.94%, 0.15%, 0.05%, and 10% in land preparation, fertilizers, pesticides, daily labor, and seeds respectively. Medium farmers were using 2.77%, 4.43%, 4.58%, 4.61%, and 6.49% of the credit in land preparation, fertilizers, pesticides, daily labor, and seeds respectively. The large farmers were utilizing 6.70%, 6.73%, 5.67%, 5.35%, and 7.79% in land preparation, fertilizers, pesticides, daily labor, and seeds respectively. It implies that medium and small farmers were more using the credit in farm activities than large farmers. The results of percentage utilization in different off-farm agriculture activities of the small farmers show that they were utilizing 9.03%, 5.12%, 6.51%, 17.83% in health care, education, domestic needs, and business respectively. The results of percentage utilization in different off-farm agriculture activities by medium farmers were 11.48%, 6.92%, 11.68%, and 27.54% that were in health care, education, domestic needs, and business respectively. The large farmers were utilizing 15.70%, 4.72%, 13.36%, 22.59%, and 10.71% of the credit in non-agriculture activities such as health care, education, domestic needs, and business respectively. The ANOVA test results were also significant for all the activities in which the farmers utilized the credit. The differences were significant at p-value=0.000. The overall results show that the farmers' utilization of credit were different across all activities.

Regression Model

Socioeconomic factors of the farm households were included in the regression model. Out of ten variables, six were having a significant relationship with the amount of credit they obtained. The model showed a good fit as revealed by the R²-value=0.78. There was no multicollinearity detected by the model as shown by variance inflation factor (VIF) values mentioned in Table 4. Results show that age has a positive association with the amount of credit. It implies that as the age increase by one year, the amount of credit will increase by PKR. 1016.37. Unlike the results for age, experience has a negative association with the amount of credit obtained. Results show that as the experience increases by one year, the credit will reduce by PKR. 969.08. Results for farm size show that as the farm size changes by one unit (acre), it will increase the amount of credit obtained by PKR. 2032.26. Its results are highly significant at p-value=0.000. Farm labor involved in farming is also significantly and positively associated with the amount of credit (p-value=0.004). The results show that if the farm labor increases by one unit, the credit will increase by PKR 17098.47. However, land ownership has a negative and significant association (p-value=0.000) with the amount of credit obtained. Its results show that as the land ownership changes from owner to non-owner the amount of credit will decrease by PKR. 50143.05.

Table 3. Utilization of agriculture credit

	Groups of Farmers			F	Sig
	Small (< 1 Acre)	Medium (1-5 Acres)	Large (>5 Acres)		
Farm Income	Mean (SD)	Mean (SD)	Mean (SD)		
	69336.15 (62591.67)	92880.73 (53462.12)	189066.66 (99245.05)	45.16	0.00
Total Amount credit	101384.18 (54628.69)	271110.0 (111857.07)	295666.66 (104078.33)	171.40	0.00
Utilization of Credit in Agriculture activities					
Land Preparation	9847.45 (3163.06)	7532.11 (6962.18)	19833.33 (9780.64)	57.16	0.00
%	9.71	2.77	6.70	--	--
Fertilizers	8056.49 (2777.17)	12020.18 (15414.15)	19900.00 (9628.80)	20.85	0.00
%	7.94	4.43	6.73	--	--
Pesticides	152.54 (1052.27)	12422.01 (4422.25)	16766.66 (4415.35)	764.14	0.00
%	0.15	4.58	5.67	--	--
Daily Labor	56.49 (751.64)	12515.59 (5382.89)	15833.33 (3494.65)	601.62	0.00
%	0.05	4.61	5.35	--	--
Seeds	10954.80 (6735.10)	17620.18 (7466.36)	23033.33 (4723.26)	58.39	0.00
%	10.80	6.49	7.79	--	--
Total (%)	28.67	22.90	32.25	--	--
Utilization in Non-agricultural activities (misuse)					
Healthcare	9163.84 (13240.40)	31128.44 (17854.91)	46100.00 (23016.26)	106.14	0.00
%	9.03	11.48	15.70	--	--
Education	5192.09 (9300.98)	18779.81 (14724.85)	14433.33 (7541.53)	50.11	0.00
%	5.12	6.92	4.72	--	--
Domestic Needs	6647.72 (11010.16)	31688.07 (20069.18)	39266.66 (15411.44)	123.35	0.00
%	6.51	11.68	13.36	--	--
Business	18084.74 (26377.25)	74678.89 (41117.91)	67833.33 (40292.96)	105.60	0.00
%	17.83	27.54	22.59	--	--
Total (%)	38.51	57.64	56.39	--	--
Other	33265.53 (15727.16)	52541.28 (32223.81)	32666.66 (21961.30)	24.70	0.00
Total (%)	32.81	19.38	10.71	--	--

Table 4. Regression Model

Variables	Coefficients	Std. Error	P-Value	VIP
Age	1016.37	1025.177	0.026*	1.37
Education	-933.40	1297.914	0.245	1.08
Experience	-969.08	937.891	0.036*	1.36
Farm Size	2032.26	1498.121	0.000**	1.12
Farm income	0.47	0.087	0.000**	1.04
Family size	11608.36	2784.335	0.146	1.19
Farm labor involved in farming	17098.47	8901.439	0.004**	1.09
Nature of Land	6933.79	38262.998	0.608	1.05
Land ownership	-50143.05	21582.13	0.000**	1.21
Constant	39764.39	69926.611	0.57	
R ² Square		0.785		

Discussion

The findings of the study show that agricultural credit is playing a significant role in increasing farm productivity. Results showed that wheat, sugarcane, maize, tobacco, and vegetable production have increased after the utilization of credit. It implies that the recent agricultural credit policy (allocation of huge funds to the agriculture sector) plays a key role in agricultural development in Pakistan. The results of the study are consistent with the findings of Shah and Gilliams (2008), who reported that the crops cultivated areas have increased after the credit. According to Mwangi (2009) maize crop has manifested that the availability of fertilizer and seeds' variety increased crop production due to the provision of agricultural credit. Furthermore, Saqib et al. (2018a) and Hussain and Thapa (2012) have reported that agricultural credit is significant for the modernization and commercialization of farming in the advancement of backward economies. According to another study by Sherlala et al. (2018), agricultural credit plays a vital role in the productivity of crops such as wheat, sugarcane, maize, tobacco, vegetable, etc.

Findings of agricultural credit utilization show that most of the small farmers utilized agricultural credit in different agricultural activities. Farmers utilized credit in land preparation, fertilizers, pesticide, daily labor, and seeds. However, there was a difference in the use of credit among farmers. Khan (2019), revealed that small farmers have utilized the credit more than the large and medium farmers in the process of land preparation, buying fertilizers, and seeds. This implies that small farmers needed credit more for these activities. However, in farming activities such as pesticide use and daily labor, they didn't need credit. The large farmers were insufficient in the

farm labor force. Therefore they were hiring labor from the labor market. Therefore, they utilized more credit than small and medium farmers in daily labor. The study also revealed that farmers misused credit in off-farm activities. The farmers utilized credit in non-agricultural activities, for example, healthcare, education, domestic needs, and business. Hussain and Thapa (2012) proved that large-scale farmers do utilize agricultural credit for educational, health-related activities, festivals, and repaying of loans. However, our study shows that agricultural credit was mostly misused by large and medium farmers. The findings of our study are consistent with that of Raad et al. (2012). They revealed that large farmers show more fungibility than small farmers. According to Nosiru (2010), agricultural credit was substituted for other than agriculture purposes. A similar study conducted by De Klerk et al. (2013), revealed that agricultural credit is mostly used in other than farming purposes. The study is supported by the findings of Katchova and Barry (2005). They revealed that agricultural credit was misused in miscellaneous activities. The study of Antón et al. (2013) explored that poor farmers and loan seekers misused agricultural credit for business and other activities. The study of Raza et al. (2018) is similar to that of our study which showed that the agricultural credit was utilized in healthcare, education, domestic needs, business, and miscellaneous activities. Influencing factors of access to credit show that an increase in age increases access to credit. The findings for age are consistent with that of Henri-Ukoha et al. (2011). They revealed that age influences access to credit. Furthermore, studies show that access to agricultural credit depends on the experience of the farmers. Experienced farmers have more knowledge about the farm procedures to get loans from the banks. Saqib et al. (2018c), reported that experienced farmers were getting more credit than inexperienced farmers. Furthermore, farm size has a positive and significant relationship with the amount of agricultural credit. Therefore, the farm size is a very important socioeconomic factor in accessing credit from formal financial sources. Further, it is a symbol of high social status in the society which helps in obtaining credit from formal financial channels. The findings of this study are in agreement with Saqib et al. (2016). They revealed that large farmers had no issue of guarantee and they obtained more credit than small farmers. Furthermore, farm income plays a key role in the amount of credit obtained. The more the farm income means that the farmers' repaying ability of loan is high. Therefore, the formal institutions extend more credit to those farmers, who have more farm income. A study from Pakistan reported that the monthly income of farmers was positively influencing the amount of credit (Saqib et al. 2016). Likewise, the farm labor was positively influencing the amount of credit. It implies that more farm labor ensures more productivity; consequently, provides more financial stability to the farmers. Bhalotra and Heady (2003) reported that the farms prepared better by labor had given good and prosperous productivity. Land ownership led to more credit. It implies that if a farmer has ownership of land, they have ownership documents. Therefore, these farmers have no issues with the guarantee to be produced to the bank. Kauffman (2013) pointed out that land ownership is means of collaterals for the banks.

The study conveys the message that utilization of agricultural credit in farm activities enhanced crops' productivity. If the Banks and governmental agencies ensure the credit utilization in agricultural activities and stop its misuse, it can enhance agricultural productivity in the future.

Conclusion

The findings of the study revealed that agricultural credit has improved agricultural production. However, the credit was utilized both in agricultural and non-agricultural activities. Farmers utilized credit in land preparation, fertilizers, seeds, pesticides, and daily labor. However, significant differences were reported in farmers' utilization in these activities. Small farmers were more utilizing the credit in land preparation, fertilizers, and seeds. Whereas, large farmers were mostly utilizing pesticides and daily labor. Besides, farmers also misused the agricultural credit in healthcare, education, domestic needs, and business. It is pertinent to note that large and medium farmers misused agricultural credit more than small farmers. Socioeconomic factors played important role in the extent of agricultural credit. The policymakers are suggested that more agricultural credit should be provided to these farmers. It enhances agricultural production and can play role in food security and poverty alleviation. Moreover, steps should be taken to control the misuse of agricultural credit. Banks should ensure that credit should be used for agricultural purposes.

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Effect of *Mondora myristica* and *Tetrapleura tetraptera* on Oxidative Stability of Coconut Oil and Palm Kernel Oil

Frank-Oputu Ayibaene¹, Odangowei I. Ogidi², Wodu Ebizimor¹, Eboh Abraham S.¹ and Chibuzor N. Victor-Bryan¹

¹Department of Biochemistry, Niger Delta University, Wilberforce Island, Bayelsa State

²Department of Biochemistry, Federal Polytechnic, Ekowe, Bayelsa State

Abstract

Oxidative stability of oils is defined as the resistance to oxidation during processing and storage. Lipid oxidation breaks down the fatty acids, thus, causes the loss of nutritional quality and produces undesirable color, flavor and toxic components making the food unacceptable by consumers. It is the major cause of deterioration of the quality of edible oils. This study was aimed at determining the effects of *Mondora myristica* and *Tetrapleura tetraptera* on the oxidative stability of coconut oil and palm kernel oil. Classical chemical methods were used to determine primary and secondary oxidation products (peroxide value, oxidative stability and p-anisidine value). Results obtained from the study revealed that there was a significant ($P<0.05$) decrease in the oxidative stability of coconut and kernel oils as time increases. Compared to the control and Vitamin E (tocopherol), specimen A (*Mondora myristica*) and specimen B (*Tetrapleura tetraptera*) had a greater ability to stabilize coconut and Palm kernel oils. Natural antioxidants added to edible oils indicate that they provide variable protection against light induced auto-oxidation. Measuring fatty acid formation and measurement of peroxide values as a means of monitoring oxidation, results also indicates an inhibitive effect on oxidation. In conclusion, *Mondora myristica* and *Tetrapleura tetraptera* have antioxidant phytochemicals that aid the prevention of lipid autooxidation which reveals their usefulness as spices and oil flavors. Thus, their use for flavoring of oils and improvement of oil shelf life is highly recommended.

Key Words: *Mondora myristica*, *Tetrapleura tetraptera*, Oxidative stability, Coconut oil, Palm kernel oil

Antagonistic Activity of *Bacillus* spp. Against Fire Blight Disease *In vitro* and *In planta*

Haris Butt, Kubilay Kurtulus Bastas*

Selcuk University Faculty of Agriculture Dept. of Plant Protection, Campus, Konya, Turkey

*Corresponding author e-mail: kbastas@selcuk.edu.tr

Abstract

Fire blight, affecting more than one hundred and thirty species in the *Rosaceae*, is probably the most destructive disease affecting pear and apple cultivars in many countries. Currently, there are no effective synthetic compounds with systemic properties. Other major problem is the occurrence and spread of strains of *Erwinia amylovora* with resistance to streptomycin and copper. Taken into consideration the human and environmental health, the use of biocontrol agents either as an alternative or as a supplement within an integrated fire blight management strategy has attracted worldwide attention. In this study, *E. amylovora* solution of 10^7 CFU ml⁻¹ was treated with bio-control agents, *Bacillus subtilis* str. QST 713, *B. amyloliquefaciens* str. MBI 600 and their mixture (at solution densities of 10^6 , 10^7 and 10^8 CFU ml⁻¹ for each one) on Petri dishes, containing King's B medium and, compared with positive (streptomycin sulphate) and negative (sterile distilled water) controls. *In vivo* studies were performed on two-year-old apple cv. Gala seedlings grown in 45-cm-diameter pots containing a sterilized mix of soil-sand-peat under controlled greenhouse conditions (85% relative humidity, 25°C temperature and 16h of day light). The plants were irrigated as needed by drip-irrigation and each pot received a mineral solution (NPK: 20-20-20) at 2 g l⁻¹ twice. When plant shoots reached a length of 30-35 cm, bio-control agents, individually and their mixture, were applied to the plants by a hand-sprayer. Obtaining the data, in *in vitro* studies, 10^8 CFU ml⁻¹ of *Bacillus* spp. suspension mixture showed strongest antibacterial effect (26mm) among the tested treatments after positive control streptomycin (28.6mm). Parallel to *in vitro* findings, the mixture was most effective against the pathogen on cv. Gala (66.03%). Findings show that the use of mixture of beneficial microorganisms with individual antagonistic properties against the pathogen can be an effective strategy as a natural alternative to agrochemicals in the scope of good agriculture practices.

Keywords: *Erwinia amylovora*, *Bacillus*, bio-control, apple, *in planta*

Effectiveness of Boron Formulations against *Pseudomonas syringae* pv. *tomato* in Tomato Seeds

Aysegul Gur¹, Kubilay Kurtulus Bastas^{1,*}, Saban Kordali², Ferah Yilmaz^{2,d}

¹Selcuk University Faculty of Agriculture Dept. of Plant Protection, Campus, Konya, Turkey

²Muğla Sıtkı Kocman University Faculty of Agric. Dept. of Plant Protection, Fethiye, Turkey

*Corresponding author e-mail: kbastas@selcuk.edu.tr

Abstract

Pseudomonas syringae pv. *tomato* (Pst), the causal agent of bacterial speck of tomato cause serious disease outbreaks in high leaf wetness, cool temperatures, and cultural practices that allow bacteria to disseminate between host plants. Boron is an essential micronutrient for growth and development of healthy plants and in agriculture. In this study, the effectiveness of 14 different boron formulations at 5 doses (1, 5, 10, 20 and 40 mM) was evaluated against Pst under *in vitro* conditions, and the 4 most successful formulations that prevented Pst, were used to coat tomato seeds of the H2274 variety pre-inoculated with the pathogen. Obtaining the data, Pst population at 10⁸ CFU ml⁻¹ density did not grow at 5 mM doses of ammonium tetrafluoroborate (AT), sodium tetrafluoroborate (ST), zinc borate (ZB) and disodium octaborate tetrahydrate (DOT) formulations, and these chemicals were used in seed assays. In controlled conditions, germination and plant emergence rates of the seeds were determined in pots, inoculated with the pathogen at 10⁸ CFU ml⁻¹ density and coated with AT, ST, ZB and DOT formulations at 5 mM doses. Among the 14 different boron formulations used in the experiments, DOT, which has 92% effectiveness in inhibiting Pst populations in tomato seeds of variety H2274, was the most successful active ingredient while 39 percent success was achieved with ST applications. The results of the present investigation revealed the significant effects of boron treatments on Pst infected tomato seeds when compared to the control, and it is thought that boron could offer an economical and simple management in reducing bacterial speck contamination in tomato seeds.

Keywords: tomato, bacterial speck, boron, seed

Production of F₁ hybrid seed of turnip by autopolyploidization

Waseem Liaquat¹, Faizan Nisar², Waqar Akram³, Muhammad Usman Aslam³, Muhammad Awais Ghani^{1*},

*corresponding author: awais.ghani@uaf.edu.pk

Institute of Horticulture, University of Agriculture, Faisalabad, Pakistan

Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

Turnip is an important root vegetable in Pakistan. It has the low yield due to the lack of high yield hybrid seed. Hybrid seed of turnip cannot be developed due to some factors which include male sterility, embryo breakdown and self-incompatibility. Autopolyploid technique in turnip is very valuable to develop new hybrids by transferring desirable traits from one species to another. So, for the Production of F₁ seed of turnip autopolyploidization technique by 3-way crossing below colchicine treated and nontreated seeds of various genotypes, after growth of two to three months. The experiment was conducted at vegetable research area, University of Agriculture Faisalabad. Autopolyploid F₁ hybrids were produce by the three-way crossing of different 22 genotype with each other. Colchicine treated plant were prepared by dipping of seeds in colchicine (0.25%) for 8 hours. Vegetative and reproductive parameters including germination percentage, days to germination, days to flower setting, seeds per silique were collected simultaneously in total period of experiment. The field experiment was laid out according to randomized complete block design (RCBD). Data was statistically investigated for morphological inconstancy in F₁ cross hybrids. It was observed that treated varieties took more time to germinate. There was no variation for days to flowering in treated and non-treated genotypes. Plant height and plant diameter was reduced in treated genotypes. Petal length was increased in treated genotypes. Silique length was found more in treated genotypes while in non-treated genotypes silique length was less. Maximum number of seeds were observed in treated x non-treated. Maximum cross successful percentage was observed treated x non-treated. Overall results showed that by treating seed with colchicine provide a wide range of variation. This procedure provides selection criteria for improving and transferring of desirable characters into cultivars.

Key words: Autopolyploid, Colchicine, genotype.

Genetic Response Of Chili Cultivars Against Anthracnose Caused By *Colletotrichum Capsici* And Its Management Through Phytoextracts And Chemicals

Yusra Gulzar*, Waqar Akram, Muhammad Usman Aslam, Iram Shafiq, Bisma Ijaz, Aina Israr

*corresponding author: yusragulzar971@gmail.com

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

Chili (*Capsicum annuum* L.) is very significant and valuable crop belongs to the family solanaceae. It has a great economic value around the world but facing many disease problems both in the field and storage condition that reduce the yield and quality of the fruit. *Colletotrichum capsici* is a major plant pathogen that causes anthracnose, a destructive disease of cereals, legumes, tomatoes and some perennial crops all around the world. The current research were conducted to determine the pathogen of anthracnose of chili and its management through plant extracts and fungicides. For this purpose, diseased samples were collected from infected field. The associated fungus were isolated, purified and identified on the bases of morphological characteristics and pathogenicity tests were performed to confirm the pathogen by following the Koch's postulates. Germplasm of chili were collected to search out the resistant and tolerant source against anthracnose of chili. The field experiment were conducted under RCBD. Seventeen varieties 10549, M6T142, M7T133, 10938, 4728, 10544, 10554, 10468, Skyline, 10468, 1788, Ghootki, Nageena, NARC-4, 4828, 10599, Desi were collected from Ayyub Agricultural Research Institute (AARI) which were used as research material to screen resistant germplasm against chili anthracnose disease. Out of seventeen varieties 10549 showed highly resistant response. M6T142 and M7T133 showed resistant response. 10938, 4728, 10544, 10554, 10468 and Skyline showed moderately resistant response. 10468, 1788, Ghootki, Nageena, NARC-4 and 4828 showed susceptible response. While 105559 and Desi showed highly susceptible response. Poisoned food technique was used for evaluation of different chemicals and phytoextracts against the disease in lab condition by using CRD. The best selected chemicals and phytoextracts were also be evaluated under natural condition against susceptible varieties of chili. Kalvanji and Alsi were found most effective among the plant Extracts. Topsin M and Contaf plus were found most effective among other Fungicides. The data was statically checked.

Key words: Germplasm, susceptible, pathogenicity.

Assessment Of Phyto-Extract And Chemicals Against Fusarium Wilt Of Cucumber

Aina Israr*, Waqar Akram, Muhammad Usman Aslam, Iram Shafiq, Bisma Ijaz, Yusra Gulzar

*corresponding author: ainaisrar136@gmail.com

Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan

Abstract

Cucumber (*Cucumis sativus* L.) is a well-known vegetable, belongs to family *cucurbitaceae*. *Cucurbitaceae* are widespread throughout the world in tropical and sub-tropical region and consist of 118 genera and 825 species. Cucumber is world widely cultivated vegetable. In Pakistan total production of cucumber is 54.29 thousand tons. Fusarium wilt of cucumber is a common fungal disease that is caused by *Fusarium oxysporum* f.sp. *Cucumerinum* responsible for devastating cucumber crop with 30% production losses. The aim of the current research is to determine an effective management of different chemicals and Phyto-extract against *Fusarium oxysporum* in lab condition as well as in field. For this purpose, the sample was collected and associated fungal pathogen isolated, purified and identified on the basis of morphological characteristics. Five varieties were collected and evaluated in sick field under RCBD. Shaheen, Hcu-163, Cuc-30, Hashim and Local were collected from Ayub Agriculture Research Institute (AARI) which was used as research material to screen resistant germplasm against *Fusarium* wilt disease. Out of five varieties two varieties Shaheen and Hcu-163 showed moderately susceptible response. Cuc-30, Green cucumber and Hashim showed susceptible response. While Local variety showed highly susceptible response towards *Fusarium* wilt disease. For the management of *Fusarium* wilt of cucumber an experiment was designed with three replications of each treatment with six different concentration of chemicals (Score, Flint max, Contaf plus, Topsin M, Alext super, Fosil) and phyto extracts (Kari pata, Ajvain, Kalvanji, Kahni, Alsi, Gajr boti) under Completely Randomized Block design (CRD), separately. Among the Chemicals Score expressed the best results to manage the *Fusarium* wilt disease. Similarly, among different Phyto extracts Kari pata showed the best results to manage the disease. The best selected fungicides and Phyto-extract was also evaluated under natural condition against susceptible crop. Kari pata+ Flint max expressed the best result against *Fusarium* wilt *in-vivo* condition. Data was evaluated by using LSD test.

Key words: Phyto-extract, Topsin M, Kari pata.

Changes in Drip Loss and Water Holding Capacity During Beef Aging in Aberdeen Angus, Charolais, Hereford, Limousine, and Simmental Cattle Breeds

Sena Ardicli¹, Hakan Ustuner², Oznur Arslan³

¹Department of Genetics, Faculty of Veterinary Medicine, Bursa Uludag University, Bursa, Turkey

²Department of Animal Science, Faculty of Veterinary Medicine, Bursa Uludag University, Bursa, Turkey

Abstract

The demand for high-quality beef has been increasing in recent years. Hence, the improvement of beef quality characteristics is one of the main objectives to positively influence consumers' choices in the meat marketplace, especially for upscale restaurants or specialty shops. Although the common trend in beef quality studies is mostly on tenderness; drip loss and water holding capacity are important indicators to determine certain correlated quality characteristics, such as juiciness, and to evaluate technological properties of meat. Another important point is that aged beef is getting more popular. But the scientific studies on the corresponding subject seem to be limited. Therefore this study was designed to evaluate the changes in drip loss and water holding capacity during different periods of beef aging. A total of 40 beef samples were obtained from Aberdeen Angus, Charolais, Hereford, Limousine, and Simmental bulls. Animals of the same age (468.50 ± 2.52 d) and slaughter weight (608.15 ± 2.11 kg) were selected. They were slaughtered on the same day at a commercial abattoir and were dressed using standard commercial procedures. In this context, the longissimus dorsi muscle was removed from half of the carcass. Each sample was divided longitudinally into two sections resulting in four samples for each animal. Initially, the analyzes were performed using fresh beef samples (day 0), and then beef samples were each aged for 24h, 72h, and 7 days at 4°C to compare the water loss values through the aging period. After the moisture on the outer surfaces of the samples was carefully dried with a paper towel, it was weighed on a precision balance (Radwag AS220/C/2, capacity 220 g, readability 0.10 mg, Bracka, Poland) and the weighing result was recorded as the initial weight (IW). The sample was placed in a transparent bag and finally weighed again after keeping it at the corresponding aging periods and recorded as the final weight (FW). Drip loss (also known as the passive water loss) was calculated with the following formula which expresses the ratio of passive water loss during aging timepoints: $\text{Drip loss (\%)} = [(IW - FW) / (IW)] \times 100$. Concerning water holding capacity, a meat sample weighing 5 g was placed on 10 cm diameter filter papers between two petri plates and was pressed under 2.25 kg for 5 min. Following the removal of the filter papers and the weight, water holding capacity, as a percentage, was calculated as $(\text{final filter weight} - \text{initial filter weight}) / \text{meat sample weight} \times 100$. Testing homogeneity of variances was performed with the Anderson-Darling test. The data were considered as repeated measures (24h, 72h, 7 days aging treatments) and statistically analyzed by using Friedman's test with the post hoc comparison by the Dunn's test. Results revealed that significant differences were found between breeds through aging treatments regarding drip loss ($P < 0.05$). In this context, beef samples obtained from Aberdeen Angus cattle had the lowest drip loss while samples of Charolais lost the highest amount of water passively during the aging time. No significant difference in water holding capacity was seen between groups. Data from the present study indicate that aging affected the drip loss considering Aberdeen Angus, Charolais, Hereford, Limousine, and Simmental breeds. Further investigation is needed to understand biochemical processes during beef aging and the development of meat tenderness.

Key Words: Beef quality, Passive water loss, Water holding capacity, Beef aging

The Effect of Semen Dilution on the Number of Spermatazoa Entering the Spermatheca of the Queen Honey Bee (*Apis mellifera* L.)

Yasin Kahya¹, H. Vasfi Gençer¹

¹Department of Animal Science, Faculty of Agriculture, Ankara University, Ankara, Turkey

Abstract

The queen mates with several drones successively in one or more mating flights, although a single drone ejaculates sufficient spermatazoa to fill the spermatheca of a queen. About 100 million spermatazoa acquired during mating was temporarily stored in the lateral oviducts. Only 5% of all spermatazoa migrate from lateral oviducts to the spermatheca, while an enormous amount is discharged from the reproductive tract within 24 hours. We detected whether diluent addition to the fresh semen injected to the queens by instrumental insemination cause an increase or decrease in the number of spermatazoa entering the spermatheca. The queens reared by the grafting method were introduced into mating boxes one day before adult emergence. When the queens were 7-day old, they (n=63) were allocated into four insemination groups for the following treatments. The queens in group 1 and group 2 were inseminated with 4 µl and 8 µl fresh semen, respectively. The queens in group 3 were inseminated with 4 µl fresh semen diluted 1-fold with NaCl (0.09%) solution (8 µl total volume). The queens in group 4 were inseminated with 8 µl fresh semen diluted 1-fold with NaCl (0.09%) solution (16 µl total volume). After onset of oviposition, each queen was dissected, and the number of spermatazoa in the spermatheca was counted. The mean number of spermatazoa in the spermathecae of queens inseminated with 4 µl fresh semen (2.57 million) was not significantly different from those of queens inseminated with 8 µl (4 µl semen+ 4 µl diluent) semen-diluent mixture (2.68 million, P>0.05). Nevertheless, the difference in the number of spermatazoa between the queens inseminated with 8 µl fresh semen (4.46 million) and the queens inseminated with 16 µl (8 µl semen + 8 µl diluent) semen-diluent mixture (3.51 million) was found statistically significant (P<0.05). The results revealed that increasing the volume of semen by dilution affected the number of spermatazoa entering the spermatheca. The addition of 1-fold diluent to 4 µl fresh semen did not cause any significant increase or decrease in the number of spermatazoa, but the addition of 1-fold diluent to 8 µl fresh semen negatively affected the number of spermatazoa entering spermatheca.

Key Words: honey bee queen, *Apis mellifera*, spermatheca, spermatazoa migration, semen dilution

A popular functional food: celery (*Apium graveolens* L.)

Elif Çil¹

¹Department Department of Maths and Science Education, Faculty of Education, Ordu University, Ordu, Turkey

Abstract

Celery is known as *Apium graveolens* in literature and is relative to carrots, parsley, and cilantro. Before being popular among influencers on social media, it had quite an illustrious history. Egyptians placed wild celery in King Tutankhamen's tomb, and Romans were the first nation that cultivates celery for medicinal use. It was used in celery wine and making a crown for athletes in Panhellenic games by Greeks. Italians and French first cultivated celery, and it has long been used medicinally by Arabs, Chinese, and Indians. The medicinal parts of the plant are roots, leaves in the world. Its seeds are also so valuable in India, Europe, United States of America. It is a vegetable containing a high antioxidant level and vitamin C. Its popular aim for medicinal purposes is to eliminate body toxins from the kidney, liver, and spleen. It has been reported that celery has antimicrobial effects on pathogenic bacteria, especially Gram-positive ones. Even though celery contains high sodium, it also lowers blood pressure because of 3-n-butyl phthalide. Celery has been used to prevent/cure hyperpigmentation on the skin or gastric ulcers successfully. It is also used as a flavoring agent in the food industry. In recent years, studies have been aiming to extend the shelf life of the food by adding celery juice or powder instead of commercial nitrate to foods such as sausage and salami. On the other hand, allergic reactions to celery range from oral activity to severe anaphylaxis. Since celery allergens are essentially heat and allergy-resistant, packaged products containing celery should include an allergen warning on the label. In this review, it was documented in the wide range about celery from archaeobotanical researches to most recent literatures. The existing findings illuminate the significance of *A. graveolens* in traditional medicine and their impact on the treatment of various diseases. This review vigorously supports the fact that *A. graveolens* is a good source of functional food.

Key Words: Archeobotanic, Traditional medicine, Medicinal usage, allergenic food

Introduction

Celery is known as *Apium graveolens* in the family Apiaceae in literature and is relative to carrots, parsley, and cilantro, which has been cultivated as a vegetable since antiquity (Table 1, Fig.1). According to Flora of Turkey, two *Apium* species are found in Turkey, generally in coastal areas (Davis, 1972). The genus name, *Apium*, is derived from the Latin word "apis," meaning "bee," as its tiny white flowers attract the bees. The species epithet "graveolens" means "heavily scented." The English word "celery" is derived from the Latin word "celer," which means "swift," as celery is considered a fast-acting remedy (Khalil et al., 2015). Nomenclatures of species in genus *Apis* in Turkish are kereviz for *A. graveolens* and Bendik for *A. nodiflorum* (<https://www.bizimbitkiler.org.tr>). The celery that is well known today is *Apium graveolens* var. *dulce* named stalk celery, and *Apium graveolens* var. *rapaceum* was also cultivated simultaneously.

Table 1. Botanical classification of celery

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliopsida
Subclass	Rosidae
Order	Apiales
Family	Apiaceae
Genus	<i>Apium</i>

Species *A. graveolens* Linn



Fig. 1. *A. graveolens* Linn
(www.tropicalplantbook.com)

Archaeobotanical researches

Before being popular among influencers on social media, it had quite an illustrious history. Archaeobotanical research showed that Egyptians placed wild celery in King Tutankhamen's tomb (Allen, 2006; Tomashevskaya, 2019). In Figure 2, remarkably well preserved floral collars from the embalming cache of Tutankhamun has celery leaves and are exhibited in the Met museum in New York City in the USA. One of the reasons that the Egyptians used wild celery in tombs is for dying purposes because *A. graveolens* has rich flavonoids that could be used to prepare natural dyes (Deveoğlu & Karadağ 2019).



Fig. 2. Collar from the embalming cache of Tutankhamun
(<https://www.metmuseum.org/art/collection/search/684769>)

Celery is an important herb that has a historical status in Greeks. It is mentioned in Homer's Iliad and Odyssey, too. The horses of Myrmidons grazed wild celery in the marshes of Troy in Homer's Iliad. The Odyssey mentions the violets and wild celery fields surrounding Calypso's Cave (Megaloudi, 2005). It was used to make a crown for athletes in Panhellenic games, which revived the Nemean Games and made celery wine by Greeks (Megaloudi, 2005; Beye 2019; Sauer et al., 2020; Fig. 3-4).



Fig. 3. A crown for athletes in Panhellenic games (It was taken from Dr. Rasmussen at <https://holylanphotos.org>)

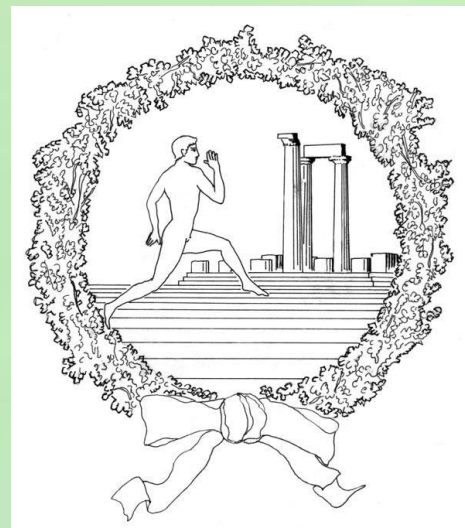


Fig. 4. The Nemean Games
(<https://nemeacenter.berkeley.edu/the-ancient-stadium/>)

Ethnobotanical Researches

According to Baharvand-Ahmadi & Asadi-Samani, "*ethnobotany deals with the traditional therapeutic properties of the medicinal plants used by people of different cultures and regions*" (Baharvand-Ahmadi & Asadi-Samani, 2017). This aromatic plant has long been used medicinally by Arabs, Chinese, Egyptians, and Indians for at least a millennium. Ethnobotanical researches show that it has been growing wild and cultivated in these countries (Asadi-Samani et al., 2015; Paniagua-Zambrana et al., 2020; Bencheikh et al., 2021). The medicinal parts of the plant are generally stalks, seeds, and leaves. When combined with emmer seeds, celery-treated teeth, cool the uterus, and contraceptives (Tomashevska, 2019). Its roots are also valuable in India, Europe, and the United States of America (Sowbhagya 2014; Andrei et al., 2018).

The chemical constituent

Today, celery is an indispensable member of many cuisines with its rich nutritional content and aroma. It is a vegetable that contains excellent natural fiber, minerals, and antioxidants, especially vitamin C and vitamin K, with a low glycemic index (Profir & Vizireanu 2013; Ibrahim 2016; Ruiz-De Anda et al., 2019; Spînu et al., 2020). Academic reports about the elementary composition of celery showed that it was rich in calcium, magnesium, copper, zinc, manganese, and selenium, especially in stalk parts (Profir & Vizireanu 2013 Golubkina et al., 2020). Celery contains potent antioxidants like phenolic compounds, flavonoids, essential oils. These antioxidants cannot be produced by the human body and should be taken in through the daily diet for a healthy body. So antioxidants

from natural products are always attracting researchers' attention. At this point, for aiming for maximum yield and minimum loss, choosing the correct or appropriate extraction method is vital. Spînu et al. (2019) reported that the best extraction method for extracting total phenols and flavanoids from unprocessed celery among ultrasound and microwave-assisted accelerated solvent extraction is ultrasound-assisted extraction. Conversely, microwave-assisted extraction from unprocessed celery is the best for total antioxidant obtaining.

Pharmacological activity

On the other hand, celery is a vegetable whose name is usually mentioned in conventional treatments, and nowadays, many researchers from different science sections have been interested in it. Its most popular aim for medicinal purposes is to eliminate body toxins from the kidney, liver, and spleen (Sowbhagya 2014; Asadi-Samani et al., 2015; Andrei et al., 2018). Kolarovic et al. (2009) reported that celery roots and leaves have a protective effect when applied with Doxorubicin. Kolarovic et al. investigated the effects of celery juice on male Wistar laboratory rats and concluded that celery leaves juice has a protective effect (Kolarovic et al., 2009). Celery extracts have exhibited anti-inflammatory, antihyperlipidemic effects in rats (Tsi & Tan, 2000; Mansi et al., 2009; Shin et al., 2019). Leaves and root extracts of celery exhibit potential activity as scavengers of free OH and DPPH radicals. So it inhibits liposomal peroxidation in the cell. Many reported studies have investigated celery's hepatoprotective, anti-spasmodic, and hypocholesterolemic activities. The methanolic extract of celery root has a crucial hepatoprotective activity against paracetamol-induced and carbon tetrachloride-induced liver damage (Al-Asmari et al., 2017). Even though celery contains high sodium, it lowers blood pressure because of 3-n-butyl phthalide (Sowbhagya 2014). Celery, dill, and parsley are used to heal urinary tract infections traditionally in Egypt and Iraq. Shaaban et al. used essential oils, and Alshwaikh et al. used watery and alcoholic extracts of these plants in their studies. Both reported that celery has antimicrobial effects on pathogenic bacteria, especially Gram-positive ones (Shaaban et al., 2012; Alshwaikh et al., 2014). Kivanç and Kunduhoğlu investigated fresh celery juice on bacteria and yeast. To the report, fresh celery juice did not show any antibacterial and anti-yeast activity among studied microorganisms (Kivanc & Kunduhoglu 1997). Celery has been used to prevent/cure hyperpigmentation on the skin or gastric ulcers successfully. The extract significantly protects the gastric mucosa and suppresses the basal gastric secretion in rats, possibly through its antioxidant potential (Al-Asmari et al., 2017).

Food & perfume supplement

Nitrite is used as a color-fixing and antimicrobial agent in processed meat products. On the other hand, it is used as a flavoring agent in the food industry. In India, the ground seed (root) is mixed with salt to produce "celery salt," which is preferred for flavoring salads, eggs, fish, and sauces (Sowbhagya 2014). N-nitroso compounds can be made from nitrite, considered carcinogens (Lee et al., 2018). In recent years, studies have been aiming to extend the shelf life of the food by adding celery juice or powder instead of commercial nitrate to foods such as sausage and salami (Horsch et al., 2014; Lee et al., 2018; Ramachandraiah et al., 2021). But the results are not perfect. So, label-friendly methods need to improve.

The essential flavor constituents of the oil responsible for the typical aroma are 3-n-butyl-4,5-dihydro phthalide (sedanenolide) (Fig. 5.). It is in wild celery and its close relatives such as dill and parsley, which makes a potential biomarker for consuming these food products.

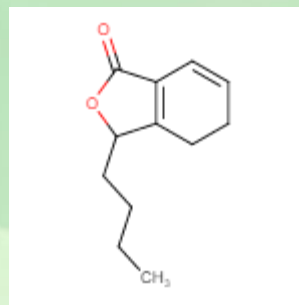


Fig. 5. 3-n-butyl-4,5-dihydrophthalide (sedanenolide) structure (<https://foodb.ca/compounds/FDB003895>)

The *A. graveolens* roots contain 2% essential oil used in flavor and fragrance industries (Sowbhagya 2014; Khalil et al., 2015; Dąbrowska et al., 2020). The essential oil from celery seeds can be used as a base in perfumes for both men and women.

Toxicity and safety

Celery juice has a strong taste and is generally preferred as a medicinal drink. So commonly used after breakfast to maximum absorbance at the stomach and should wait at least thirty minutes after drinking the celery juice before consuming anything else. At this point, we can say that celery is generally safe for widespread use. However, it may cause allergies in the central European population. Symptoms may include swelling or urticaria and

sometimes difficult breathing as anaphylaxis. If anyone has this symptom after eating celery, they need emergency medical attention immediately. Since celery allergens are largely heat and allergy-resistant, packaged products containing celery should include an allergen warning on the label. Also, pregnant women should avoid celery seed supplements, as they can cause uterine stimulation.

Another risk involves pesticides. Fang et al. reported that twenty-five pesticides were identified in total, out of which, carbofuran was found to exceed the maximum residue limit (Fang et al., 2015). Celery ranks at number 11 on the Environmental Working Group's 2021 dirty dozen™ list of 12 types of produce most likely to contain pesticides (<http://www.ewg.org/foodnews/>).

As a conclusion, this review vigorously supports the fact that *A. graveolens* is a good source of functional food.

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- <http://www.ewg.org./foodnews/>

Effect of Nitrogen and Diammonium Phosphates Fertilizer and Gumbo cultivars (*Abelmoschus esculantus* L.) on fruit phonological characteristics

Abdalla Mohamed Hussein

Department of Horticulture Sciences, Faculty of Agriculture and Natural Resources, University of Kassala, Sudan.
Email: abdallamohussein@gmail.com.

Abstract

There's variation in the consumers desire, which requires to planting different cultivars of the crop to meet different human tastes. This study aimed to evaluate the effect of nitrogen and DAP fertilizers and Gumbo cultivars on pod characters. The experiment executed in (SRCBD), with three replications. The treatments consisted of fertilizer as, zero Co, two levels of nitrogen N, 25 and 50 Kg fed⁻¹ and Diammonium Phosphates DAP, 50 and 100 Kg fed⁻¹, used as the main plot and three cultivars of Okra, Bassnty Ba, Jamoia Ja and Khartomia Kh, used as sub plot. The results show significant differences among all traits, except pod dry weight and diameter, which were not responding to the cultivars as a treatment, moreover Bassanty gave the greatest value of the pod fresh weight, dry matter and length compare with both cultivars. The plant grown without fertilizer increased pod fresh and dry weight, pod diameter and dry matter, while pod length decrease. Lower dose of DAP also donates the longest and highest pod fresh weight. The interaction presented that Bassanty with different doses of fertilizers gave the longest pod, heaviest fresh weight and higher dry matter, contrary pod diameter and dry weight were decreased, while those parameters were increased by Khartoumia received no fertilizer. Therefore, the selection of fertilizer type and an optimum dose associated with cultivar of unique pod characters should be considered to satisfy the consumers tastes.

Keywords: Nitrogen DAP, Gumbo Cultivars, Fruit Characteristics.

Intoduction

Gumbo (*Abelmoschus esculentus* L. Moench) It is a warm season annual plant harvested for its fruit, which is a long, ribbed, spineless pod. It was originated from Africa and now cultivated in tropical, sub- tropical and warm temperate regions around the world (NRC, 2006). Okra production has nutritional values and usefulness to human and animals, and it is like any other vegetable is constrained by certain factors such as weed interference, soil fertility, fertile soil, tillage practices, low yielding varieties and sub-optimal plant density (Adejonwo et al., 1989; Burnside 1993; Dikwahal et al., 2006; Adeyemi et al., 2008 and Iyagba et al., 2012). There are various ways to improving yield of Okra plant, but the best way is to provide the appropriate amount of fertilizers and to select high yielding cultivars (Ginindza et al., 2015). Dange et al., (2002) elucidated that more quantity of available phosphorus often that would have favored the plant to enter into reproductive characters. The total area under cultivation has increased over the years. India is the world largest producer, followed by Nigeria and Sudan (Varmudy, 2011). Okra is an important vegetable crop in Sudan, there fresh fruits can be consumed locally or for export, which may contribute positively to the national economy and foreign exchange earnings. Consumers prefer are a widely different, therefore it should be met with the highly and proper quality of the fruits. This study was done to evaluate the effect of nitrogen and DAP fertilizers and different cultivars of Gumbo plants on the phonological characteristics of the fruit.

Materials and Methods

Filed experiment was carried out during the summer season at the 1st March of the year 2021, in the experimental farm of the Faculty of Agriculture and Natural Resources, University of Kassala, Sudan. Situated between Longitude 35° – 36' E Latitude 15°- 18' N and Altitude 450 m ASL. A trial in Split Randomized Complete Block Design (SRCBD), with three replications was executed. Plot area was six meters square, two plants per hole were sown, each meter contains forty plants. The treatments consist of zero fertilizer Co and two levels of urea as a source of nitrogen (N 46%, P 0 and K 0) N₁ and N₂, equal to 25 and 50 Kg fed⁻¹ respectively, and DAP as a source of nitrogen and phosphorus (N 18%, P 46% and K 0) D₁ and D₂, equal to 50 and 100 Kg fed⁻¹ subsequently, and three cultivars of okra Bassnty Ba, Jamoia Ja and Khartomia Kh. Fertilizers used as the main plot, while cultivars used as sub plot. Both fertilizers added as one dose, DAP applied at the time of planting, while nitrogen applied after three weeks from sowing. The observation of fruit phonological registered were, pod fresh and dry weight, pod dry matter and pod length and diameter. The data were statistically analyzed using computer software program (MSTAT-C). The means were separated using Least Significant Difference (LSD) at probability ≤ 0.05.

Results

Effect of Nitrogen and DAP Fertilizer and Gumbo Cultivar on Pod Fresh and Dry Weight

The results in Table 1 show that the pod fresh weight significantly increased by lower dose of DAP fertilizer and decreased by the higher dose of both fertilizers, while pod dry weight significantly increased by control and decreased by the higher dose of DAP. Otherwise, the pod dry weight was not affected by cultivars as a treatment. The interaction between fertilizer and cultivar reflected significant increase. Generally, and overall fertilizer treatments, Bassanty cultivar had weightiness pod fresh weight. Khartoumia and Jamaia cultivars received no fertilizer in addition to lower doses of DAP and nitrogen respectively increased pod fresh weight. Jamaia cultivar treated by the higher dose of DAP noticed the minimum values of pod fresh and dry weight. This results confirms the fact that the moderate supplying nutrients, having positive influenced effect in the fruit attributes. Bipul et al., (2018) noticed that the integrated use of inorganic fertilizer could bring significant differences in yield attributing characters, while Saha et al., (2016) noticed that the single fruit fresh weight statistically affected by cultivars, they explained that the variation in individual fruit weight may be due to may be due to the genetic potentiality of Okra cultivars.

Table 1. Effect of Nitrogen and DAP Fertilizer and Gumbo Cultivar on Pod Fresh and Dry Weight

Fertilizer	Pod Fresh Weight (g)			Means	Pod Dry Weight (g)			Means
	Cultivar				Cultivar			
	Ba	Ja	Kh		Ba	Ja	Kh	
Co	6.00 ^a	5.75 ^a	6.00 ^a	5.53 ^a	0.646 ^{abc}	0.680 ^{abc}	0.712 ^a	0.679 ^a
N ₁	5.67 ^{ab}	6.00 ^a	4.67 ^{de}	5.44 ^b	0.678 ^{abc}	0.661 ^{abc}	0.600 ^c	0.646 ^{ab}
N ₂	5.67 ^{ab}	4.67 ^{de}	5.33 ^{bc}	5.22 ^c	0.632 ^{abc}	0.603 ^{bc}	0.695 ^{ab}	0.643 ^{ab}
D ₁	6.00 ^a	5.33 ^{bc}	6.00 ^a	5.78 ^a	0.643 ^{abc}	0.645 ^{abc}	0.646 ^{abc}	0.645 ^{ab}
D ₂	6.00 ^a	4.33 ^e	5.00 ^{cd}	5.11 ^c	0.608 ^{bc}	0.599 ^c	0.665 ^{abc}	0.624 ^b
Means	5.87 ^a	5.23 ^c	5.40 ^b		0.641 ^a	0.648 ^a	0.664 ^a	
C v %	12.11				8.14			

Differences between means as indicated by the same letters for the different treatments are not statistically significant at probability ≤ 0.05 .

Effect of Nitrogen and DAP Fertilizer and Gumbo Cultivar on Pod Length and Diameters

There were significance differences due to the fertilizer application on pod length and diameter (Table 2). DAP fertilizer in lower dose gave the lengthiest pod followed by the higher dose. Despite, the plant received no fertilizer decreased pod length, it was increased pod diameter. The lower amount of nitrogen fertilizer decreased both attributes. Bassanty cultivar had a longest pod and statistically different compared with Khartoumia and Jamaia cultivars, otherwise cultivars had no effect on the pod diameter. The interaction between couple treatments could bring significant differences in both characters. Higher dose of DAP fertilizer received by Bassantiy and Jamaia cultivars appearing higher and lower values of pod length, respectively. Khartoumia cultivar received no fertilizer increased pod diameter furthermore, this cultivar with lower doses of nitrogen decreased pod diameter. The fruit length was differed according to the fertilizer types and genetic diversities, it was maximum in case of DAP which is an integrated nutrition of nitrogen and phosphorus elements. This result is agree with the findings of Hazel and Raymund (2018) they reported that the non fertilizer application produced shorter fruit and Abbasi et al., (2010) who mentioned that the adequate supplying of DAP fertilizer as lower or higher dose, provide the plant by phosphorus element, which was contributed positively on pod length and slightly on pod diameter. Eshiet and Brisibe (2015) examined four cultivars of okra they noticed that the pod length differed significantly among varieties. Rehmatullah et al., (2016) regarding length of green pods expressed highly significant results for fertilizers. Saha et al., (2016) reported that the fruit length varied significantly among the cultivars.

Effect of Nitrogen and DAP Fertilizer and Gumbo Cultivar on Pod Dry Matter

As in Table 3 there were significant differences in the pod dry matter due to the fertilizer, cultivar and their interaction. The greatest values of the plant dry matter registered with no fertilizer treatment and a lower dose of DAP which were statistically similar, while the other thrice fertilizer treatments registered closeness lower values. The cultivar Bassanty donate the highest pod dry matter compared with both cultivars. The interaction between fertilizer and cultivar presented that Bassanty cultivar with a different dose of fertilizers had a superiors pod dry matter compared with both cultivars treated with a similar or different dose of fertilizer. The lower mean of this attribute given by Jamaia cultivar received higher dose of DAP. The increase in pod dry matter due to the no fertilizer or lower dose of DAP supported by the findings of Sajid et al., (2012) they regarded that the incremental dose of N and P in combinations had not significantly influenced yield attributing. The percentage of pod dry matter vary with to the genetic variability, this result is consistent with the finding of Temam et al., (2020) who reported that the genotypes had a highly differences for percentage dry matter contents.

Table 2. Effect of Nitrogen and DAP Fertilizer and Gumbo Cultivar on Pod Length and Diameters

Fertilizer	Pod Length (cm)			Means	Pod Diameter (cm)			Means
	Ba	Ja	Kh		Ba	Ja	Kh	
Co	6.97 ^b	5.77 ^g	5.49 ⁱ	6.07 ^c	1.24 ^{bcd}	1.30 ^{ab}	1.35 ^a	1.29 ^a
N ₁	6.58 ^d	5.87 ^f	5.70 ^{gh}	6.05 ^c	1.15 ^{ef}	1.17 ^{def}	1.09 ^f	1.14 ^c
N ₂	6.71 ^c	5.63 ^h	5.38 ^j	5.91 ^d	1.20 ^{cde}	1.17 ^{def}	1.15 ^{def}	1.18 ^{bc}
D ₁	7.04 ^b	5.51 ⁱ	6.16 ^e	6.24 ^a	1.14 ^{ef}	1.17 ^{def}	1.28 ^{abc}	1.19 ^b
D ₂	7.41 ^a	5.20 ^k	5.77 ^g	6.12 ^b	1.13 ^{ef}	1.14 ^{ef}	1.19 ^{cde}	1.15 ^{bc}
Means	6.94 ^a	5.59 ^c	5.69 ^b		1.17 ^a	1.19 ^a	1.23 ^a	
C v %				7.76				4.45

Differences between means as indicated by the same letters for the different treatments are not statistically significant at probability ≤ 0.05 .

Table 3. Effect of Nitrogen and DAP Fertilizer and Gumbo Cultivar on Percentage of Pod Dry Matter

Fertilizer	Pod Dry matter (%)			Means
	Ba	Ja	Kh	
Co	8.58 ^a	7.45 ^{abcdef}	7.41 ^{abcdef}	7.81 ^a
N ₁	7.67 ^{abcde}	6.79 ^{cdefg}	6.32 ^{fg}	6.93 ^b
N ₂	7.91 ^{abcd}	6.72 ^{defg}	6.19 ^g	6.94 ^b
D ₁	8.06 ^{ab}	6.51 ^{efg}	7.95 ^{abc}	7.51 ^{ab}
D ₂	8.29 ^a	5.89 ^g	7.01 ^{bcdefg}	7.06 ^b
Means	8.10 ^a	6.67 ^b	6.98 ^b	
C v %			9.78	

Differences between means as indicated by the same letters for the different treatments are not statistically significant at probability ≤ 0.05 .

Conclusion

This study was done to evaluate the effect nitrogen, diammonium Phosphates and Gumbo cultivars on the phenological characteristics of the fruit. From the results obtained, it could be concluded that the Its concluded based on above results, that the internal factors (genetic) of okra cultivars, stated in Bassanty cultivar improved pod attributes. and the external factors (fertilizer) landslide in lower dose of DAP as a neutral source of nitrogen and phosphorus had a clearly favorite effect on major yield characteristics of fruits. The most important attributes as Pod fresh weight, length and dry matter presented by Bassanty cultivars with higher dose of DAP. Therefore, the selection of fertilizer type and an optimum dose, associated with cultivar having unique pod characters should be considered to satisfy the consumer tastes, according to their needs.

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Determination of Antimicrobial Activity of *Cytinus ruber* Extracts

Gülten Tiryaki Gündüz, Özge Akgül

Food Engineering Department, Faculty of Engineering, Ege University, İzmir, Turkey

Abstract

Cytinus ruber, known as “yer narı” in Turkish, is a parasitic plant that mostly grows in the roots of the plants belongs to *Cistaceae* family. Pollinated by insects such as ants, *C. ruber* is commonly found in Mediterranean countries, Madagascar and South Africa and has been used as a medicine for diseases such as dysentery or eye infections in traditional medicine. The nectar in the flower of *C. ruber* can also be consumed. In this study, antimicrobial activity of water and methanol extracts of nectar and stem parts of *C. ruber* against *Staphylococcus aureus* ATCC 6538P, *Salmonella* Typhimurium ATCC 13311 and *Escherichia coli* O157:H7 ATCC 43895 have been investigated. Results showed that water extract of nectar (NWE) didn't cause any inhibition zones, while the inhibition zones of water extract of stem (SWE) were 30.33 ± 6.76 , 14.83 ± 1.04 , 13.33 ± 1.38 mm for *S. aureus*, *S. Typhimurium* and *E. coli* O157:H7, respectively. It is also shown that methanol extract of stem (SME) showed higher antimicrobial activity than methanol extract of nectar (NME). MIC values for SME was 0.35 mg/ml, 0.70 mg/ml, 1.41 mg/ml whereas they were 1.04 mg/ml, 4.15 mg/ml and 4.15 mg/ml for NME for *S. aureus*, *S. Typhimurium* and *E. coli* O157:H7, respectively. It was found that *S. aureus* was the most sensitive bacteria for all extracts examined and the lowest MIC value for *S. aureus* was observed in the stem water extract (0.19 mg/ml). These results indicate that *C. ruber* has high antimicrobial activity and has the potential to be used as a natural antimicrobial in the food industry. Further studies including determination of chemical components as well as the evaluation of toxicity are required.

Key words: *Cytinus ruber*, antimicrobial, parasitic plant

Yer narı (*Cytinus ruber*) Ekstraktlarının Antimikrobiyal Etkisinin Belirlenmesi

Özet

Yer narı olarak bilinen *Cytinus ruber*, *Cistaceae* ailesinin köklerinde gelişen parazitik bir bitki türüdür. Akdeniz ülkeleri, Madagaskar ve Güney Afrika'da rastlanan ve karınca gibi çeşitli canlıların polenlerini taşıması ile yayılan yer narı, geleneksel tıpta dizanteri ve göz enfeksiyonları gibi çeşitli hastalıkların tedavisinde kullanılmaktadır. Yer narının çiçek içerisindeki nektarı tüketilebilmektedir. Yapılan bu çalışmada, yer narının nektar ve gövde kısımlarının su ve metanol ekstraktlarının *Staphylococcus aureus* ATCC 6538P, *Salmonella* Typhimurium ATCC 13311 ve *Escherichia coli* O157:H7 ATCC 43895 üzerine antimikrobiyal etkisi incelenmiştir. Çalışma sonunda nektar su ekstraktında (NSE) 3 mikroorganizma için de inhibisyon zonu gözlenmezken, gövde su ekstraktı (GSE) *S. aureus*, *S. Typhimurium* ve *E. coli* O157:H7 için sırasıyla $30,33 \pm 6,76$, $14,83 \pm 1,04$, $13,33 \pm 1,38$ mm inhibisyon zonu oluşturmuştur. Gövde metanol ekstraktının (GME), nektar metanol ekstraktına (NME) göre antimikrobiyal aktivitesinin daha yüksek olduğu tespit edilmiştir. GME MİK değeri *S.aureus* için 0,35 mg/ml iken *S. Typhimurium* için 0,70 mg/ml, *E. coli* O157:H7 için 1,41 mg/ml olarak belirlenmiştir. NME için bu değerlerin sırasıyla 1,04 mg/ml, 4,15 mg/ml ve 4,15 mg/ml olduğu tespit edilmiştir. İncelenen tüm ekstraktlar için, en hassas mikroorganizmanın *S. aureus* olduğu belirlenmiş ve *S. aureus* için en düşük MİK değeri gövde su ekstraktında (0,19 mg/ml) gözlenmiştir. Çalışma sonucunda, yer narının yüksek antimikrobiyal aktiviteye sahip olduğu belirlenmiş olup, gıda sanayinde doğal antimikrobiyal madde olarak kullanım potansiyelinin olabileceği ortaya konmuştur. Bitkinin kimyasal içeriğinin belirlenmesi ve toksisitesinin araştırılması için daha fazla çalışmanın yapılması gerekmektedir.

Anahtar Kelimeler: *Cytinus ruber*, yer narı, antimikrobiyal, parazitik bitki

Giriş

Cytinus, *Cytinaceae* ailesine ait, klorofili olmayan ve Ladengiller olarak bilinen *Cistus* ailesine ait türlerin köklerinde yetişen parazitik bir bitkidir (Magiatis et al., 2001). *Cytinus visseri*, *Cytinus capensis*, *Cytinus sanguineus*, *Cytinus baroni*, *Cytinus glandulosus*, *Cytinus malagasicus*, *Cytinus hypocistis* ve *Cytinus ruber* gibi farklı türleri bulunmaktadır (Nickrent, 2007). *C. hypocistis* ve *C. ruber* Akdeniz ülkelerinde yetişen, Akdeniz ülkelerine özgü, türleridir (Magiatis et al., 2001). Ülkemizde Bodrum, Balıkesir, Kaş gibi çeşitli şehirlerde *C. hypocistis* ve *C. ruber* türlerine rastlanmakta, halk arasında *C. ruber*'e yer narı, *C. hypocistis*'e inek memesi, balık gibi çeşitli isimlerle hitap edilmektedir. Ülkemizde, yer narının özsuyu emilerek gıda olarak tüketiminin yanı sıra zambak olarak endüstriyel kullanımının olduğu bilinmektedir (Ertuğ, 2003; Satıl et al., 2017).

C. hypocistis ve *C. ruber*'i birbirinden ayıran en temel özellik çiçek rengidir. *C. hypocistis* sarı renkli çiçeklere sahipken *C. ruber* beyaz veya hafif pembe renkli çiçeklere sahiptir. Bu türler Şubat-Temmuz aylarında gelişmekte ve genel olarak karıncaların polenlerini taşıması yardımıyla yayılmaktadır (De Vega et al., 2009; Govaerts and Nickrent, 2010). İki türün de vejetatif gövdesi konakçı bitkinin köklerinde bulunmaktadır. Yaklaşık 5-12 cm gövde uzunluğuna sahip olan yer narı, ilkbaharda çiçeklenmekte olup, çiçeklenme için en az 3 yıla ihtiyacı vardır (De Vega et al., 2007; Govaerts and Nickrent, 2010).

Cytinus türlerinin tam olgunlaşmamış hali kuşkonmaz ikamesi olarak kullanılabilen veya çiçeği içerisindeki özsuyu emilerek gıda olarak tüketilebilmektedir. Hakkında yeterli çalışma bulunmayan *Cytinus* türleri, geleneksel tıpta dizanteri ve göz enfeksiyonu gibi çeşitli hastalıkların tedavisinde kullanılabilmektedir (Zucca et al., 2015).

Cytinus türlerinin hidrolize olabilen tanenlerce zengin olduğu belirtilmiştir (Sanjust et al., 2021). *C. ruber*'in metanol ekstraktı üzerine yapılan bir çalışmada, *C. ruber*'in temel bileşenlerin gallotanin ve ellagitanin olduğu ortaya konmuştur (Magiatis et al., 2001). *C. ruber*'in besin içeriği ise 5.04 g/100 g protein; 2.74 g/100 g yağ; 54.05 g/100 g karbonhidrat olarak belirlenmiştir (Sanjust et al., 2021). Silva et al (2019) tarafından gerçekleştirilen bir çalışmada ise *C. hypocistis*'in gövde ve nektar kısımlarının besin içeriği incelenmiştir. Çalışma sonucunda bitkinin 0,67 g/100 g kuru ağırlık yağ, 4,90 g/100g kuru ağırlık protein ve 86,8 g/100 g kuru ağırlık karbonhidrat içerdiği, nektarda ise bu değerlerin sırasıyla 1,4 g/ 100 g yağ, 9,4 g/100 g protein, 85,1 g/100 g karbonhidrat olduğu tespit edilmiştir.

Cytinus türlerinin antimikrobiyal aktivitesinin incelendiği çalışma sayısı oldukça sınırlıdır. *Cytinus hypocistis*, *Cytinus* türleri içerisinde en çok çalışılan türdür. Silva et al. (2020) tarafından yapılan bir çalışmada, *C. hypocistis* bitkisinin tamamı, taç yaprağı, gövde ve nektar kısımlarının etanol/su ekstraktlarının farklı mikroorganizmalar üzerine antimikrobiyal etkisini incelenmiştir. Çalışma sonucunda ekstraktların Gram pozitif ve Gram negatif mikroorganizmalar üzerine inhibitif etki gösterdiği tespit edilmiştir. En etkili ekstraktın 0,625–2,5 mg/ml minimum inhibisyon konsantrasyonu (MİK) değerleri ile gövde ekstraktı, en az etkili ekstraktın ise 2,5–10 mg/ml ile nektar ekstraktı olduğu ifade edilmiştir. Diğer bir çalışmada ise *C. hypocistis* bitkisinin etanol ve su ekstraktları kullanılmış, en geniş inhibisyon zonu iki ekstrakt için de 18,00 mm ile *Staphylococcus epidermidis* DSM 1798'de gözlenmiş, *S. epidermis*'i 13,5 mm (su ekstraktı) ve 13 mm (etanol ekstraktı) inhibisyon zonu ile *Staphylococcus aureus* DSM 1104'ün takip ettiği tespit edilmiştir. İki ekstrakt da *Escherichia coli* DSM 1103, *Enterobacter cloacae* DSM 30054, *Pseudomonas aeruginosa* DSM 1117, *Klebsiella pneumoniae* DSM 681'de inhibisyon zonu oluşturmamıştır (Zucca et al., 2015).

Dünya genelinde ve ülkemizde *Cytinus* türleri üzerine gerçekleştirilen sınırlı sayıda çalışma bulunmaktadır. Ülkemizde yer narının (*Cytinus ruber*) antimikrobiyal etkisinin incelendiği çalışmaya rastlanmamıştır. Bu çalışmada, ülkemizde yetişen yer narının su ve metanol ekstraktlarının seçilen gıda kaynaklı patojen bakteriler üzerine antimikrobiyal etkisinin belirlenmesi amaçlanmıştır.

Materyal ve Yöntem

Yer Narı

Çalışma materyali olan yer narı (*Cytinus ruber*) Antalya'nın Kaş ilçesinden Mayıs 2021 tarihinde toplanmış, Ege Üniversitesi Gıda Mühendisliği Bölümü'ne getirilerek su ve metanol ekstraktları hazırlanmıştır.

Yer Narı Ekstraktlarının Elde Edilmesi

Çalışmada yer narının nektar ve gövde bölümlerinden su ve metanol ekstraktları hazırlanmıştır. Gövde kısmı rondodan geçirildikten sonra, nektar kısmı çiçekten alındığı şekilde kullanılmıştır. Nektar ve rondodan geçirilmiş gövdenin su ekstraktı, 1/4 (w/v) oranında hazırlanmıştır. Örnekler 48 saat boyunca karanlıkta bekletildikten sonra, 15 dakika ultrasonikasyon (Bandelin, Sonorex Super RK106, 35kHz) işlemine tabii tutulmuştur. Elde edilen ekstrakt kaba filtreden geçirilip liyofilize edilmiştir (Anthika et al., 2015; Mahmoudi et al., 2020).

Metanol ekstraktları da su ekstraktları gibi 1/4 (w/v) oranında hazırlanmış, 25 gr nektar ve rondodan geçirilmiş gövde 100 ml metanol içerisinde oda sıcaklığında 7 gün tutularak ekstrakte edilmiştir. Elde edilen ekstraktlar Whatman no #1 filtre kağıdından süzülmuş ve rotary evaporatorde (HEIDOLPH, 45°C) metanol uçurulduktan sonra liyofilize edilmiştir (Amenour et al., 2010).

Test Kültürleri

Çalışmada *Escherichia coli* O157:H7 ATCC 43895, *Staphylococcus aureus* ATCC 6538P, *Salmonella* Typhimurium ATCC 13311 test kültürleri kullanılmıştır. Stok kültürler Tryptone Soy Broth'ta (TSB, pH 7.3±0.2, Oxoid) iki defa geliştirilerek aktifleştirilmiştir. Kültürler 37 °C'de 18-24 saat inkübe edildikten sonra, 10 dak santrifüj işlemine tabii tutulmuştur (4000 g, 20 °C). Santrifüj işlemi sonunda supernatant uzaklaştırılmış, tüpte kalan pellete peptonlu su (%0,1) ilave edilerek tekrar santrifüj işlemi uygulanmıştır. Bu işlem 2 kez tekrar edilmiştir. 2. yıkama sonunda elde edilen pellet peptonlu su (%0,1) ile süspanse edilmiş, bu süspansiyondan gerekli dilüsyonlar hazırlanarak 0,5 McFarland değerine ayarlanmıştır (Karabiyikli and Kışla, 2012; Guo et al., 2017).

Antimikrobiyal Aktivitenin Belirlenmesi

Disk Difüzyon Yöntemi

Test kültür süspanسیونlarından 100 µl inokulum alınarak, Mueller-Hinton Agar (MHA, pH 7,4, Merck) bulunan petrilere inoküle edilmiştir. Steril 6 mm çaplı kağıt diskler inokülasyon yapılmış petrilere yerleştirildikten sonra, disklere 30 µl ekstrakt emdirilmiştir. 37 °C'de 24 saat inkübasyon süresinin sonunda inhibisyon zonları mm olarak ölçülmüştür (Keven-Karademir ve Avunduk, 2015).

Broth mikrodilüsyon yöntemi ile minimum inhibisyon konsantrasyonu (MİK) ve minimum bakterisidal konsantrasyonu (MBK) değerlerinin belirlenmesi

MİK bir mikroorganizmanın gelişimini inhibe eden veya geciktiren en düşük antimikrobiyal madde konsantrasyonu iken, MBK mikroorganizma gelişiminin gözlenmediği en düşük konsantrasyondur (Andrews, 2015; Bektaş et al., 2020). Ekstraktların test kültürleri üzerindeki MİK değerlerinin belirlenmesi için 96 kuyucuklu plakalar kullanılmıştır. İlk kuyucuk hariç diğer bütün kuyucuklara 100 µl Mueller-Hinton Broth (MHB, pH 7,4, Merck), ilk kuyucuklara ise 200 µl ekstrakt ilave edilmiştir. İlk kuyucuktan 100 µl ekstrakt alınmış ve sağa doğru gerekli seyreltmeler yapılmıştır. Ardından bütün kuyucuklara 100 µl test kültür süspanسیونu inoküle edilmiş ve plakalar 37 °C'de 24 saat inkübasyona bırakılmıştır. Inkübasyon süresi sonunda mikrobiyal gelişimin belirlenmesi için 20 µl trifenil tetrazolyum klorür (%1, v/v) kullanılmış, renk dönüşümü gözlenmeyen en düşük konsantrasyon MİK değeri olarak belirlenmiştir (No et al., 2002; Jung et al., 2010). Renk değişiminin gözlenmediği her bir kuyucuktan alınan 10 µl'lik inokulum MHA petrilere ekilmiş, 37 °C'de 24 saatlik inkübasyon sonucunda gelişim gözlenmeyen konsantrasyon MBK olarak seçilmiştir (Bertella et al., 2018).

İstatistiksel Analizler

İstatistiksel analizler, IBM SPSS Statistics 22 paket programı aracılığıyla uygun test yöntemi seçilerek %95 güven aralığında yapılmıştır. Ortalamalar arasındaki farklılık ANOVA varyans analizi ile belirlenirken, Post-Hoc yöntemi olarak Duncan çoklu karşılaştırma testi uygulanmıştır.

Bulgular ve Tartışma

Yer narının su ve metanol ekstraktlarının antimikrobiyal aktivitesi disk difüzyon ve broth mikrodilüsyon yöntemleri ile belirlenmiştir. Nektar su ekstraktı test edilen üç kültür için inhibisyon zonu oluşturmazken, test kültürleri içinde en geniş inhibisyon zonunu 30,33±6,76 mm ile *S. aureus* için gövde su ekstraktının oluşturduğu belirlenmiştir. *E. coli* O157:H7 ve *S. Typhimurium* kültürleri için ise en geniş inhibisyonu zonları gövde metanol ekstraktlarında ölçülmüş olup, inhibisyonu zon çaplarının sırası ile 22,17±0,80 mm ve 20,08±2,24 mm olduğu tespit edilmiştir (Tablo 1).

Tablo 1. Yer narı nektar ve gövde ekstraktlarının test edilen mikroorganizmalar için inhibisyonu zonları (mm)

Test Kültürleri	İnhibisyon Zonu (mm)*			
	Nektar		Gövde	
	Su Ekstraktı	Metanol Ekstraktı	Su Ekstraktı	Metanol Ekstraktı
<i>Staphylococcus aureus</i> ATCC 6538P	..**	16,10 ± 2,39 ^{a, B}	30,33 ± 6,76 ^{b, B}	23,50 ± 4,02 ^{ab, A}
<i>Salmonella</i> Typhimurium ATCC 13311	..**	10,00 ± 0,90 ^{a, A}	14,83 ± 1,04 ^{b, A}	20,08 ± 2,24 ^{c, A}
<i>Escherichia coli</i> O157:H7 ATCC 43895	..**	11,63 ± 1,63 ^{a, A}	13,33 ± 1,38 ^{a, A}	22,17 ± 0,80 ^{b, A}

* Sonuçlar ortalama±standart sapma olarak verilmiştir. Aynı satırdaki farklı küçük harfler (a-c) ortalama değerler arasındaki istatistiksel farklılığı göstermektedir (P<0,05). Aynı sütundaki farklı büyük harfler (A-B) ortalama değerler arasındaki istatistiksel farklılığı göstermektedir (P<0,05).

** İnhibisyon zonu görülmemiştir.

Gövde metanol ekstraktı en etkili antimikrobiyal ajan olarak belirlenmiş, gövde metanol ekstraktını gövde su ekstraktı, nektar metanol ekstraktı, nektar su ekstraktının takip ettiği görülmüştür (Tablo 2). Test edilen üç patojen bakteri içerisinde en hassas mikroorganizmanın *Staphylococcus aureus* ATCC 6538P olduğu belirlenmiş, *S. aureus* için en düşük MİK değeri 0,19 mg/ml ile gövde su ekstraktında belirlenmiştir. Maisetta et al. (2019) tarafından yapılan bir çalışmada, *C. hypocistis* ve *C. ruber* bitkilerinin etanol ve su ekstraktlarının farklı mikroorganizmalar üzerine inhibitif etkisi incelenmiş ve en hassas mikroorganizmanın *Enterococcus faecium* VanR1 olduğu belirlenmiştir. Çalışmada, *C. ruber* su ekstraktının *Enterococcus faecium* VanR1 için MİK değerinin 31,5 µg/ml, etanol ekstraktında ise bu değerin 125 µg/ml olduğu ortaya konmuştur. Çalışmada aynı zamanda, *S. aureus* ATCC 33591 için yer narının su ekstraktının (MİK: 125 µg/ml) etanol ekstraktına (MİK: 250 µg/ml) göre daha etkili olduğu tespit edilmiştir.

Yapılan bu çalışmada, *E. coli* O157:H7 ve *S. Typhimurium* için en düşük MİK değerleri sırası ile 1,41 mg/ml ve 0,70 mg/ml ile yer narı gövde metanol ekstraktında görülmüştür. Çalışma sonucunda en hassas mikroorganizma *S. aureus*, en dirençli mikroorganizma ise *E. coli* O157:H7 olarak tespit edilmiş, nektar ve gövde ekstraktlarının test edilen Gram pozitif bakteriler üzerine daha etkin antimikrobiyal aktivite gösterdiği ortaya konmuştur. Silva et al. (2020) tarafından gerçekleştirilen çalışmada *C. hypocistis*'in farklı kısımlarının etanol/su ekstraktlarının Gram negatif bakteriler (MİK=0,625-2,5 mg/ml) üzerine Gram pozitif bakterilere (MİK=0,625-10 mg/ml) göre daha etkili olduğu ortaya konmuştur. Aynı çalışmada, yapılan bu çalışmaya benzer olarak gövde etanol/su ekstraktının en etkili, nektar etanol/su ekstraktının en etkisiz ekstrakt olarak belirlendiği ifade edilmiştir.

Tablo 2. Yer narı nektar ve gövde ekstraktlarının test kültürlerine karşı MİK ve MBK değerleri (mg/ml)

Test Kültürleri	Nektar				Gövde			
	Su Ekstraktı MİK (mg/ml)	MBK (mg/ml)	Metanol Ekstraktı MİK (mg/ml)	MBK (mg/ml)	Su Ekstraktı MİK (mg/ml)	MBK (mg/ml)	Metanol Ekstraktı MİK (mg/ml)	MBK (mg/ml)
<i>Staphylococcus aureus</i> ATCC 6538P	50,00	-*	1,04	2,08	0,19	0,78	0,35	2,82
<i>Salmonella Typhimurium</i> ATCC 13311	50,00	-*	4,15	33,24	1,56	1,56	0,70	2,82
<i>Escherichia coli</i> O157:H7 ATCC 43895	50,00	-*	4,15	33,24	1,56	3,12	1,41	11,28

* Test edilen konsantrasyonlarda MBK değerlerinin bulunmadığı tespit edilmiştir.

Nektar su ekstraktlarının test edilen üç patojen bakteri için bakterisidal aktivite göstermediği tespit edilmiştir. En yüksek bakterisidal aktivite ise gövde su ekstraktında tespit edilmiş olup, *S. aureus*, *S. Typhimurium* ve *E.coli* O157:H7 için MBK değerleri sırasıyla 0,78 mg/ml, 1,56 mg/ml ve 3,12 mg/ml olarak belirlenmiştir.

Sonuç olarak, yer narı nektarının metanol ekstraktının, gövdesinin ise su ve metanol ekstraktlarının test edilen üç patojen bakteri için de antimikrobiyal aktiviteye sahip olduğu belirlenmiştir. Nektar su ekstraktının diğer ekstraktlara göre daha yüksek minimum inhibisyon konsantrasyonunun olduğu belirlenmiş, bakterisidal etkisinin ise olmadığı tespit edilmiştir. Çalışma sonucunda etkin antimikrobiyal aktivitesi nedeniyle yer narının gıda sanayinde doğal antimikrobiyal madde olarak kullanım potansiyelinin olabileceği ortaya konmuştur. Bitki üzerine yapılmış yeterli araştırma olmaması nedeniyle bu bitkinin kimyasal içeriğinin belirlenmesi ve toksisitesinin araştırılması için daha fazla çalışma yapılması önerilmektedir.

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Effect Of Seed Rate And Land Plotting On Leaves And Root Attributes Of Radish Plant (*Raphanus Sativus* L.)

Abdalla Mohamed Hussein

Department of Horticulture Sciences, Faculty of Agriculture and Natural Resources, University of Kassala, Sudan.
Email: abdallamohussein@gmail.com.

Abstract

This study was conducted during July 2021, to determine the effect of seed rate and land plotting on Radish plant. The experiment were laid out in (CRBD), with three replications. The treatments consist of seed rate; 18 (S₁), 27 (S₂), and 36 (S₃) Kg ha⁻¹ and land plotting; Flat (F), Ridge (R) and Border (B). The results show that minimum seed rate and ridge method significantly increased number of leaves, leaf fresh and dry weight, root size, dry matter, fresh weight and yield, in order to the significant increase in the leaf dry matter, root length and girth due to ridge method and slight increase due to lower seed rate. Flat method significantly and slightly increased marketable and unmarketable roots, subsequently. The interaction appears significance difference, whereas lower seed rate applied in ridge gave the higher values of number of leaves, leaf fresh and dry weight, and root length, girth, size, fresh and dry weight and yield. The lower values of this attribute presented by higher seed rate applied in or flat and border. Therefore, seed rate of 18 Kg ha⁻¹ applying in the ridge plotting can suggest for the cultivation of Radish in the heavy clay soil of New Halfa.

Keywords: Seed Rate; Land Plotting; Radish Plant.

Introduction

Radish (*Raphanus sativus* L.) is a cool season, fast growing, root vegetable crop. The short growing season allows it to be grown in rotations and in companion cropping systems. Although it can be cultivated out of its normal growing season [5]. It is a good source of vitamin C and supplies a variety of minerals. About 100 g of edible Radish consists of 1.0 mg of protein, 94 mg of water, 0.7 mg of fiber, 4.0 mg of carbohydrates, 0.1 mg of fat, 42 mg of calcium and 1 mg of iron [16]. Radish growth and yield are greatly affected by plant density and planting methods [11]. Plant density has a strong influence on the growth, and yield formation of Radish [12]. A proper sowing method, achieved the maximum growth resulting in the highest yield [11]. Yield decreased by 2.3% when plant density increased by 33% [8]. Decreasing plant density, reduced the total yield [6]. The highest yield was obtained at the closest plant spacing [7]. Inter-row spacing did not affected root and shoot yield of radish [9]. The importance of cultural practices of the crops clearly reflected in the vegetative and reproductive growth, as well as nutritional values. As one of the root crops and for strongest vegetative growth, which lead to higher yield components, Radish plant requires a silt soils. Otherwise, in the heavy clay soils and for good quality and better root formation and production, Radish needs an optimum seed rate and high efficiency planting method. The aim of this study is to investigate the interactive effect of seed rate and land plotting on leaf, root yield and quality of Radish plant in heavy clay soil of New Halfa Agricultural Scheme.

Materials And Methods

Location

A field experiment was conducted during the autumn season 7 July of the year 2021, at the administration farm of the Faculty of Agriculture and Natural Resources, University of Kassala, Sudan, Longitude 35° – 36' E, Latitude 15°- 18' N and altitude 450 meters above the sea level.

Soil And Climate Of The Experiment

The soil of the experiment is heavy clay, profile consists of a dark brown surface, covers the larger part, 75% of the irrigable area of New Halfa Agricultural scheme. It belongs to Khasm Elgirba series, content a clay with percentage around 69% and pH in the range of 4.8 to 8.8. The climate of this area is semi-arid with a summer season of mean daily temperature of 23° c and winter season of mean daily temperature of 15.7 ° c. The hottest month is June and the coldest month is January, while the rainy season is during June to September [2].

Experimental Design

The experiment was factorial combined and laid out in Complete Randomized Blocked Design (CRBD), with three replications. The unit of the experiment was 2 meters in width and 2.8 meters in length.

Treatments

The treatments consist of three rates of seed; 18 (S₁), 27 (S₂) and 36 (S₃) Kilogram per hectare, and three land designs of sowing method; Flat (F), Ridge (R) and Border (B).

Data Collection

By means of six plants and after fifty days from sowing, leaves number, leaf fresh and dry weight and leaf dry matter, root fresh and dry weight, root length, girth, dry matter and root size were measured. The total number of marketable and unmarketable roots per meter square was counted and yield ton per hectare was assessed.

Data Analyses

The data were statistically analyzed using computer software program (MSTAT-C). The means compared using Least Significant Difference (LSD) to test the level of significance, at probability of ≤ 0.05 .

Results And Discussion

The Effect Of Seed Rate And Land Plotting On The Number Of Leaves, Leaf Fresh Weight, Dry Weight And Leaf Dry Matter

The data presented in Table 1. reflected the effect of plant density, land plotting and their interaction on leaf attributes. Lower seed rate significantly increased leaf number (36.8%), leaf fresh (37.6%) and dry (39.0, %) weight and no significant increase noticed in dry matter (35.4%). Both medium and higher seed rate decreased this attributes, and statistically similar. Ridge planning significantly increased leaves number (37.9%), leaf fresh (39.2%) and dry (40.7%) weight and leaf dry matter (35.4%), compared with flat and border . Ridge plotting with lower seed rate significantly increased number of leaves per plant, leaf fresh and dry weight, it contributed by (15.6%, 18.5, 17.5%) respectively, while ridge received higher rate of seed increased leaf dry matter (13.2%). The lower values of the leaves number and leaf fresh and dry weight given by the medium seed rate applied in border plotting, this treatments participated by (8.7, 9.1, 7.6%) respectively, while the minimum leaf dry matter appeared by the higher rate of sown in a flat (8.5%). The increase in the growth parameters in the lower seed rate compared with medium and higher rate may be due to the sufficiency of the plant nutrients to the less number of the plants per unit area. [14] Suggested that the effect of plant spacing on the growth parameters may be due to competition of plants for available nutrients. Land planning show a similar face, whereas, ridge method of planting provided by the higher values of the above mentioned characters of leaf. These results were supported by the finding of [11] who reported that the maximum number of leaves per plant and fresh and dry weights of leaves significantly affected by sowing method whereas, the higher values achieved in ridge sowing compared with flat sowing.

The Effect Of Seed Rate And Land Plotting On The Root Length, Girth, Size And Dry Weight

With no significance difference, decreasing seed rate increased root length and girth, it contributed by (34.6, 34.4%) consequently, and significantly increased root size (38.1%) and root dry weight (38.9%) against medium (29.9, 31.1%) and high (31.9, 30.0%) seed rate subsequently, which were statistically similar. Ridge, positively increased root length (35.6%) against the border, which was offered by (33.2%), and significantly compared with flat (31.2%). Ridge, shared significantly by the widest root diameter (35.9%), biggest size (43.6%) and heaviest dry weight (41.3%), followed by a border and flat planning, respectively. There is significant effect noticed in the root length due to the interaction between seed rate and method of plotting. Regardless of seed rate, ridge slightly increased root length compared with both other designs. Ridge with lower seed rate significantly increased root girth (12.7%) and dry weight (16%), in addition to the root size (16.0%), which was also increased by the ridge that received higher seed rate (15.1%). Otherwise, flat plotting and overall seed rates, had a shortest root length and girth and weakest size and dry weight (Table 2). Increasing the seed rate negatively affected root properties, this explanation supported by the findings of [15] who found that root diameter, fresh weight, dry weight of the Radish roots decreased when the plant density increased and confirmed by [15] and [4] they noticed that the wider sowing, provided more chance for the development of root, which resulted in a maximum root girth and weight. [13] mentioned that root girth, weight and other reproductive processes are negatively affected as the plant density increased. [11] reported that the owing method had a highly significant effect on root length and fresh weight, the plant obtained the highest values in ridge sowing. [1] notice that the wider sowing in ridge, cause rapid increase in root girth and weight of radish are due to vigorous vegetative growth.

Table 1. Effect Of Seed Rate And Land Plotting On Leaves Number, Leaf Fresh And Dry Weight, And Leaf Dry Matter.

Attribute	Leaves Number (No.)		Leaf Fresh Weight (gm)		Leaf Dry Weight (gm)		Leaf Dry Matter (%)	
treatment	Mean	%	Mean	%	Mean	%	Mean	%
S ₁	18.02 ^a	36.8	40.04 ^a	37.6	4.30 ^a	39.0	11.03 ^a	35.4
S ₂	15.43 ^b	31.5	32.55 ^b	30.6	3.26 ^b	29.6	9.78 ^a	31.4
S ₃	15.50 ^b	31.7	33.78 ^b	31.8	3.46 ^b	31.4	10.35 ^a	33.2
LSD		1.601		4.22		0.40		1.43
F	15.65 ^b	32.0	33.91 ^b	31.9	3.30 ^b	29.9	9.54 ^b	30.6
R	18.57 ^a	37.9	41.75 ^a	39.2	4.49 ^a	40.7	11.04 ^a	35.4
B	14.72 ^b	30.1	30.72 ^b	28.9	3.24 ^b	29.4	10.58 ^{ab}	34.0
LSD		1.6		4.22		0.39		1.43
S ₁ F	14.83 ^{cb}	10.1	29.06 ^c	9.10	3.22 ^{de}	9.70	11.13 ^{abc}	11.9
S ₂ F	17.61 ^b	12.0	38.22 ^b	12.0	3.95 ^{bc}	11.9	9.57 ^{cd}	10.2
S ₃ F	14.50 ^{cd}	9.90	34.45 ^{bc}	10.8	2.72 ^{ef}	8.20	7.93 ^d	8.50
S ₁ R	22.84 ^a	15.6	59.17 ^a	18.5	5.79 ^a	17.5	9.77 ^{bcd}	10.5
S ₂ R	15.89 ^{bc}	10.8	30.56 ^c	9.60	3.33 ^{cde}	10.1	11.05 ^{abc}	11.8
S ₃ R	16.99 ^{bc}	11.6	35.51 ^{bc}	11.1	4.34 ^b	13.1	12.30 ^a	13.2
S ₁ B	16.39 ^{bc}	11.2	31.89 ^{bc}	10.0	3.89 ^{bcd}	11.8	12.19 ^{ab}	13.0
S ₂ B	12.78 ^d	8.70	28.89 ^c	9.10	2.50 ^f	7.60	8.73 ^{cd}	9.30
S ₃ B	15.00 ^{bcd}	10.2	31.39 ^{bc}	9.80	3.33 ^{cde}	10.1	10.80 ^{abc}	11.6
LSD		2.77		7.31		0.69		2.48
CV%		9.82		11.91		10.87		13.78

Differences between means as indicated by the same letters for the different treatments are not statistically significant at probability ≤ 0.05.

Table 2. Effect Of Seed Rate And Land Plotting On Root Length, Girth, Size And Dry Weight.

Attribute	Root Length (cm)		Root Grith (gm)		Root Size (cm ³)		Root Dry Weight (gm)	
treatment	Mean	%	Mean	%	Mean	%	Mean	%
S ₁	16.57 ^a	34.6	3.01 ^a	34.4	47.46 ^a	38.1	2.72 ^a	38.9
S ₂	15.99 ^a	33.4	2.87 ^a	32.8	37.30 ^b	29.9	2.18 ^b	31.1
S ₃	15.33 ^a	32.0	2.88 ^a	32.9	39.79 ^b	31.9	2.10 ^b	30.0
LSD		1.59		2.37		3.43		0.232
F	14.93 ^b	31.2	2.71 ^b	31.0	28.93 ^c	23.2	1.68 ^c	24.0
R	17.07 ^a	35.6	3.14 ^a	35.9	54.28 ^a	43.6	2.89 ^a	41.3
B	15.91 ^{ab}	33.2	2.90 ^b	33.1	41.35 ^b	33.2	2.43 ^b	34.7
LSD		1.59		2.36		3.44		0.23
S ₁ F	15.56 ^a	10.8	2.86 ^c	10.8	33.33 ^{de}	8.90	1.77 ^d	8.40
S ₂ F	14.67 ^a	10.2	2.81 ^{bc}	10.6	25.41 ^f	6.80	1.57 ^d	7.50
S ₃ F	14.56 ^a	10.1	2.65 ^c	10.0	28.06 ^{ef}	7.50	1.70 ^d	8.10
S ₁ R	17.22 ^a	12.0	3.37 ^a	12.7	59.61 ^a	16.0	3.37 ^a	16.0
S ₂ R	17.28 ^a	12.0	2.97 ^{abc}	11.2	46.94 ^b	12.6	2.50 ^c	11.9
S ₃ R	16.72 ^a	11.6	3.09 ^{ab}	11.7	56.28 ^a	15.1	2.80 ^{bc}	13.3
S ₁ B	16.94 ^a	11.8	2.99 ^{abc}	11.3	49.44 ^b	13.2	3.03 ^{ab}	14.4
S ₂ B	16.05 ^a	11.2	2.82 ^{bc}	10.7	39.56 ^c	10.6	2.47 ^c	11.8
S ₃ B	14.72 ^a	10.2	2.89 ^{bc}	10.9	35.05 ^{cd}	9.40	1.80 ^d	8.60
LSD		2.75		0.41		5.96		0.40
CV%		9.96		8.14		8.29		9.97

Differences between means as indicated by the same letters for the different treatments are not statistically significant at probability ≤ 0.05.

The Effect Of Seed Rate And Land Plotting On The Root Fresh Weight, Unmarketable And Marketable Root And Yield Ton Per Hectare

As in Table 3. and with significant differences, the gradual increase in the seed rate, gradually increased unmarketable roots (17.7, 29.9, 52.4%), decreased root fresh weight (45.4, 30.0, 24.6%) and total yield per hectare (46.8, 29.0, 24.1%). Marketable roots reflected no significance difference among the seed rate and unmarketable roots among planting method. Flat plot, significantly increased marketable roots (37.7%) followed by ridge (32.1%) and broad (30.2%). Ridge sowing extremely increased root fresh weight (44.5%), which lead to higher yield (44.6%), supervene by border (28.8%) and flat (26.8%). The lower seed rate, especially with ridge method increased root fresh weight (23.2%) and decreased unmarketable roots (26.0%). Contrarily, with higher seed rate specially with border method which decreased fresh weight (8.10%) and increased unmarketable roots specially with flat plot (20.1%). Middle density applied in flat and ridge methods maximized and minimized marketable roots, they contributed by (13.0, 9.10%) subsequently. Lower seed rate with ridge method had dramatically increased total yield, it contributed by (25.9%), this was extremely values compared with other values, especially with higher seed rate applied in border plot (7.00%). This result confirmed by the findings of [1] who mentioned that wider sowing may be preferred, as this will increase airflow through the crop, reducing disease pressures allows the plant to reach much and bearing maximum yields. Ridge method of planting was a better method for sowing Radish compared with flat and border method, many studies results supported these findings. [10] reported that ridge sowing gave a maximum root yield as compare other sowing method, and [11] who noticed the ridge sowing in the arid environment was better than flat sowing method, it provides a better environment for root growth, yield components and performance of cultural practice. On contrary, of the findings of [3] who regarded increment in total yield due to increasing plant density. This difference may be due to the different between seeds rate.

Table 3. The Effect Of Seed Rate And Land Plotting On The Root Fresh Weight, Unmarketable And Marketable Root And Yield Ton Per Hectare

Attribute	Root Fresh Weight (g)		No. Unmarketable Roots Per m ²		No. Marketable Roots Per m ²		Yield ton Per Hectare (ton ha)	
	Mean	%	Mean	%	Mean	%	Mean	%
treatment								
S ₁	52.91 ^a	45.4	36.67 ^c	17.7	36.89 ^a	33.8	19.76 ^a	46.8
S ₂	34.96 ^b	30.0	61.78 ^b	29.9	36.22 ^a	33.2	12.25 ^b	29.0
S ₃	28.68 ^c	24.6	108.3 ^a	52.4	36.00 ^a	33.0	10.18 ^c	24.1
LSD		0.919		9.893		1.031		0.673
F	27.56 ^c	23.6	74.56 ^a	36.1	41.11 ^a	37.7	11.31 ^c	26.8
R	51.83 ^a	44.5	66.11 ^a	32.0	35.00 ^b	32.1	18.80 ^a	44.6
B	37.17 ^b	31.9	66.11 ^a	32.0	33.00 ^c	30.2	12.08 ^b	28.6
LSD		0.919		9.893		1.031		0.673
S ₁ F	31.72 ^e	9.10	36.00 ^{ef}	5.80	40.33 ^b	12.3	12.80 ^{bc}	10.1
S ₂ F	25.00 ^g	7.10	63.00 ^{cd}	10.2	42.67 ^a	13.0	10.67 ^d	8.40
S ₃ F	25.94 ^g	7.40	124.7 ^a	20.1	40.33 ^b	12.3	10.46 ^d	8.30
S ₁ R	81.17 ^a	23.2	26.00 ^f	4.20	40.33 ^b	12.3	32.74 ^a	25.9
S ₂ R	42.50 ^c	12.2	67.00 ^c	10.8	29.67 ^e	9.10	12.49 ^c	9.90
S ₃ R	31.83 ^e	9.10	105.3 ^b	17.0	35.00 ^c	10.7	11.17 ^d	8.80
S ₁ B	45.83 ^b	13.1	48.00 ^{de}	7.70	30.00 ^e	9.20	13.75 ^b	10.9
S ₂ B	37.39 ^d	10.7	55.33 ^{cd}	8.90	36.33 ^c	11.1	13.58 ^{bc}	10.7
S ₃ B	28.28 ^f	8.10	95.00 ^b	15.3	32.67 ^d	10.0	8.907 ^e	7.00
LSD		1.59		17.13		1.79		1.17
CV%		2.37		14.36		2.84		4.53

Differences between means as indicated by the same letters for the different treatments are not statistically significant at probability ≤ 0.05 .

Conclusion

This study was done to evaluate the effect of seed rate and land plotting of sowing method on the vegetative growth and yield production of Radish plant. From the results obtained, it could be concluded that the gradual increase in seed rate more than 18 Kilogram per hectare gradually increased unmarketable roots and decreased fresh weight of marketable roots, leading to lower yield per hectare. Ridge method of planting increased the total yield per hectare due to the exceptionally increase fresh weight of marketable roots. Therefore, lower seed rate of 18 Kilogram per hectare applying in the ridge method of sowing can suggest for the cultivation of Radish plants in the heavy clay soil of New Halfa Agricultural Scheme and for the other similar soils.

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Determination of Inhibition Effect of Propolis Extract on *Cucumber mosaic virus* in Zucchini Squash

Serkan Yeşil¹

¹Department of Plant Protection, Faculty of Agriculture, Selçuk University, Konya, Turkey

Abstract

Zucchini squash (*Cucurbita pepo* L), which is grown for fresh consumption, has a very important place in vegetable production in Turkey. Virus diseases are one of the most devastating diseases on zucchini squash in the country. One of these diseases is *Cucumber mosaic virus* (CMV, *Cucumovirus*, *Bromoviridae*). Also, it's very common and devastating on many vegetables worldwide. Propolis, which is composed mainly by the plant resins and exudates that honey bees gather, showed antiviral activity against plant and human viruses. In this study, the potential of propolis to control CMV was investigated by taking advantage of these antimicrobial properties of propolis. For this purpose, propolis extracted with 95% ethanol and diluted in distilled water to obtain different concentrations as 2, 4, 6, 8 and 10% were used. Effects of propolis against CMV were determined by *in vitro* and *in vivo* studies. In *in vitro* studies, mixtures of CMV infected plant sap and different concentrations of propolis were inoculated to zucchini leaves as soon as the mixture was prepared, 1 and 2 hours later. *In vivo* studies were performed by spraying with propolis dilutions to plant leaves before and after CMV inoculation immediately, 1 and 2 hours later. Except of 2%, all concentrations caused to symptoms reductions of the infection, in all studies. In the result of *in vitro* studies, the ratios of healthy plants were calculated as 10, 10, 30, 40% and 10, 20, 40, 50% after one and two hours, respectively. *In vivo*, by spraying concentrations of 4, 6, 8 and 10% before inoculation obtained healthy plants as 10, 20, 40 and 50% after one-hour period, and as 10, 30, 40 and 50% after two-hour period, while the extracts sprayed after inoculation, ratios of healthy plants as 10, 20, 20 and 30% after one-hour period, and as 10, 10, 20 and 20% after two-hour period. According to the results of the study, it was determined that applications of different propolis concentrations had the potential to reduce CMV infection, and these results should be supported by field trials.

Key Words: CMV, Infection, Propolis, Symptom, Zucchini squash

Propolis Ekstraktının Sakız Kabağında Patojen Hıyar Mozaik Virüsü (CMV)'nü Engelleme Etkisinin Belirlenmesi

Özet

Taze sebze olarak tüketilen sakız kabağı (*Cucurbita pepo* L), Türkiye'nin sebze üretiminde önemli bir yere sahiptir. Ülkemizde virüs hastalıkları sakız kabağı üretiminde oldukça büyük ekonomik kayıplara yol açan hastalıklar arasındadır. Bunlardan bir tanesi de Hıyar mozaik virüsü (*Cucumber mosaic virus*, CMV, *Cucumovirus*, *Bromoviridae*)'nin sebep olduğu mozaik hastalığıdır. Bu hastalık, aynı zamanda dünya genelinde çok sayıdaki sebze türünde yaygın olarak görülmekte ve sorun oluşturmaktadır. Esas olarak bal arılarının topladığı bitki reçineleri ve eksüdatlarından oluşan propolis, bitki ve insan virüslerine karşı antiviral aktiviteye sahiptir. Bu çalışmada propolisin bu antimikrobiyal özelliklerinden yararlanılarak bunun CMV'yi kontrol etme potansiyeli araştırılmıştır. Bu amaçla %95 etanol ile ekstrakte edilen ve distile su ile seyreltilerek 2, 4, 6, 8 ve %10 olmak üzere farklı konsantrasyonlarda elde edilen propolis dilüsyonları kullanılmıştır. Propolisin CMV'ye karşı etkileri *in vitro* ve *in vivo* çalışmalarla belirlenmiştir. *In vitro* çalışmalarda, CMV ile enfekteli bitki özsuğu ve farklı konsantrasyonlarda propolis karışımları, karışım hazırlanır hazırlanmaz, hazırlandıktan 1 ve 2 saat sonra kabak yapraklarına bulaştırılmıştır. *In vivo* çalışmalarda ise, CMV bulaştırılmasından hemen önce ve sonra, 1 ve 2 saat önce ve sonra bitki yapraklarına propolis dilüsyonları püskürtülerek gerçekleştirilmiştir. Denemelerde kullanılan propolis konsantrasyonlarının %2 dışındaki tüm konsantrasyonları, enfeksiyonun semptomlarında azalmaya neden olmuştur. Yapılan *in vitro* çalışmalar sonucunda sağlıklı bitki oranları bir ve iki saat sonra sırasıyla %10, 10, 30, 40 ve %10, 20, 40, 50 olarak hesaplanmıştır. *In vivo* denemelerde ise; inokülasyon öncesi propolisin %4, 6, 8 ve 10'luk dilüsyonlarının püskürtülerek uygulanması ile elde edilen sağlıklı bitki oranları, inokulasyondan bir saat önce uygulanması sonucunda %10, 20, 40 ve 50 ve inokulasyondan 2 saat önce uygulanması sonucunda ise %10, 30, 40 ve 50 olarak hesaplanmıştır. Yine CMV inokulasyonundan sonra yapılan propolis uygulamalarında ise, sağlıklı bitki oranları bir saatlik süre sonunda %10, 20, 20 ve 30 ve iki saatlik süre sonunda %10, 10, 20 ve 20 olarak belirlenmiştir. Çalışmanın sonuçlarına göre, farklı propolis konsantrasyonlarının uygulamalarının CMV enfeksiyonunu baskılama potansiyeline sahip olduğu ve bu sonuçların saha denemeleri ile desteklenmesi gerektiği düşünülmektedir.

Anahtar Kelimeler: CMV, Enfeksiyon, Propolis, Sakız kabağı, Simptom

Giriş

Propolis, arıların kovan girişinden ve kovadaki çatlaklardan diğer canlıların (böcekler ve mikroorganizmalar gibi) kovanlarına girişlerini engellemek için, çeşitli çiçek nektarları ile kendi salgılarının karışımından ürettikleri reçineli bir karışımdır. Propolis kelimesi iki Yunanca bir kelime olup, pro (önünde) ve polis (şehir veya topluluk) kelimelerinin birleşiminden türetilmiştir. Bu madde, tüm dünyada geleneksel tıp alanında antik çağlardan beri kullanılmaktadır. Son araştırmalar propolisin antibakteriyel, antioksidan, antiinflamatuvar ve antitümör aktiviteleri dahil olmak üzere çok çeşitli farmakolojik özelliklere sahip olduğunu göstermiştir (Marcucci, 1995; Bankova ve ark., 1996; Kujumgiev ve ark., 1999; Abd El Hady ve Hegazi, 2002). Propolisin aktivitesi ve bileşenleri, coğrafi kökenine göre değişiklik göstermektedir (Kujumgiev ve ark., 1999). Propolisin antifungal ve antibakteriyel aktiviteleri konularında çok farklı çalışmalar yapılmıştır, ancak bu maddenin antiviral aktivitesi hakkında da bol miktarda bilgi bulunmaktadır (Marcucci, 1995; Takemura ve ark., 2012). Propolisin antiviral aktivitesi; Influenza A ve B gibi virüsler, İnsan immün yetmezlik virüsü (HIV), Hepatit virüsü, Enfeksiyöz bursal hastalık virüsü (IBDV), Herpes simpleks virüsü (HSV), Vaccinia virüsü, Poliovirüs ve reovirüs, Bakla beneklilik virüsü (BBMV), patatesten görülen çeşitli virüsler gibi farklı bitki ve hayvan virüsleri için rapor edilmiştir (Abd El Hady ve Hegazi, 2002; Fahmy ve Omar, 1989; Mohamed ve Owayss, 2005; Búfalo ve ark., 2009; Schnitzler ve ark., 2010; Doğan ve Hayoğlu, 2012; Coelho ve ark., 2014).

Kabak bitkisi Dünya'nın birçok yerinde üretilerek, farklı ekonomilerde önemli bir ticari öneme sahiptir. Dünya çapında toplam kabakgil üretimi, domates veya turuncgillerden daha fazladır ve patatesin yaklaşık yarısı kadardır (Gaba ve ark., 2004). Sakız kabağı, ülkemizde 2020 yılı verilerine göre, 99746 da tarım alanına ekilerek, 547208 ton üretim sağlanmıştır (TÜİK, 2021). Kabak dünyanın birçok yerinde olduğu gibi ülkemizde de meyvesi için üretilmesinin yanı sıra tohumları ve çiçekleri için de üretimi yapılmaktadır (Vural ve ark., 2000). Kabak bitkisi, meyvesinin yemeklik olarak tüketilmesiyle birlikte tohumlarının da çerez olarak tüketilmesinden dolayı kabakgiller içerisinde ayrı bir öneme sahiptir.

Hıyar mozaik virüsü (*Cucumber mosaic cucumovirus*-CMV) *Bromoviridae* familyası *Cucumovirus* cinsine dahil, izometrik yapıda ve 29 nm çapında partiküllere sahip bir viral etmendir. CMV'nin ırkları: IA, IB ve II. olmak üzere 3 alt grupta sınıflandırılmaktadır. Virüs, mekanik inokulasyonla ve 80'den fazla yaprak biti türü ile non-persistent olarak taşınmaktadır. Bu yaprak bitleri içerisinde en yaygın olanları *Myzus persicae* ve *Aphis gossypii*'dir. CMV 19 bitki türünde tohumla taşınabilmektedir. Bunların dışında etmen küsküt ile de taşınmaktadır. Etmen konukçu bitkinin kök, gövde, yaprak ve meyvelerinde sistemik olarak bulunur. Hastalıklı bitki artıklarında ve yabancı otlarda yaşayışını devam ettirebilir. Yabancı otlar virüsü belirti göstermeden de taşıyabilir ve yabancı ot tohumları hastalığın yayılışında büyük önem taşır. CMV ile enfekteli bitkiler bodur kaldıkları gibi boğum araları kısalmış, yapraklarda şiddetli şekil bozukluğu, damarlar arasında küçük yeşilimsi sarı lekeler ve deformasyonlar görülür. Virüs ile enfekteli bitkilerin yaprak ayası daralır ve ipliksi bir görünüm alır. CMV büyük bir kısmı dikotiledonlar olmak üzere 1200'den fazla yabancı ve kültür bitkisinde enfeksiyon oluşturabilmektedir (Chen 2003). Aynı zamanda, CMV börülce, kereviz, kabakgiller, biber, marul, domates, biber, muz, yemlik baklagiller ve süs bitkilerinde de rapor edilmiştir (Flasinski ve ark., 1995; Gafny ve ark., 1996; Latham ve ark., 1999; İkbal ve ark., 2011; Ashfaq ve ark., 2014). Bugüne kadar gerçekleştirilen birçok araştırma sonucunda, Türkiye kabakgil üretim alanlarında CMV'nin yaygın olarak bulunduğu ve bu bitkilerde ekonomik önemde verim ve kalite kayıplarına neden olduğu rapor edilmiştir (Yılmaz ve ark., 1992; Kaya ve Erkan 2011; Topkaya ve Ertunç 2012; Yılmaz 2014; Şevik ve Balkaya 2015; Korkmaz ve ark., 2018; Yeşil: 2019a, b; 2020, 2021).

Bu çalışmanın temel amacı, farklı propolis konsantrasyonlarının CMV enfeksiyonu üzerindeki etkisini belirlemek ve bu uygulamaların Türkiye'de sebze üretim alanlarında en fazla görülen virüs hastalıklarından bir tanesi olan CMV ile mücadelede çevre dostu bir yaklaşım ortaya koymaktır.

Materyal ve Yöntem

Virüs Kaynağı

Çalışma kapsamında, virüs inokulum kaynağı olarak daha önceden hem serolojik, hem de moleküler olarak teşhisi yapılmış ve aynı zamanda kılıf proteini geni (*cp*) kısmi olarak dizi analizine tabi tutulmuş ve gen bankasına (NCBI) KC989614 aksesyon numarası alınarak yüklenmiş olan C-5 kodlu CMV izolatı (Yeşil, 2013) kullanılmıştır. Derin dondurucuda muhafaza edilen CMV ile bulaşık yaprak örnekleri, içerisinde PBS (Phosphate-Buffered Saline, fosfat tamponu, 0,01M, pH:7) tampon bulunan havanlarda buz üstünde havan eli kullanılarak ezilmişlerdir. Elde edilen CMV ile bulaşık bitki ekstraktı, söz konusu izolatin saflığını teyit etmek amacıyla, virüsün lokal lezyon konukçusu olan *Chenopodium quinoa* Willd. bitkilerine birbirini takip edecek şekilde seri inokulasyonlar gerçekleştirilmiştir. Ardından virüs çoğaltılmak üzere sakız kabağı yapraklarına öncesinde karborundum tozu uygulanması şeklinde pamuk yardımıyla inokule edilmiştir. İklim odası koşullarında (25 ± 2 °C, 14 s. aydınlık / 10 s. karanlık) bekletilen bu bitkiler inokulasyondan 14 gün sonra gerçekleştirilen gözlemlerde CMV belirtileri gösterdikleri belirlenmiştir. Virüs inokulum kaynağı olarak kullanılmadan önce bu bitkilerden alınan örneklerdeki CMV enfeksiyonları DAS-ELISA testi ile doğrulanmıştır.

Propolis ekstraktlarının hazırlanması

Bal arısı yetiştiricilerinden elde edilen saf haldeki propolis örnekleri %95'lik saflıktaki etanol ile ekstraksiyonunun ardından iki kat müslinden süzölmüş ve etanol buharlaştırılarak uzaklaştırılmıştır (Mohamed ve Owayss, 2005). Denemelerde kullanılmak üzere saf su ile %2, 4, 6, 8 ve 10'luk konsantrasyonlardaki dilüsyonları hazırlandı. Farklı propolis konsantrasyonlarının CMV enfeksiyonu üzerindeki etkileri *in vitro* ve *in vivo* denemelerde ortaya konmaya çalışılmıştır.

Propolis ekstraktının *in vitro*'da CMV'ye etkisi

Çalışmanın bu aşamasında, farklı konsantrasyonlardaki (%2, 4, 6, 8 ve 10) propolis dilüsyonlarının CMV ile enfekteli bitki ekstraktı ile karıştırılması ve bu karışımın bekletilmeden veya bir süre bekletildikten sonra virüsün aktivitesine etkisi ortaya konmaya çalışılmıştır. Bu amaçla, CMV ile bulaşık bitki ekstraktı ve farklı konsantrasyondaki propolis dilüsyonunun 500'er µl alınarak karıştırılmıştır. Elde edilen 1 ml'lik karışım (CMV ile bulaşık bitki ekstraktı + propolis dilüsyonu) sakız kabağı yapraklarına bekletmeden hemen, 1 ve 2 saat bekletmenin ardından mekanik olarak bulaştırılması şeklinde *in vitro* denemeler gerçekleştirilmiştir. Her denemede, gerçek yaprak oluşturmuş 10 adet kabak bitkisi bulaştırılmıştır ve bu işlem 14 gün sonra belirti varlığına göre uygulamalar değerlendirilmiştir. Mekanik olarak inokule edilmiş bitkiler, CMV'nin varlığını ve yokluğunu doğrulamak için DAS-ELISA ile test edilmiştir. Ayrıca denemelerde, sadece CMV bulaştırılan bitkiler pozitif kontrol ve sadece propolis dilüsyonu bulaştırılan bitkiler negatif kontrol olarak kullanılmıştır.

Propolis ekstraktının *in vivo*'da CMV'ye etkisi

Çalışmanın bu aşamasında ise, farklı konsantrasyonlardaki (%2, 4, 6, 8 ve 10) propolis dilüsyonları, bitkilere CMV bulaştırmadan önce (hemen önce, 1 ve 2 saat önce) ve sonra (hemen sonra, 1 ve 2 saat sonra) olmak üzere direkt yapraklara püskürtülerek uygulanmıştır. CMV bulaştırılan veya bulaştırılacak olan kabak yaprakları dilüsyon ile tamamen ıslatılana kadar püskürtme işlemi yapılmıştır. *In vivo* aşamasında da yine tüm bitkiler mekanik olarak CMV ile bulaştırılmıştır. Her denemede, gerçek yaprak oluşturmuş 10 adet kabak bitkisi virüsle bulaştırılmıştır ve belirtilerin gelişmesi için iklim odası koşullarında (25 ± 2 °C, 14 s. aydınlık /10 s. karanlık fotoperiyodu) tutuldu. Bu işlem 14 gün sonra belirti varlığına göre uygulamalar değerlendirilmiştir. Hem belirti gösteren hem de sağlıklı görünen bitkiler, sırasıyla CMV varlığını ve yokluğunu doğrulamak için DAS ELISA testi ile testlenmiştir. Ayrıca denemelerde, sadece CMV bulaştırılan bitkiler pozitif kontrol ve sadece propolis dilüsyonu bulaştırılan bitkiler negatif kontrol olarak kullanılmıştır.

Bulgular ve Tartışma

CMV bulaştırılan sakız kabağı bitkilerinde gözlenen belirtiler

Çalışma sırasında kullanılan C-5 kodlu CMV izolatı daha önce yapılan başka bir çalışmada doğal olarak bulaşık olduğu farklı yöntemlerle ortaya konulmuş olan hıyar (*Cucumis sativus* L.) yapraklarından sağlanmıştır. İzolat *C. quinoa* Willd. bitkisine inokulasyonu ile lokal lezyonlar gözlenmiş ve tekrarlanan inokulasyonlarla söz konusu izolatın saflaşması sağlanmıştır. Ardından izolat, çoğaltılmak amacıyla sakız kabağı bitkilerine inokule edilmiştir. Sakız kabağı bitkilerine inokule edilen C-5 izolatı, inokulasyondan yaklaşık 1 hafta sonra mozaik belirtilerinin oluşumuna sebep olmuştur. Bununla birlikte, inokulasyonun 10. gününde gerçekleştirilen gözlemlerde yapraklarda sigilleşme, iplikleşme ve pürüzlenme gibi şekil bozukluklarının geliştiği de belirlenmiştir.

Propolis ekstraktının *in vitro*'da CMV'ye etkisi

Farklı konsantrasyonlardaki (%2, 4, 6, 8 ve 10) propolis dilüsyonlarının CMV ile enfekteli bitki ekstraktı ile karıştırılması ve bu karışımın bekletilmeden veya 1 ve 2 saat bekletildikten sonra virüsün aktivitesine etkisine ait sonuçlar Çizelge 1.'de özetlenmeye çalışılmıştır. Kabak bitkilerine gerçekleştirilen propolis+CMV karışımı inokulasyonundan sonra bitkiler 14. günde gözlemlenmişler ve belirti durumları kaydedilmiştir. Çalışmanın bu aşamasında gerçekleştirilen uygulamalarda, CMV ile bulaşık bitki ekstraktı ile karıştırılan propolis dilüsyonlarının hepsi yapraklara bekletilmeden uygulandıklarında CMV enfeksiyonlarına karşı etkisiz bulunurken; %2'lik konsantrasyon dışındaki diğer tüm propolis konsantrasyonları 1 veya 2 saat bekletilmelerinin ardından uygulandıklarında CMV enfeksiyonunu baskılama yönünden etkili bulunmuşlardır. %4, 6, 8 ve 10'luk propolis dilüsyonlarının sakız kabağı yapraklarına bir ve iki saat bekletildikten sonra bulaştırılmalarının ardından sağlıklı bitki oranları sırasıyla %10, 10, 30, 40 ve %10, 20, 40, 50 olarak hesaplanmıştır. *In vitro* uygulamalar sonucunda, %10'luk konsantrasyondaki propolis ekstraktının CMV enfeksiyonlarını baskılamada en başarılı konsantrasyon olduğu görölmüştür.

Ayrıca, denemelerde inokule edilen tüm sakız kabağı bitkilerindeki belirti varlığı veya yokluğunun sebeplerinin CMV enfeksiyonunun varlığı veya yokluğu olduğunu teyit etmek için bitkiler DAS-ELISA testine tabii tutuldu. Dolayısıyla, belirti gösteren bitkilerde CMV varlığı tespit edilirken, sağlıklı bitkilerde ise CMV enfeksiyonları tespit edilememiştir.

Çizelge 1. Propolis ekstraktının farklı konsantrasyonlarının farklı sürelerde bekletilmelerine göre CMV enfeksiyonları üzerindeki baskılama etkileri

Uygulama şekli	Bitki sayısı	K ⁺¹	K ⁻²	Propolis konsantrasyonu (%)				
				2	4	6	8	10
Bekletilmeden	Bulaştırılan	10	10	10	10	10	10	10
	Sağlıklı	0	10	0	0	0	0	0
	Etki (%)	0	10	0	0	0	0	0
1 saat sonra	Bulaştırılan	10	10	10	10	10	10	10
	Sağlıklı	0	10	0	1	1	3	4
	Etki (%)	0	10	0	10	10	30	40
2 saat sonra	Bulaştırılan	10	10	10	10	10	10	10
	Sağlıklı	0	10	0	1	2	4	5
	Etki (%)	0	10	0	10	20	40	50

¹K+: Sadece CMV bulaştırılmış pozitif kontrol, ²K-: Sadece propolis bulaştırılmış negatif kontrol.

Propolis ekstraktının *in vivo*'da CMV'ye etkisi

Sakız kabağı yapraklarına CMV bulaştırılmadan önce ve sonra bu yapraklara %2, 4, 6, 8 ve 10'luk konsantrasyonlarda hazırlanan propolis ekstraktının püskürtülmesinin CMV enfeksiyonunu engelleme etkilerine dair sonuçlar Çizelge 2.'de verilmiştir. Çalışmanın bu aşamasında, propolis konsantrasyonları sakız kabağı yapraklarına CMV bulaştırılmadan hemen önce, 1 ve 2 saat önce CMV bulaştırıldıktan hemen sonra ve 1 ve 2 saat sonra olmak üzere farklı zamanlarda yapraklara püskürtülerek uygulanmıştır. Yine CMV inokulasyonundan 14 gün sonra bitkilere belirti varlığı veya yokluğuna göre kontrol edilerek değerlendirilmiştir. *In vivo* deneme sonuçlarına bakıldığında, *in vitro* denemelerde olduğu gibi CMV inokulasyonundan hemen önce veya hemen sonra yapılan propolis uygulamalarının hiçbir konsantrasyonda başarı göstermediği gözlemlenmiştir. Bununla birlikte yine %2'lik propolis dilüsyonunun yapraklara püskürtülmesinin CMV enfeksiyonunu engelleme açısından tüm uygulama zamanları için etkisiz olduğu görülmüştür. *In vivo* denemelerde; inokulasyon öncesi propolisin %4, 6, 8 ve 10'luk dilüsyonlarının püskürtülerek uygulanması ile elde edilen sağlıklı bitki oranları, inokulasyondan bir saat önce uygulanması sonucunda %10, 20, 40 ve 50 ve inokulasyondan 2 saat önce uygulanması sonucunda ise %10, 30, 40 ve 50 olarak hesaplanmıştır. Yine CMV inokulasyonundan sonra yapılan propolis uygulamalarında ise, sağlıklı bitki oranları bir saatlik süre sonunda %10, 20, 20 ve 30 ve iki saatlik süre sonunda %10, 10, 20 ve 20 olarak belirlenmiştir.

Ayrıca, denemelerde inokule edilen tüm sakız kabağı bitkilerindeki belirti varlığı veya yokluğunun sebeplerinin CMV enfeksiyonunun varlığı veya yokluğu olduğunu teyit etmek için bitkiler DAS-ELISA testine tabii tutuldu. Dolayısıyla, belirti gösteren bitkilerde CMV varlığı tespit edilirken, sağlıklı bitkilerde ise CMV enfeksiyonları tespit edilememiştir.

In vivo denemeleri sonucunda, farklı konsantrasyonlardaki propolis ekstraktının sakız kabağı bitkisinde CMV kaynaklı belirtileri azaltıcı etkisi en fazla CMV inokulasyonundan önce uygulandığında elde edilmiştir. Sonuçlara bakıldığında özellikle CMV inokulasyonundan 2 saat önce sakız kabağı bitki yapraklarına propolis ekstraktı uygulandığında; %6, 8 ve 10'luk konsantrasyonlarının CMV enfeksiyonunu sırasıyla %30, 40 ve 50 oranlarında engellediği görülmektedir. Bu sonuçlar özellikle çok sayıda ve farklı familyalara ait konukçu kültür bitkisi ve yabancı ot türlerine sahip, aynı zamanda 30 civarı farklı yaprakbiti türü ile çok etkin olarak taşınabilen bir virüs olan CMV ile mücadelede ümit vadetmektedir. Bu bağlamda, bu çalışma sonucunda elde edilen verilerin bahçe ve tarla koşullarında da denenerek teyit edilmesi faydalı olacaktır.

Çizelge 2. Farklı konsantrasyonlardaki propolis ekstraktının CMV inokulasyonundan önce ve sonra uygulanmasının sakız kabağı bitkilerinde CMV enfeksiyonu üzerinde engelleyici etkileri

Uygulama şekli	Bitki sayısı	K ⁺¹	K ⁻²	Propolis konsantrasyonu (%)				
				(İnokulasyondan önce / İnokulasyondan sonra)				
				2	4	6	8	10
Bekletilmeden	Bulaştırılan	10	10	10/10	10/10	10/10	10/10	10/10
	Sağlıklı	0	10	0/0	0/0	0/0	0/0	0/0
	Etki (%)	0	10	0/0	0/0	0/0	0/0	0/0
1 saat	Bulaştırılan	10	10	10/10	10/10	10	10/10	10/10
	Sağlıklı	0	10	0/0	1/1	2/2	4/2	5/3
	Etki (%)	0	10	0/0	10/10	20/20	40/20	50/30
2 saat	Bulaştırılan	10	10	10/10	10/10	10/10	10/10	10/10
	Sağlıklı	0	10	0/0	1/1	3/1	4/2	5/2
	Etki (%)	0	10	0	10/10	30/10	40/20	50/20

¹K+: Sadece CMV bulaştırılmış pozitif kontrol, ²K-: Sadece propolis bulaştırılmış negatif kontrol.

Bu çalışma ile, propolis ekstraktının virüs enfeksiyonunu engelleyici etkisi üzerine elde edilen sonuçlar ile, literatürde konu ile ilgili daha önce yapılan çalışma sonuçları benzerlik göstermektedir. Sırbistan'da yapılan bir araştırmada, yağlık kabak ekim alanlarında önemli bir sorun olan Kabak sarı mozaik virüsü (*Zucchini yellow mosaic potyvirus*, ZYMV) kaynaklı enfeksiyonlarla mücadelede farklı propolis konsantrasyonları hem *in vitro* hem de *in vivo* koşullarda uygulanmış. Uygulama sonuçlarına göre %5 ve 10'luk konsantrasyonlarda hazırlanan propolis ekstraktının hem *in vitro* hem de *in vivo* koşullarda ZYMV enfeksiyonunu engelleyici etkiler gösterdiği gözlemlenmiştir (Vucurovic ve ark., 2017). Mohamed ve Owayss (2005), BBMV (*Broadbean mottle virus*, Bakla beneklilik virüsü) üzerinde *in vivo* ve *in vitro* olarak uygulanan farklı propolis konsantrasyonlarının virüs enfeksiyonunu %35-80'e kadar azalttığını göstermiştir. Fahmy ve Omar (1989), propolis ekstraktı ilave edilmiş modifiye Murashig-Skoog (MS) kültür ortamına, virüslerle bulaşık altı farklı patates çeşidinden alınan apikal meristemler ve sürgünler ekilmiş, bu propolis içeren besiyerinde yaklaşık 1 ay yetiştirilen patates bitkilerinde Patates S, Y, M ve X virüslerinin varlıklarının dikkate değer düzeyde azalma gösterdiği belirlenmiştir. Literatürde bulunan çalışmalarda propolisin aynı zamanda hayvanlarda hastalık yapan virüsler üzerinde de engelleyici etkilerinin olduğu bildirilmektedir. Coelho ve ark. (2014), propolisin picornavirüs replikasyonunda 64 kata kadar azalma, influenza virüsünde 32 kat azalma ve kızamık virüsünde 8 kat azalma ve kızamıkçık virüsü replikasyonunda 103 kat azalmaya sebep olduğunu bildirmektedirler. Ayrıca fareler üzerinde yapılan bir çalışma sonucunda; %5'lik propolis solüsyonunun İnfluenza virüsü enfeksiyonundan önce uygulandığında enfeksiyonun tamamen engellendiği, enfeksiyondan sonra uygulandığında ise propolisin hiçbir engelleyici etki göstermediği bildirilmektedir (Ghisalberti, 1979).

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A framework for Blockchain Technology in Vietnamese Domestic Rice Supply Chain Traceability

Hoang Quoc Tuan^{1*}, Le Tuan Phuc¹, Pham Ngoc Hung¹, Nguyen Thi Thao¹, Cung Thi To Quynh¹, Lai Quoc Dat², Nguyen Hoang Dung²

¹School of Biotechnology and Food technology, Hanoi University of Science and Technology, No1 Dai Co Viet, Hanoi, Vietnam

²Ho Chi Minh City University of Technology, No 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City.

*Corresponding author: tuan.hoangquoc@hust.edu.vn, tuanhqibft@gmail.com.

Abstract

As rice is a basic grain of food consumption in Vietnam, its integrity during supply chain processes is always a major concern for the consumers. The traceability systems are one of the solution to this problem. However, traditional traceability offer consumers the ability for tracking the history of products, but not the trust. Due to the lack of transparency of traditional traceability, businesses can hardly obtain consumers' trust and loyalty. With the rapid growth in the technology, many emerging technologies have been applied in the rice supply chain system. The blockchain technology, which is decentralized, not governed by any central authority and distributed is the solution for the problems arising in the rice traceability system.

In this paper, we introduce a framework of blockchain implementation to trace and authenticate the Vietnam domestic rice supply chain. The blockchain system is integrated with the chemical and biological analysis, which will assure safety, quality, authenticity and traceability of rice in supply chain management processes.

Key Words: Vietnamese Rice, Supply chain, Blockchain, Authenticity, Traceability

Introduction

The authenticity and traceability of food products is becoming ever more important as globalization continues to increase the complexity of food supply chains [Jishi Wanga *et al.*]. Food consumers now struggle with choosing products that are good for their health and friendly to the environment, or not buying unsafe or fraud food products. They need to have adequate information of the food product brands, instruction to use and adequately preserve the products. Using transparent information as a foundation, food supply chain traceability enables the access to critical and exact information about origins and quality of products in the whole supply chains at anywhere and/or anytime that the consumer or/and clients would like to trace. Traceability is undertaken primarily at the administrative level, where the use of advanced analytical tools is not available [M.Espiñeira *et al.*]. Traditional traceability offer consumers tracking the history of products, but not the trust. Due to the lack of transparency of traditional traceability, businesses can hardly obtain consumers' trust and loyalty.

Blockchain traceability helps consumers track the journey of products, give them trustworthy information about how the products were made, transported, distributed to them. All the information is very transparent; therefore, Blockchain traceability is the ideal tool for gaining consumers' trust in the brands [Dutta P *et al.*]. Blockchain is a novel technology that has been gaining many attentions and expected to become the one transforming businesses across different industries including food sectors [Armstrong *et al.*]. In addition, analytical techniques such as mass spectrometry techniques, spectroscopic techniques, separation techniques, and others that enable the provenance of food to be determined provide an independent means of verifying traceability systems and also help to prove food product authenticity, to combat fraudulent practices and to control adulteration, which are important issues for economic, religious, or cultural reasons [Thomas Burke].

Vietnam is one of the world's richest agricultural regions and is the second-largest (after Thailand) exporter worldwide and the world's seventh-largest consumer of rice [Vietnam Rice Industry Report]. The Mekong Delta is the heart of the rice-producing region of the country where water, boats, houses and markets coexist to produce a generous harvest of rice [Kersten Clauss *et al.*]. Vietnam's land area of 33 million ha has three ecosystems that dictate rice culture. In recent years, many high value rice varieties have been researched and developed such as ST25, ST4 varieties etc, which were awarded 1st international prizes. Therefore, the authenticity and traceability is necessary to ensure the Vietnamese rice brands due to a lot of competition among rice exporting countries in the region.

Based on the administrative as well as chemical and biological data gathered from multiple sources and the analysis of a case study, a research is conducted in Vietnam rice chain with the aim at answering the research question: How can blockchain resolve to address the traceability and authenticity issues in Vietnamese domestic rice sector? The paper will share the findings from the study and propose a new framework using blockchain to improve the traceability as well as authenticity of rice products.

Literature Review

Traceability in food supply chain

Up to date, a lots of approaches have been developed and already applied for food supply chain traceability, ranging from simple methods such as traditional paper-based ones to sophisticated and advanced technologies [Petter Olsen *et al.*]. However, less developed and/or even developing countries tend to prefer choosing traditional ones i.e recording by paper documents rather than using cutting-edge techniques i.e digital technology to perform traceability in food supply chain [Samantha Islam *et al.*]. Most of Vietnamese farmers are not familiar even with recording documents and exchanging them with wholesalers and/or traders who will buy their products, let alone participating in a complex computer or handphone-based system except rice product companies who has their own farm or under their quality control [Hai V.P *et al.*]. Besides that there are not many applications developed specifically for food traceability since companies prefer to use their internal integrated information system to avoid overspending on additional fee for external IT system.

Blockchain applications in food traceability

Blockchain technology has been used to allow retailers and consumers to track the provenance of meat and other food products from their origins to stores and restaurants [Leong *et al.*]. As a new trend, blockchain technology has much potential to become a realistic technological option to address the challenge in mining and managing information across the food supply chain. A blockchain is a decentralized, distributed, and oftentimes public, digital ledger consisting of records called blocks that is used to record transactions across many computers so that any involved block cannot be altered retroactively, without the alteration of all subsequent blocks [Iansiti *et al.*]. Blockchain technology can be characterized through five principles: security, peer-to-peer transmission, transparency with pseudonymity, irreversibility of records and computational logic [Andoni *et al.*].

The first blockchain system for food supply chain was applied by Walmart and IBM. They were running a trial to use a blockchain-backed system for supply chain monitoring for lettuce and spinach — all nodes of the blockchain were administered by Walmart and were located on the IBM cloud [Corkery *et al.*]. The results show that one cited benefit is that the system could enable rapid tracing contaminated food produce. Some analysts are less convinced that most consumers will be that interested in this traceability system [Gstettner *et al.*].

The systems are purely a 'supply chain' with information being tracked far beyond the origin and quality of the product, including farming and processing parameters, shipping details, and more. The Internet of Things (IoT) has also been integrated into the blockchain to improve the efficiency of the food traceability system in the hope of building an open and comprehensive network of devices capable of organizing and self-organizing transparent data and resource sharing [Gstettner *et al.*, Madakam S *et al.*]. However, there are inherent limitations for the adoption of blockchain in food traceability. To enable blockchain to work effectively, all parties and contacts are involved. In addition, the integrity of the data is under the control of the data collector, and an authentication system is required to prevent tampering. Having a unified system with clear standards and regulations is a major impediment to adoption [Corkery *et al.*, Gstettner *et al.*]. Chemical and/or biological data of food is one of valuable information that should be integrated into blockchain system for avoiding human error and interference i.e administrative information, an information assigned to food objects by collectors' purpose.

Research methodology

In this research, the potential roles of blockchain technology to ability to apply to the traceability system in Vietnam's domestic rice sector was identified. Information and data are gathered from multiple sources and presented in flowchart forms. The information and data analyses will serve as a foundation to propose a theoretical framework that is expected to answer the research question: *How can blockchain technology resolve to address the traceability and authenticity issues in Vietnamese domestic rice supply chain?*

Rice supply chain and traditional traceability model

Vietnam is set to remain the world's second largest rice exporter in 2021 with 6.4 million tons, an increase of 233,000 tons compared to last year although affected by the Covid-19 epidemic. Government, producers and farmers are seen to shift their focuses from reducing the poverty towards emphasis on technology usage to eliminate labor intensive farming and thus impacting the growth in productivity of the farmers. Vietnam has around 8 million hectares of land under rice cultivation and it has an average yield of 3.5 tons per hectare. Besides that, quality management as well as traceability system were also applied for improving Vietnam's rice brand to importer [Vietnam Rice Industry Report]. With the climate change, continuous rising demand by consumers and the food security, rice industry is facing the challenge of producing rice without compromising on efficiency, equitability, environmentally-friendly, more resilience to climate change and to ensure the food safety. Besides that, Vietnam rice industry also recognizes the value of traceability system and understand the cost and profit based on brand differentiation to provide competitive advantage to the existing and new entry players.

The Vietnam rice supply chain management follows the multi-stage supply chain system which consists of farmers, middle-man agents or mundi, rice processing companies, distributors and retailers [Hung K.N *et al.*]. Figure 1 explains in detail the multiple stages involved in rice supply chain and their functioning. In both the domestic consumption and exporting distribution channels, there are generally at least four or five supply chain agents between the farm-gate and the consumers. The chains are long compared with other agricultural product supply chains in Vietnam as well as with rice supply chains in other leading producer countries [Trang N.T.N *et al.*].

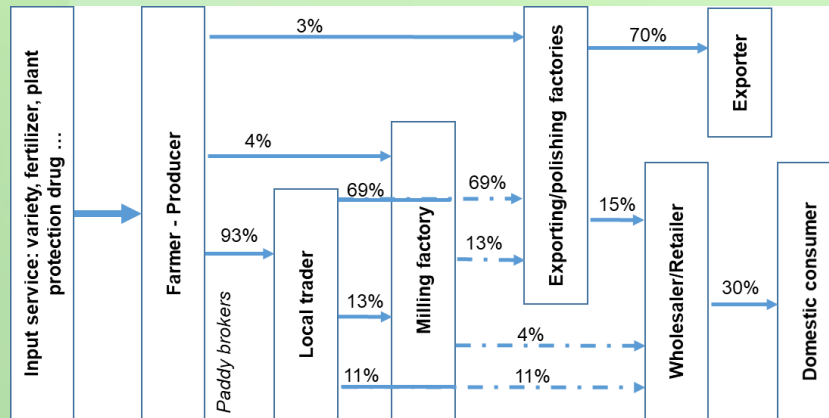


Figure 1: Vietnamese Domestic Rice supply chain [Hung KN *et al.*]

The Primary stage of rice supply chain starts with 93% paddy farmers selling paddy to local trader and about 17% selling to rice processing companies directly or indirectly through intermediaries based on productivity and type of farmers i.e Large Land Holders and Small Land Holders and the ability or/and capacity of the their business system. In rice milling company paddy is being processed and converted into rice through multiple stages like cleaning, husking, polishing, packaging and storing. After converting paddy to rice, rice processing companies will sell rice to exporting/polishing factories and wholesalers. From here on exporting/polishing factories will sell rice to exporters, and wholesaler/retailers will sell rice to domestic consumers.

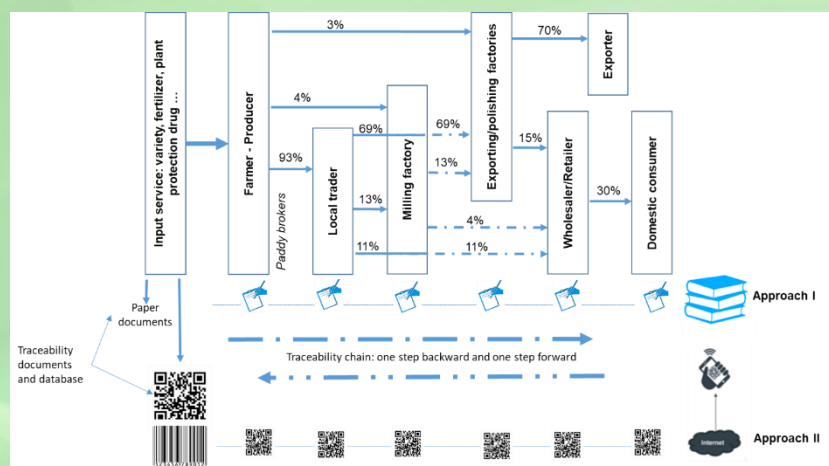


Figure 2: Traditional traceability model in the Vietnamese domestic rice supply chain

At least two approaches have been developed and already applied for rice supply chain traceability in Vietnam, ranging from simple methods such as traditional paper-based ones (approach I) to sophisticated technologies (approach II) such as using barcode and/or QR for recording traceability database. A traditional rice traceability system can record the whole circulation process of rice, from planting, production, processing, and warehousing to use by consumers (Fig 2). Once fraud or unsafe rice are found, they can be traced back to the source. But the traceability based on paperwork will take a lot of time to trace information whenever get requirement from consumer or/and clients. This drawback was partial solved by applying QR or/and barcode into IT system. However, the traditional rice traceability system still has some limitations, such as its inability to prevent counterfeiting and facilitate the disclosure of sensitive information.

Application Scenario

Here we are proposing a new framework for traceability as shown in figure 3 for the Vietnamese domestic rice supply chain, making use of blockchain, IoT, analyzer instruments and smart contracts. The traceability database are not only the administrative data, processing parameters but also are gathered from multiple sources by analytical techniques i.e characteristic chemical and biological data of rice samples. Each technology has its benefits and limitations and ultimately no individual technology can single-handedly address all the issues surrounding authenticity, provenance and traceability. Therefore, we proposed that adopting a framework that integrates multiple technologies into a combined proactive solution could be the key to ensure authenticity, traceability and provenance of rice products

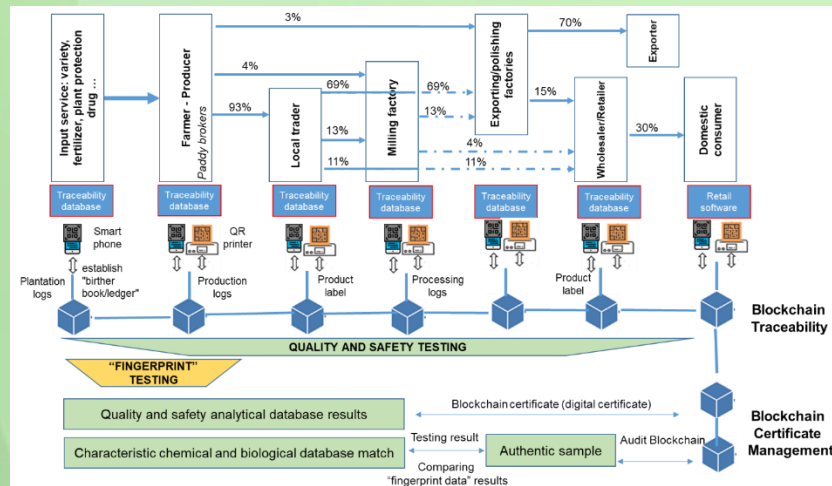


Figure 3: Propose framework for a blockchain traceability system for rice supply chain

In this traceability system, all supply chain members mentioned in figure 3, should have to register and provide the administrative information, production/processing parameters by themselves into the system, and match their unique identities and digital profiles stored in the blockchain system. The characteristic chemical and biological data of paddy rice and rice products such as protein, amino acid, fatty acid, mineral, ash content, v.v and DNA were studied and provided by an independent analytical laboratory. Besides that, the additional information was collected from local digital camera, weather information, farm's GPS (The Global Positioning System) etc, and recorded and upload into the blockchain systems.

The blockchain-based traceability system can be explained in five stages of a rice supply chain, namely 1) Plantation/at the farm and Production; 2) Procurement/local trader 3) Processing plant, 4) Distribution and 5) at the retailers.

Plantation/production

At rice fields, during rice crop cultivation, the time-lapse movie technology applied for recording cultivation data by digital cameras. A production logs software was created and using during crop. All step of rice crop cultivating was recorded by production logs software and crosscheck with Good Agricultural Practice (GAP) or Organic Cultivation Standard as they were applied by farmer. The production harvested paddy is packed in bags (50kg/bag) and labeled with tags i.e removable paper-based with QR codes printed or RFID card and entered into the blockchain with a digital profile. The key traceability information regarding the paddy is stored in these digital profiles. The traceability data are growing conditions such as soil, water, area, season etc, quality of the seed, planting time, plucking time and information regarding fertilizers, pesticides used for the yield of the crop, farmer information (name, address, ID etc), time-lapse movie and GPS of rice fields. After that, a new trade is initiated between the farmers/producers and the intermediaries i.e local trader or rice processing companies where the rice product is exchanged after signing a digital contract (Smart contract) that is stored on the blockchain with all traceability information through handheld tag reader and wireless network i.e QR barcode scanner or smart-phone.

Procurement/Local trader

At the second stage, when the truck carrying paddy rice arrives at local trader warehouse, the worker will scan the seal and access the data that have been input by farmers and collectors. The worker is thus able to verify and accept the shipment while the scan was logged and the status of rice batch was updated to blockchain. At procurement center or local trader, digital profile of the product was updated to blockchain by providing information related to local trader (ID number, administrative info etc), warehouse condition, time of import to warehouse, product quantity and quality information of paddy and traceability data from plantation/production stage. At this stage, the

digital camera was also applied for recording the time-lapse movie during storing paddy rice. The rapid analyses such as using NIR instrument could be applied to check quality and safety of paddy rice and the resulted analytical data is also updated to blockchain. If a quality or safety issue is detected after the analysis, the inspectors of local trader will trace back and inform farmer as well as update this analysis results into blockchain system.

Processing

After receiving the paddy, the rice processor will convert the paddy into rice. Information regarding processing steps such as cleaning, husking, polishing, storage, and packaging is stored on digital product records and updated to the blockchain. At this time, the quality and safety of rice are also analyzed and updated in the blockchain. A time-lapse movie of the entire process was also recorded. In addition, processing companies will enable QR codes with data such as identifiers, GPS or GLN (Global Location Number), administrative information, etc. Distribution After receiving packages of rice products from rice processing companies the data regarding the quality and safety of rice products, storages, logistics and distribution is been continuously updated on blockchain system at specific intervals by the distributors, such that it will keep track on all the activities of distributors while supplying rice to retailers and validated against the smart contract. At this stage, the traceability data of distributors or exporters will activate and update to the blockchain system.

Retailing

When retailers receive rice bags, they nearly obtain all the information by scanning the tags installed on packages of rice products. Retailers or wholesalers need to scan QR codes from distributors on each product so that the status of products can be added to blockchain and consumers can access the origin of the rice products.

As all the information of rice products is stored in its digital profile on the blockchain, anyone with a software i.e can scan QR, linked with blockchain can obtain all the details and audit all the activities involved in the supply chain of particular rice at any stage and at any time. Whenever they would like to trace or even authenticate the quality or/and origin of analytical samples if they have analysis chemical or biological data of it by comparing with "fingerprint data".

The end domestic consumer can download QR code reader app via App Stores or app which already intergated QR scan function such Zalo on their smart phone and use it to scan the QR code on the products and check its provenance as well as authenticity. They will be redirected to a web page with information that answers the following questions about a particular rice product:

- What farm does the rice used to make this item come from? What are the agricultural standards (GAP, Organic standards, etc) that farmers follow when growing rice?
- When and where are rice products produced? What process and how does this product arrive? What is the quality of these products? Food safety standards that processors follow when producing rice products (ISO, organic standards, etc.)
- When did this product arrive at the retailer and appear on the shelf? The expiration date of the product? Besides that, the consumer also can see all time-lapse movie, analysis chemical and biological data of products in this webpage.

However, in fact, in the Vietnamese market, the small retail model is still very popular next to supermarkets, convenience stores, and retailers. These small grocers cannot afford standard technology systems, even POS systems that scan QR codes on purchased products to update their status; while smartphones have become very popular gadgets. Therefore, this feature is not practical enough to apply to the entire rice supply chain in Vietnam. If not only rice, but also scanning channels selling other food items become unified in terms of equipment and technology in the future, surely this channel can be expanded to apply to any supply chain food any other product.

Conclusion

With this paper, a theoretical framework of the blockchain system for Vietnamese domestic rice supply chain as traceability as well as authenticity tool was proposed. The benefits when employing into rice supply chain is to ensure integral traceability, to fight fraud and to minimize the system errors as it provides traceability of rice by recording all the events happening in the supply chain from rice farm to retailer. This system can bring benefits to different supply chain members in many ways. Every time rice transfer from a member to another member in the supply chain, the information is recorded and uploaded on the blockchain. Thus, creating a permanent history of the rice from manufacturer to sale for traceability. Besides that, time-lapse movie, analysis chemical and biological data is also analyzed and uploaded on the blockchain as additional traceability and/or authenticity information.

Another benefit of blockchain is the elimination of human errors such as that of farmers, traders and conventional rice producers in Vietnam in the circulation of rice and rice products. Consumers now have reliable support tools to prove the traceability and authenticity of rice products, especially rice products with high commercial value, to regain their confidence. With sensors, digital camera, analytical equipments and smart contracts are integrated to the system, businesses can save significant time and costs for human resources or intermediaries to control the

quality, safety and traceability their products. Besides, processor can be more assured that the standard procedures would be strictly followed by farmers/producer since this traceability system can trace back to a particular batch of rice coming from which farm.

Related to administrative management, the government can rely on the proposed traceability solution with transparency, convenience and more importantly, a realistic system to solve rice safety issues and frauds with limited risks of human errors and being tampered during the information exchange, especially when the competition in rice market is increasing among rice-exported countries.

Future research

Future projects can further research on rice industry by developing traceability system for export instead of for only domestic market like this paper.

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2, 4-dichloro-6-[(E)-[(3-methoxyphenyl) imino] methyl] phenol (DPMP) as a seed priming agent in bread wheat (*Triticum aestivum* L.)

Harun Bektaş^{1*}, Yasemin Bektaş¹

¹Department of Agricultural Biotechnology, Faculty of Agriculture, Siirt University, Siirt, Turkey

Abstract

Seedling vigor and germination uniformity are two important traits for a uniform stand establishment and homogeneous growth in field crops. Evaluation of organic and synthetic chemicals, phytohormones, and plant metabolites as seed priming agents is an advanced field of study. There have been significant achievements in the use of priming agents as a standard approach before sowing. Here, a new plant defense elicitor, 2,4-dichloro-6-[(E)-[(3-methoxyphenyl) imino] methyl] phenol (DPMP), is evaluated as a priming agent in bread wheat (*Triticum aestivum* L.). The study was conducted under controlled conditions with three different doses of DPMP as priming agent and control treatment. According to the results, there were significant differences between priming applications and control on the number of lateral roots, shoot fresh weight and shoot fresh weight/root fresh weight ratio. The rest of the evaluated traits did not have a significant difference, but most of the traits had higher values compared to control. A total of 10 out of 13 seedling traits evaluated had higher values compared to un-primed seeds (control). Root fresh weight, plant height/root length ratio, and the number of lateral roots were negatively affected by priming. DPMP is an unexplored chemical and seed priming with DPMP provided promising results, however, there is a need for the evaluation of different species/cultivars with DPMP to understand its actual potential and usability as a priming agent.

Key Words: Plant defense elicitor, seed priming, root growth, bread wheat

Introduction

Cereal grains and pulses are the two of the most consumed food groups worldwide. Of these, bread wheat is the primary food source of more than half of the Worldwide population. It is estimated that global consumption of wheat, especially in developing nations, will nearly double and current trends cannot meet growing demand (Godfray et al. 2010). There is a need for improving grain yield by extending the potentials of current cultivars and releasing new ones. Climate change and increasing demand for food consumption force agronomists and breeders to find alternative solutions in addition to releasing high potential cultivars (Kilian et al. 2021; Snowdon et al. 2021; Massel et al. 2021; Kamenya et al. 2021). To meet the growing demand and increase the production quality and quantity, all tools of modern agricultural approaches are applied (Watson et al. 2018; Hussain et al. 2021; Bakala et al. 2021; Badaeva et al. 2021; Langridge et al. 2021). One of the ways to improve yield per area is to achieve uniform stand establishment (FAOSTAT 2018). Bread wheat (*Triticum aestivum* L.) is one of the most consumed crops as human food and is under continuous pressure of abiotic and biotic stress factors (Tuberosa 2012; Ziyaev et al. 2011; Borlaug 2007). To cope with these stressors, all steps of production from seed sowing to post-harvest are working their parts. One of the early steps of this progress is seed preparation and sowing. Winter or spring, all wheat cultivars, and species are sown in the field and let grow till next summer. Achieving higher rates of seed germination and seedling emergence is dependent on genetic and environmental factors (Choudhary et al. 2021; Butler et al. 2017). Properly sown seeds tend to emerge at high percentages, while low-quality seeds and seeds under low moisture conditions, generate much lower germination rates, resulting in low stand establishment. Several seed pre-sowing applications are applicable to increase germination rates, to improve stand establishment, plant biomass production, and grain yield. Of these, seed priming “Seed Applications, Priming or Pre-Application” is a promising approach that is developed against various abiotic and biotic stress conditions (Ashraf et al. 2018; Singh et al. 2015; Tiryaki et al. 2005). Seed priming allows faster and uniform germination, higher stress tolerance, and optimum assimilate use. Previous studies demonstrated a significant positive effect of seed priming on wheat (Choudhary et al. 2021; Ambreen et al. 2021), sunflower (Singh et al. 2015), arabidopsis and apple (Gully et al. 2019), pepper (Aly Torky 2016), and stevia (Shahverdi et al. 2017). Priming may be applied with various organic or synthetic compounds including but not limited to hormones, vitamins, minerals, plant metabolites, polyethylene glycol (PEG) 6000 and 8000, salts, and synthetic chemicals (Pawar and Laware 2018; Mal et al. 2019). Here we aimed to evaluate a new and promising synthetic chemical, 2,4-dichloro-6-[(E)-[(3-methoxyphenyl) imino] methyl] phenol (DPMP), as a seed priming agent. Three different doses of DPMP in addition to control were applied to bread wheat seeds and seedling growth parameters were evaluated under controlled conditions. Therefore, this study aimed to 1) find optimum application dose for DPMP as a seed priming agent, and 2) compare root development effects of DPMP seed priming in bread wheat cultivar Bezostaja 1.

Materials and Methods

Plant material and priming

Bread wheat (*Triticum aestivum* L.) cultivar Bezostaja 1 was used to test the effects of priming on seedling development. 2,4-dichloro-6-[(E)-[(3-methoxyphenyl) imino] methyl] phenol (DPMP), provided by Prof. Dr. Thomas EULGEM, University of California, Riverside, was used as seed priming agent. Seeds were surface sterilized with 5% NaOCl for 5 minutes and with 70% ethanol for 1 minute and washed under running water. Three different doses of DPMP (110, 180, and 250 μ M) and relevant concentrations of solvent (DMSO) as control groups were applied to bread wheat seeds in test tubes for 24 hours.

Experimental design

Seeds primed with three different DPMP doses and un-primed control seeds were grown under sterile water. A semi-hydroponic system (Acikbas et al. 2021; Bektaş 2021) is used to evaluate the effect of priming on seedling development. Primed and imbibed seeds were placed on a germination paper (60 x 40 cm) and covered with a second layer of germination paper as ten seeds per paper. The study was conducted according to factorial design with two replications and 10 plants per replication. Plants were grown for 15 days in a climate-controlled room (25-27°C average temperature, 45-60% relative humidity, and 14 hours/10 hours (light/dark)) in Siirt University, Faculty of Agriculture. Each seedling was scanned with a handheld scanner (Iscan portable mini scanner) at 300 DPI image quality at the end of the experiment. Seedling growth parameters were collected using image analysis under a PC environment using ImageJ image processing software (Rueden et al. 2017). For seedling root characteristics; the number of roots (NOR), the longest root length (LonRL), total root length (TRL), average root length (aRL), number of lateral roots (NOLatRL), plant height (PH), shoot fresh weight (SFW), root fresh weight (RFW), shoot dry weight (SDW) and root dry weight (RDW) were examined. Ratios of SFW/RFW, SDW/RDW, and PH/RL were calculated to observe biomass allocation in primed seeds.

Statistical analysis

The software package Statistix 10 (Analytical Software, Tallahassee, FL) was used for statistical analysis. Analysis of variance (ANOVA) was used to test for the significance and the Least Significant Difference (LSD) test was used for grouping. The study was carried out in a factorial design with two replications and ten plants per replication.

Results and Discussion

Cliche motto of the agriculture sector “feeding the billions” and coping with climate change are two issues to solve for breeders, producers, and consumers (Godfray et al. 2010). All tools of classical and modern breeding approaches are needed to cope with radically changing environmental conditions. Pre-sowing seed applications, including seed priming, aim to improve the stress tolerance potential of currently grown materials. After seed priming, germination, and seedling growth rates, stand establishment and overall productivity are reported to get improved (Choudhary et al. 2021; Ambreen et al. 2021; Mal et al. 2019; Pawar and Laware 2018). We applied a new synthetic chemical elicitor known as DPMP (Bektas et al. 2016), to obtain a similar outcome on a well-known bread wheat cultivar (Bezostaja 1). A total of 13 different traits related to seedling growth parameters were evaluated under semi-hydroponic conditions. Three traits, the number of lateral roots, shoot fresh weight, and shoot fresh weight/root fresh weight ratio were significantly different in DPMP primed seeds compared to control (Table 1 and Figure 1b, g and i). While the rest of the traits had wide differences between primed and un-primed seeds, the results were not statistically significant.

Even though the results for several traits were not statistically significant at $p < 0.05$ level, they had a large difference between control and DPMP applications (Figure 1). There were promising results in the number of roots (24.19 to 33.06%), longest root length (11.05 to 24.03%), and total root length (18.98 to 40.97%) when primed and un-primed means were compared. On the other hand, the number of lateral roots (-12.48 to -42.36%), plant height/root length ratio (-24.68 to 41.12%), and root fresh weight (-1.31 to -10.84%) were negatively affected by the priming compared to control. Since the results obtained were diverse, it was worth mentioning. However, there is a need for evaluating DPMP under larger sets of plant material and different growth conditions. We are still skeptical of the meaning of current results. The effect of DPMP as a seed priming agent was not previously reported, but its effect as a defense elicitor is validated by Bektas et al. (2016). Accordingly, DPMP foliar-applied plants of *Arabidopsis thaliana* and tomato had significantly better biotic stress tolerance and improved immune response compared to control plants without any treatment.

Priming with synthetic chemicals is a relatively new and unexplored field. There is a need for defining, evaluating, and validating large libraries of chemicals for seed priming and other possible applications in plant production and protection. Here, a preliminary study highlighted the possibility of using DPMP as a seed priming agent. The results need validation under different sets of conditions.

Table 1.

Variable	Treatment	Mean	SE Mean	Minimum	Maximum
NOR	110 DPMP	3.50	0.29	2.00	5.00
	180 DPMP	3.64	0.28	2.00	5.00
	250 DPMP	3.75	0.25	3.00	5.00
	Control	2.82	0.33	1.00	5.00
NolatR*	110 DPMP	28.38	3.18	50.00	50.00
	180 DPMP	39.46	4.26	15.00	68.00
	250 DPMP	43.08	4.97	25.00	76.00
	Control	49.22	6.98	16.00	87.00
LonRL	110 DPMP	26.40	1.86	10.28	34.55
	180 DPMP	27.94	1.32	22.26	33.94
	250 DPMP	29.37	1.64	21.12	36.23
	Control	23.68	2.93	55.30	35.83
TRL	110 DPMP	71.12	8.72	11.62	132.50
	180 DPMP	83.87	8.00	31.21	128.30
	250 DPMP	84.27	1.07	28.88	133.82
	Control	59.78	10.40	72.50	100.52
aRL	110 DPMP	22.20	1.58	87.10	29.82
	180 DPMP	22.99	1.50	15.61	30.95
	250 DPMP	24.15	1.55	14.39	31.03
	Control	20.08	2.64	36.20	29.32
PH	110 DPMP	12.57	0.92	50.00	17.00
	180 DPMP	13.32	0.66	95.00	17.50
	250 DPMP	12.95	1.05	65.00	19.00
	Control	12.77	0.91	50.00	16.00
PH/RL	110 DPMP	0.57	0.10	0.16	15.70
	180 DPMP	0.49	0.03	0.32	0.67
	250 DPMP	0.45	0.04	0.26	0.63
	Control	0.76	0.19	0.14	2.26
SFW*	110 DPMP	0.10	0.01	0.02	0.19
	180 DPMP	0.10	0.01	0.05	0.15
	250 DPMP	0.10	0.01	0.05	0.15
	Control	0.07	0.01	0.01	0.11
RFW	110 DPMP	0.05	0.01	0.00	0.09
	180 DPMP	0.05	0.01	0.03	0.09
	250 DPMP	0.05	0.01	0.03	0.08
	Control	0.05	0.01	0.03	0.09
SDW	110 DPMP	0.01	0.00	0.00	0.02
	180 DPMP	0.01	0.00	0.01	0.02
	250 DPMP	0.01	0.00	0.01	0.02
	Control	0.01	0.00	0.00	0.02
RDW	110 DPMP	0.01	0.00	0.00	0.02
	180 DPMP	0.01	0.00	0.01	0.02
	250 DPMP	0.01	0.00	0.01	0.02
	Control	0.01	0.00	0.01	0.02
SFW/RFW*	110 DPMP	2.48	0.39	1.26	8.00
	180 DPMP	2.23	0.21	1.14	3.58
	250 DPMP	2.01	0.13	1.50	2.64
	Control	1.38	0.18	0.16	2.27
SDW/RDW	110 DPMP	1.15	0.20	0.18	3.11
	180 DPMP	1.06	0.14	0.33	2.38
	250 DPMP	1.00	0.00	1.00	1.00
	Control	0.90	0.15	0.25	1.85

NOR: Number of roots; NolatR: Number of Lateral Roots; LonRL: Longest root length; TRL: Total root length; aRL: Average root length; PH: Plant height; PH/RL: Plant height/root length ratio; SFW: Shoot fresh weight; RFW: Root fresh weight; SDW: Shoot dry weight; RDW: Root dry weight; SFW/RFW: Shoot fresh weight/root fresh weight ratio; SDW/RDW: Shoot dry weight/root dry weight ratio. *: significant at $p < 0.05$.

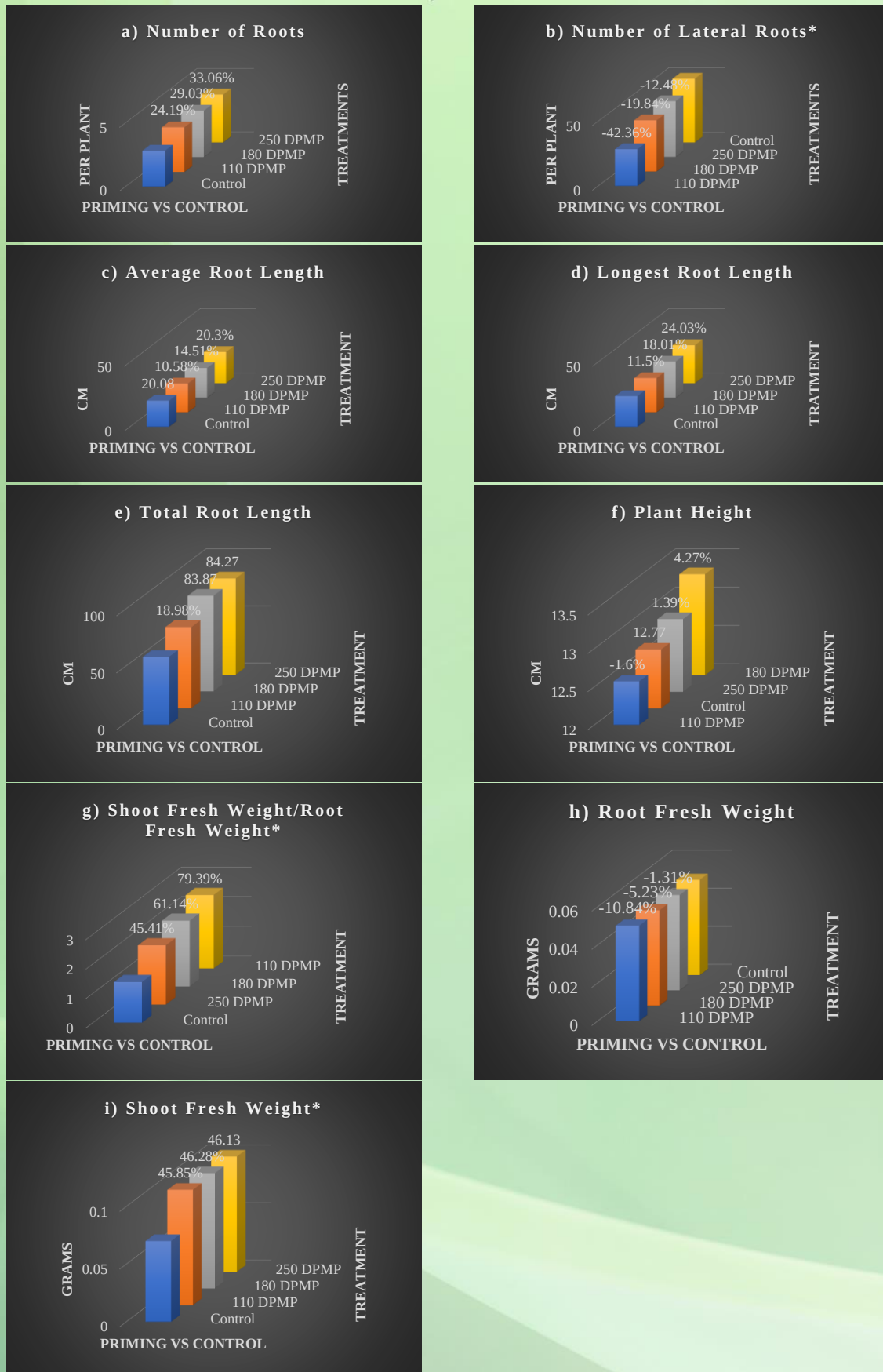


Figure 1: *There were significant ($p<0.05$) differences between DPMP applications (110, 180, and 250 μM) and control on b) Number of lateral roots, g) shoot fresh weight/root fresh weight ratio, and i) shoot fresh weight. Differences in other traits were not significant at $p<0.05$.

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Transportation of Food Products and Cold Chain

Mesut Selamoğlu¹, Mustafa Sevindik²

¹ Osmaniye Korkut Ata University, Bahce Vocational School, Department of Management and Organization, Logistics Programme, Bahce, Osmaniye, Turkey

² Osmaniye Korkut Ata University, Bahçe Vocational School, Department of Food Processing, Bahce, Osmaniye, Turkey

Abstract

The deterioration of food products and their contamination by microorganisms occur intensively during transportation stages. Many abiotic parameters play a role in the deterioration of food products. In particular, factors such as temperature and humidity, which are necessary for the development of microorganisms, are important parameters in food spoilage. In this context, providing suitable conditions for the transportation of food products will delay the deterioration of food. Logistics provides services to meet the needs of businesses in the product flow required by all sectors in global trade. Although the mobility required for the product flow is the first service the industry has responded to, it is not the only service. Storage, packaging, customs clearance and other value-added services performed throughout the entire process constitute other components of logistics. The transportation services required for the flow of products are provided by four types of transportation, mainly by road, rail, sea and air. All kinds of transportation also include a number of special services in accordance with the demands and expectations of the sectors. Today, the diversity of products that are subject to trade has led to the diversification of logistics services in itself. One of these special services offered in accordance with the structure of the products and the expectations of the customers is temperature-controlled transportation. This concept, which means keeping the temperature at the required levels in all logistics processes, especially in transportation in certain product groups such as foods, is generally known as cold chain logistics. In this context, the importance of cold chain logistics applied in the transportation of food products is mentioned in this study.

Key Words: Cold chain, Logistics, Foods, Food Logistics, food spoilage

Introduction

Logistics provides services to meet the needs of enterprises in the flow of products needed by all sectors in global trade. Although the mobility required for product flow is the first service to which the industry responds, it is not the only one. It constitutes the other components of logistics in storage, packaging, customs clearance and other value-added services that are realized in the whole process. The transport services required for the flow of products are provided by four types of transport, mainly in the form of road, rail, sea and air transport (İpekçi and Tanyaş, 2021). All types of transport also include a number of special services in accordance with the demands and expectations of the sectors. At the moment today, the diversity of products subject to trade has led to the diversification of logistics services in itself. One of these special services offered in accordance with the structure of the products and the expectations of the customers is heat-controlled transport. This concept, which means keeping heat at the required levels in all logistics processes, especially transportation in certain product groups such as foods, is generally known as cold chain logistics (Küçük, 2019).

Food Spoilage

Foods are exposed to spoilage factors at different stages. They are exposed to many spoilage factors at all stages of production, harvest, storage and transportation. Especially abiotic factors such as temperature and humidity affect the growth of microorganisms. Due to the different climatic effects of the nutrients, especially during the transportation stages, it has a negative effect on the deterioration process. In this context, prevention or reduction of microorganism growth in the transportation of food products can reduce food spoilage during transportation. In this study, the cold chain used in the transportation of food products and food logistics are emphasized (Sevindik, 2018; Sevindik and Uysal, 2021).

Cold Chain

Cold chain; storage, distribution, handling, transportation and heat sensitive products are monitored and controlled activities. In addition, it is an integrated system consisting of records, procedures and equipment such as cold rooms and coolers, transport containers, vehicles. On the other hand, this concept covers the processes of production, transportation, marketing and storage of food products and provides for the control of all these processes at a certain temperature (Korucuk, 2018). The cold chain has been expressed not only as keeping products at the appropriate temperature, but also as cost savings and increasing efficiency in the supply chain (İzer, 2017).

Today, consumers' desire to access reliable food is increasing. This, in turn, increases the importance of the Cold Chain in the distribution channel from large-scale grocery stores to small-scale grocery stores, indicating that it should be maintained with more attention and care (James and James, 2010).

Today, in the modern understanding of consumption, customers pay more conscious attention to the expiration dates of the products they buy, the freshness of the product, and its appearance. In this context, retailers will meet customer expectations by delivering the product to the customer at the desired quality and time. Optimal management of processes throughout the entire supply chain is of great importance. This importance increases even more in temperature sensitive products compared to other products. Such products go through many stages, starting from the production stage until they reach the customer. Various food items offered for sale in supermarkets are processed at different temperature degrees and replaced on shelves. A break in the cold chain in this process will cause the product to deteriorate and will ultimately have a direct negative impact on customer health (Likar and Jevsnik, 2006).

Managing the cold chain is not only keeping products at the appropriate temperature, but also increase the efficiency and cost savings in the supply chain. Well-managed cold chains provide suppliers with many benefits in the process of delivering the product to customers who care about high quality. In addition, in a well-managed cold supply chain, time management becomes a chain of values, as it must be done effectively. As a value-preserving mechanism, the cold chain is of great importance for the global circulation of high-value products (Ashok et al., 2017).

Products that require temperature control are more difficult to logistical activity. The shorter shelf life of such products reveals greater importance to the reliability and speed of transport and handling systems. Temperature-controlled products also require special transportation and storage equipment and closer tracking on the product within the logistics system (Rodrigue ve Notteboom, 2014).

The difference of the cold chain from the traditional supply chain is firstly that the operational conditions in the cold chain are more detailed, and secondly, the products subject to the cold chain from production to consumption are at risk of deterioration (Heap, 2006).

An effective shipment requires good coordination and time management. Any delay in the process of logistics activity of the product, a change in the degree of heat will both financially damage the enterprise, and, more importantly, a deterioration in food and pharmaceutical products subject to the cold chain will adversely affect health and may even lead to fatal consequences (Ma and Guan, 2009).

In order to ensure that the product does not deteriorate and is not damaged during the cold supply chain process, the pharmaceutical, medical and food sectors require cold chain technology more and more (Craig, 2007). In today's global sunday, the dependence on the cold chain is increasing in importance day by day, as in the last century. As in the pharmaceutical industry, the testing, production and distribution of medicines significantly depends on the smooth and controlled delivery of the shipment. A large number of pharmaceutical products along the cold chain are in change from the past to the present (Forcinio and Wright, 2005).

Violations that can occur at any point of the cold chain, that is, storage temperatures that are suitable for products, lead to a decrease and deterioration of product quality. Because an increased temperature will cause undesirable improvements in product characteristics depending on the type of product. The expiration date, which the consumer primarily controls, is valid only if the conditions in the cold chain are fully complied with (Craig, 2007). Although the manufacturer monitors the temperature changes in the logistics and marketing processes using temperature monitoring methods, there is no chance to recover retrospectively affected products in a possible violation. This, in turn, will cause different problems for the manufacturer-seller-buyer. Therefore, it is an advantageous practice for all parties to make products safe at all stages of the cold supply chain, while reducing the costs of the cold supply chain and using systems that can detect this in possible problematic situations (Ma ve Guan, 2009).

The share of logistics in the good quality and safe consumption of products subject to the cold chain is large. The cold supply chain has a feature that requires the most attention by having a complex structure and at the same time has the most frequent problems. A large part of the logistics distribution of perishable food and medicine takes place at the manufacturer and seller. Logistics service providing company is committed to fulfill the service of cold in the supply chain, distribution network and Information Systems, the lack of much undeveloped, cold supply chain, in time, will make it difficult to be of the desired quality (Li Jie, 2010; Selamoglu, 2021).

Food Logistics

Food logistics is the process of packaging, transportation, handling and storage of foodstuffs at conditions suitable for the structure of food (temperature, humidity, pressure). The maintenance and control of tools, equipment and tools necessary to achieve the specified conditions is a rather important issue. The importance of the cold chain is great, as fluctuations in temperature and humidity changes can cause undesirable situations in the physical, sensory and chemical structures of products. Food logistics covers all the distribution processes carried out from the purchase of raw materials to the final place of consumption (Leybourne and Grant, 1999).

Depending on the region and season variability in agricultural production for food requirements of continuity, fast degradation trends in the agri-food requirement of the continuity of certain trends in agricultural products processing and preservation methods necessitates the application of fast degradation, and food industry fulfills this function. Types of food products such as meat, fish, dairy products, grain products, mineral or carbonated drinks,

bakery products, fresh fruits and vegetables, canned goods and frozen products can be classified. However, all of them have in common is that certain shelf life. Products must be consumed within the specified expiration date period. A different common feature of food products is that these products must be transported in a hygienic environment during the entire supply chain period from the state of raw materials to the state of final consumption. For this reason, it makes it mandatory that food logistics should be handled differently than other logistics systems (İpekçi and Tanyaş, 2021).

Foods can become harmful due to many factors, such as handling, storage or use errors at the consumption stage. Factors that make food harmful are classified as physical, chemical and biological (Without labor, etc., 2005). Minimal (less-than-half) processed products, which have shown a significant trend in economic and consumer terms all over the world in recent years, also need to be transported by cold chain. These include, in addition to the products in which fruits and vegetables are used, other food products too. Therefore, the importance of cold chain and logistics systems is increasing day by day (Fredriksson and Liljestrand, 2015).

The responsibility for the process from the raw material to the final product is not only dedicated to a single company, but also covers the entire supply chain. Because of this, the quality of the product produced is affected by the quality of the supplier as well as the quality of the production. Foods that can deteriorate quickly are foods that have little durability, such as fresh fish, fresh meat, dairy products, for example, and these foods need to be paid close attention to during storage. The first-in-first-out (FIFO) principle of interest for these products, that is, the implementation of FIFO, is also important (Bogataj et al., 2005).

The distribution chain of food products goes through many different steps until it reaches the consumption process. During the distribution chain, it was observed that the temperature of the products transported in different containers undergoes more temperature changes compared to the temperature of the products that have been temperature controlled in the same container. The product temperature varies in all processes, including loading into warehouses, unloading, and even if this happens for a short time, it can exceed the required temperature limits of 19. The food cold chain must comply with the 3T (time, temperature, tolerance) principles. The final quality of the product is evaluated together with the time, temperature and tolerance of the product during storage. There are different economic and technical indicators aimed at ensuring product control due to the inability to restore quality losses (Lan and Ya, 2008).

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Potential evaluation of Thyme (*Origanum vulgare* L.), Sage (*Salvia officinalis* L.) and Peppermint (*Mentha piperita* L.) essential oils as Plant Immune Activators

Eylül Berfin Birgül¹, Zeynep Ağaç¹, Yasemin Bektaş¹

¹Siirt University, Faculty of Agriculture, Department of Agricultural Biotechnology, Siirt/TURKEY

Abstract

Pesticides are used extensively to protect plants against diseases or to cure them. However, the toxic effects of pesticides on non-target organisms (humans, animals, etc.) and environmental pollution caused by pesticide shows the necessity of alternative solutions to protect the plants from pathogens. Plants recognize pathogens and protect themselves with complex regulation of the immune system. External application of plant immune system activators (Plant activators), stimulates the plant's immune system against pathogens, reduces the severity of diseases but does not show direct toxic effect against pathogens. Research over the years has revealed that various natural compounds can be used as plant activators. Even though medicinal aromatic plants such as peppermint, thyme, and sage are reported to be effective in many areas, and they have the potential to be candidates as plant activators, there were no studies in this direction in the literature. Therefore, we aimed to evaluate peppermint, thyme, and sage as plant activators and performed experiments with various aspects. First, we tested the effect of the direct application of mint, thyme, and sage essential oils on tomato plants and determined the optimal essential oil concentrations that can be applied to plants directly as a foliar spray ($10^{-4}\%$, $10^{-5}\%$, $10^{-6}\%$). Then, we tested the direct antibacterial activities of indicated concentrations of mint, thyme, and sage essential oils on *Pseudomonas syringae* pv *tomato* DC3000 (*Pst*) growth. According to the results, even at these low concentrations ($10^{-4}\%$, $10^{-5}\%$, $10^{-6}\%$), thyme essential oil has an antibacterial effect against *Pst*. However, the other two essential oil were not directly toxic to *Pst* at $10^{-5}\%$, $10^{-6}\%$ concentrations. To understand the effect of these essential oils as a plant activator, we applied them to plants and observed the growth of *Pst* on tomato. According to the results, while mint and sage oil reduced the number of *Pst* on plants, thyme did not change it. Also, for the first time, we investigated the effects of aerial application of mint, thyme, and sage essential oils on some plant defense genes (*WRKY70* and *PR1*) expressions, however, at these concentrations, mint, thyme, and sage essential oils did not induce indicated defense genes expression. Further detailed studies with other medicinal aromatic plants may shed on light their potential effect on plant protection.

Key Words: Plant immune system, Essential oils, Plant activators, *Origanum vulgare* L., *Salvia officinalis* L., *Mentha piperita* L.

Bitki Bağışıklık Aktivatörleri olarak Kekik (*Origanum vulgare* L.), Adaçayı (*Salvia officinalis* L.) ve Nane (*Mentha piperita* L.) uçucu yağlarının potansiyel değerlendirmesi

Özet

Pestisitler, bitkileri hastalıklara karşı korumak veya tedavi etmek için yaygın olarak kullanılmaktadır. Ancak pestisitlerin hedef olmayan organizmalar (insan, hayvan vb.) üzerindeki toksik etkileri ve pestisitlerin neden olduğu çevre kirliliği, bitkileri patojenlerden korumak için alternatif çözümlerin gerekliliğini göstermektedir. Bitkiler patojenleri tanıyarak ve bağışıklık sisteminin karmaşık düzenlemesi ile kendilerini korurlar. Bitki bağışıklık sistemi aktivatörlerinin (bitki aktivatörleri) dışarıdan uygulanması bitkinin patojenlere karşı bağışıklık sistemini uyarır, hastalıkların şiddetini azaltır ancak patojenlere karşı doğrudan toksik etki göstermez. Yıllar boyunca yapılan araştırmalar, çeşitli doğal bileşiklerin bitki aktivatörleri olarak kullanılabileceğini ortaya koymuştur. Nane, kekik, adaçayı gibi tıbbi aromatik bitkilerin birçok alanda etkili olduğu ve bitki aktivatörü olarak aday olma potansiyeline sahip olduğu bildirilse de literatürde bu yönde bir çalışmaya rastlanmamıştır. Bu nedenle nane, kekik ve adaçayının bitki aktivatörü olarak potansiyelleri çeşitli yönleriyle araştırılmıştır. İlk olarak, nane, kekik ve adaçayı esansiyel yağlarının domates bitkilerine doğrudan uygulanmasının etkisi test edilmiş ve bitkilere doğrudan yaprak spreyi olarak uygulanabilecek en uygun uçucu yağ konsantrasyonları ($10^{-4}\%$, $10^{-5}\%$, $10^{-6}\%$) belirlenmiştir. Ardından, belirtilen konsantrasyonlarda nane, kekik ve adaçayı esansiyel yağlarının doğrudan antibakteriyel aktiviteleri *Pseudomonas syringae* pv *tomato* DC3000 (*Pst*) büyümesi üzerinde test edilmiştir. Sonuçlara göre, bu düşük konsantrasyonlarda bile ($10^{-4}\%$, $10^{-5}\%$, $10^{-6}\%$) kekik esansiyel yağının yine antibakteriyel etkiye sahip olduğu görülmüştür. Bununla birlikte, diğer iki uçucu yağ, $10^{-5}\%$, $10^{-6}\%$ konsantrasyonlarında *Pst* için doğrudan toksik değildir. Bu uçucu yağların bitki aktivatörü olarak etkisini anlamak için bitkilere uygulanmış ve domateste *Pst*'nin gelişimi gözlemlenmiştir. Sonuçlara göre nane ve adaçayı yağı bitkilerdeki *Pst* sayısını azaltırken kekik değiştirmemiştir. Ayrıca, ilk kez, nane, kekik ve adaçayı esansiyel yağlarının sprey uygulanmasının bazı bitki savunma genleri (*WRKY70* ve *PR1*) ekspresyonları üzerindeki etkileri araştırılmıştır, ancak bu konsantrasyonlarda nane, kekik ve adaçayı esansiyel yağları belirtilen savunma genlerinin ekspresyonunu indüklememiştir. Farklı konsantrasyonlarla ve farklı tıbbi aromatik bitkilerle yapılacak daha detaylı çalışmalar, tıbbi aromatik bitkilerin bitki korumada kullanım potansiyelini belirlemeye ışık tutabilir.

Anahtar Kelimeler: Bitki İmmün Sistemi, Esansiyel Yağlar, Bitki aktivatörleri, *Origanum vulgare* L., *Salvia officinalis* L., *Mentha piperita* L.

Giriş

Bitkiler doğada birçok patojenin saldırısına maruz kalırlar ve bu saldırılar bitkisel üretimde çok büyük verim ve kalite kayıplarına neden olur. Bitkileri patojenlere karşı korumak ve/veya oluşan hastalık semptomlarını azaltmak amacı ile çoğunlukla pestisitler kullanılmaktadır. Günümüzde tarımın birçok alanında pestisitler çok yoğun ve bilinçsiz bir şekilde kullanılmakta, bunun sonucunda gıdalarda, toprakta, yeraltı suyunda ve havada pestisit kendisi ya da dönüşüm ürünleri kalıntı oluşturmaktadır. Bu kalıntılar başta insan sağlığı olmak üzere bütün canlı yaşamını ve doğal dengeyi tehlike altına sokmaktadır (Pretty, 2008; Nicolopoulou-Stamati ve ark., 2016). Pestisit kullanımının meydana getirdiği sağlık sorunları ve çevre kirliliği birçok ülkenin bazı önlemler almasını ve bazı kimyasal bileşiklerin yasaklanmasını sağlamıştır, ancak önlemler yeterli değildir (Skevas ve ark., 2013). Pestisitlerin belirgin yan etkilerinin olması, araştırmacıları bitkileri biyotik stres etmenlerine karşı güçlü kılacak alternatif bileşik, yöntem ya da yaklaşımlara sürüklemiştir. Bu alternatif metodlardan bir tanesi de bitki aktivatörleridir (Walters ve ark., 2013; Villaverde ve ark., 2014). Bitki aktivatörleri, bitkiye dışarıdan verilen, bitkinin doğal immün (bağışıklık) sistemini uyarak güçlenmesini ve bitki zararlılarına karşı daha dayanıklı ve güçlü kalmalarını sağlayan uyarıcılardır. Bu uyarıcılar bitki savunma sistemini tetikleyerek, bitkiyi patojene karşı daha güçlü kılarlar, patojene ve diğer organizmalara karşı doğrudan bir toksisitesi de bulunmamaktadır (Bektas ve Eulgem, 2015). Bu nedenle günümüzde ortaya çıkan pestisitlerin çevreye ve diğer organizmalara olan yan etkilerini ortadan kaldırmak için, pestisitlere alternatif olarak tarımda bitki aktivatörlerinin kullanılması hedeflenmektedir. Tarım ve Orman bakanlığının "iyi tarım uygulamaları" hedefleri de bu çerçevedeki ürünlerin kullanımını ve formüle edilmesini desteklemektedir (Tarım ve Orman Bakanlığı 2018-2022 Stratejik Planı, 2018). Bitki aktivatörlerine örnek olarak; Bion® ticari markası ile birçok ülkede uzun yıllardır kullanılan ASM (Acidobenzolar- S-. Methyl) verilebilir. ASM bitki immün sistemini uyarak tek yıllık ve çok yıllık bitkilerde geniş bir yelpazede patojenlere karşı bitkiyi güçlü kılmaktadır (Bektas ve Eulgem, 2015). ASM gibi sentetik bitki aktivatörlerinin yanı sıra bazı doğal ürünlerin de (β -aminobutyric acid, deniz yosunu özütü, chitosan vb.) bitki aktivatörü olarak kullanıldığı da bilinmektedir (Bohland ve ark. 1997, Washington ve ark. 1999, Bengtsson ve ark. 2014).

Bitkiler birçok amaç için kullanıldıkları gibi, tıbbi amaçla da yaygın olarak kullanılırlar. Dünya çapında, Dünya Sağlık Örgütü (DSÖ) tarafından listelenen ve tıbbi amaçlar için yaygın olarak kullanılan toplam 21.000 bitki çeşidi bulunmaktadır. Bitkilerin yapılarındaki metabolizmalarının ara ya da son ürünü olarak ortaya çıkan ikincil metabolitler, bitkiler için doğrudan yaşamsal işlevler için gerekli olmasa da tıbbi amaçla kullanım yelpazesini genişletmektedir. İkincil metabolitler bitkilerin otçullar ya da patojenler gibi doğal düşmanlarına ya da stres koşullarına karşı ürettikleri ürünlerdir. Bu metabolitler bitkileri terapotik kullanımlar için zengin bir kaynak haline getirmiştir (Anand ve ark., 2019). Yapılan araştırmalar birçok ikincil metabolitin hücre sinyali etkileyebildiğini, oksidatif veya UV stresine karşı koruma sağlayabildiğini göstermiştir. Ayrıca birçok bitkinin ekstraktlarının anti-bakteriyel, anti-fungal vb. etkiler yaptığı da rapor edilmiştir (Askarinia ve ark., 2019). Bunlara ek olarak yakın zamanlarda yapılan araştırmalar antibakteriyel ilaç olarak kullanılan colistin sülfatın aynı zamanda bitki immün sistemini uyarıcı özelliğinin de olduğunu göstermiştir (Halder ve ark., 2019). Bu da bitki ekstraktlarının/esansiyel yağların bitki aktivatörü olarak kullanılabilmesi açısından olumlu adaylar olduğunu göstermiştir. Bitki familyalarından Lamiaceae familyası otsu ve çalı formunda olabilen, aromatik kokusu ve gövdesindeki salgı tüyleri ile bu açıdan en ilgi çeken familyalar içerisinde. Origanum, Thymus, Ocimum, Mentha, Rosmarinus, Sideritis ve Salvia Lamiaceae familyasına ait bitkilerdendir. Günümüze kadar yapılan çalışmalar Lamiaceae familyasından birçok türün antibakteriyel ve antifungal etkisinin olduğunu kanıtlamış ve birçok patojene karşı etkileri gösterilmiştir (Askarinia ve ark., 2019). *Mentha piperita* L. (Nane), *Salvia officinalis* (adaçayı), ve *Origanum vulgare* L. (kekik) da bu familya içerisinde bulunup, yapılan araştırmalar bu bitkilerin ekstraktlarının antibakteriyel ve antifungal etkilerini göstermiştir (Yanar ve ark., 2011, 2016., Yılmaz ve ark., 2014). Nane, kekik ve adaçayının doğal ürün olması ve yapılan araştırmalarda güçlü antimikrobiyal, antifungal vb. özelliklerinin olması, bu ürünün colistin sülfat örneğinde olduğu gibi bitkilerin immün sistemini uyarma potansiyelinin de olabileceğini düşündürmüştür. Ancak bu konu üzerine bilginiz dahilinde literatürde herhangi bir çalışma yapılmamıştır ve çalışma bu yönü ile özgün niteliktedir.

Pestisitler tarım alanlarında ve kontrolsüz bir şekilde kullanılması, hedef dışı organizmaların ve doğanın bu pestisit kalıntılarından etkilenmesine sebep olmaktadır. Bu kalıntılar yeraltı suları, toprak ve diğer biyolojik unsurlar üzerinde birikerek hem insan sağlığını, hemde biyolojik dengeyi tehlike altına sokmaktadır. Bitki zararlılarına karşı, pestisit kullanımına alternatif olarak geliştirilen bitki aktivatörlerinin çeşitliliğinin artırılması ve bu bileşiklerin etkinliğinin ortaya çıkarılması gelecek yıllarda pestisitlerin yerinin bu ürünler ile doldurulmasını sağlayabilir. Bitki ekstraktları genel olarak çeşitli alanlarda kullanılmaktadır. Aynı zamanda bu ürünler içeriklerinden dolayı bitki aktivatörü olmak için umut veren bileşiklerdir. Bu çalışmada, ticari olarak satılan nane, adaçayı ve kekik bitki esansiyel yağlarının bitki aktivatörü olarak potansiyelleri değerlendirilmiştir.

Materyal ve Yöntem

Bitki, patojen ve büyütme koşulları

Bu çalışmamızda Moneymaker domates (*Solanum lycopersicum* L.) çeşidi ve *Pseudomonas syringae* pv. *tomato* DC3000 (*Pst*) patojeni kullanılmıştır. Nane, kekik ve adaçayı esansiyel yağlarının *Pst*'ye karşı etkinliği test edilmiştir. Bunun için domates tohumları öncelikle 5 dakika %5 (v/v) çamaşır suyunda bekletilmiş ve ardından %70 Ethanol ile 10 dakika muamele edilmiştir. Bol su ile durulandıktan sonra karanlıkta, steril petrilere bir hafta çimlendirilmiştir. Ardından da saksılara aktararak 3-4 yapraklı büyüme yaşına kadar 26 -28°C sıcaklık ve 16 h/8 h gündüz-gece rejiminde, Siirt Üniversitesi, Tarımsal Biyoteknoloji bölümü büyütme odasında büyütülmüştür.

Antibakteriyel aktivite çalışması

Balen^R marka Nane, kekik ve adaçayı esansiyel yağlarının *Pst*'ye karşı antibakteriyel etkisini test etmek amacıyla King's B (KB) sıvı besi kültürü hazırlanarak *Pst* çoğaltılmış ve OD600: 0.2 konsantrasyonu ayarlanmıştır. Antibakteriyel test yapabilmek için besi yerlerine; Farklı konsantrasyonlarda (%10⁻⁴, %10⁻⁵, %10⁻⁶) Nane, kekik ve adaçayı esansiyel yağları yada Dimethyl sülfokside (DMSO) katılmıştır. Pozitif kontrol olarak sadece bakteri uygulaması yapılmıştır. Kültürler 26-28 °C oda sıcaklığında çalkalayıcıya (220 RPM) konularak, optik yoğunluk, belirli sürelerde ölçülmüştür ve data analizi (Bektas ve ark., 2016)'ya göre yapılmıştır. Deneme en az üç kez tekrarlanmıştır.

Bitki aktivatörü olarak Nane, kekik ve adaçayı esansiyel yağlarının uygulanması

3-4 yapraklı büyüme yaşındaki domates bitki yapraklarına, *Pst* uygulamasından 1 gün öncesinde 5 ml %10⁻⁴ ve %10⁻⁵ konsantrasyonlarda esansiyel yağ sprey yapılmıştır. Kontrol bitkilerine ise kullanılan DMSO konsantrasyonu sprey yapılmıştır. Tornera ve Dangl (2001) protokolüne göre; 0. günde domates bitkileri OD600: 0.005 konsantrasyonunda hazırlanan *Pst* solüsyonuna daldırılmış ve bitkiler gelişmeye bırakılmıştır. 0. günde ve 4. günde bakteri sayımı yapılarak esansiyel etkileri tespit edilmiş ve data analizi yapılmıştır. İzolatların geliştirilmesi ve re-izolasyon aşamasında KB katı besiyeri kullanılmıştır.

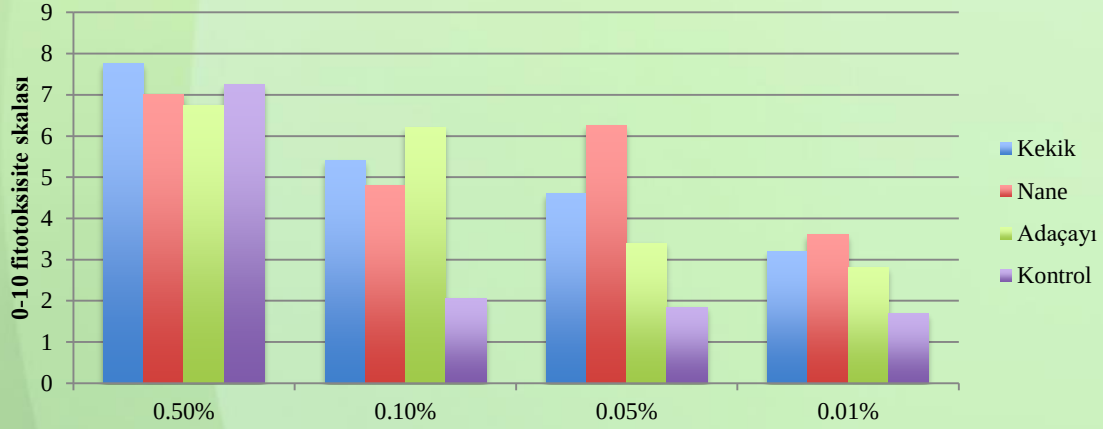
Gen ifadesi analizleri

Çalışma kapsamında belirtilen bitkisel yağların bitki immün sistemi üzerine etkilerini test etmek amacı ile uygulanan bitkisel yağ konsantrasyonlarının *PR1* ve *WRKY70* genlerinin ifadelerine etkilerine bakılmıştır. Bitkisel yağ uygulandıktan 24 saat sonra bitki materyalleri RNA izolasyonu için toplanmıştır. Her deney grubundan toplam dokuz yaprak toplanıp, yapraklar sıvı nitrojen içinde hızla ezilmiş ve toz haline getirilmiştir. Ardından toplam RNA'yı çıkarmak için PureLink RNA Mini Kiti kullanılarak RNA izolasyonu yapılmıştır. Toplam RNA ekstraktlarının konsantrasyonu ve saflığı, Multiskan GO spektrofotometresi kullanılarak belirlenmiştir. 1 µg RNA kullanılarak ve RevertAid First Strand cDNA Sentez Kiti (Thermo Fisher Scientific) kullanılarak cDNA sentezlenmiştir. Domates savunması ile ilgili genlerden *WRKY70* ve *PR1* genlerinin primerleri kullanılarak gen ifadesine thermocycler (Thermo Fisher) ile bakılmıştır. Yapılan çalışmada kontrol olarak housekeeping genlerden *Actin* kullanılmıştır.

Bulgular ve Tartışma

Nane, adaçayı ve kekik bitkisel yağlarının fitotoksitesinin belirlenmesi ve bitkiye uygulanacak konsantrasyonların tespiti

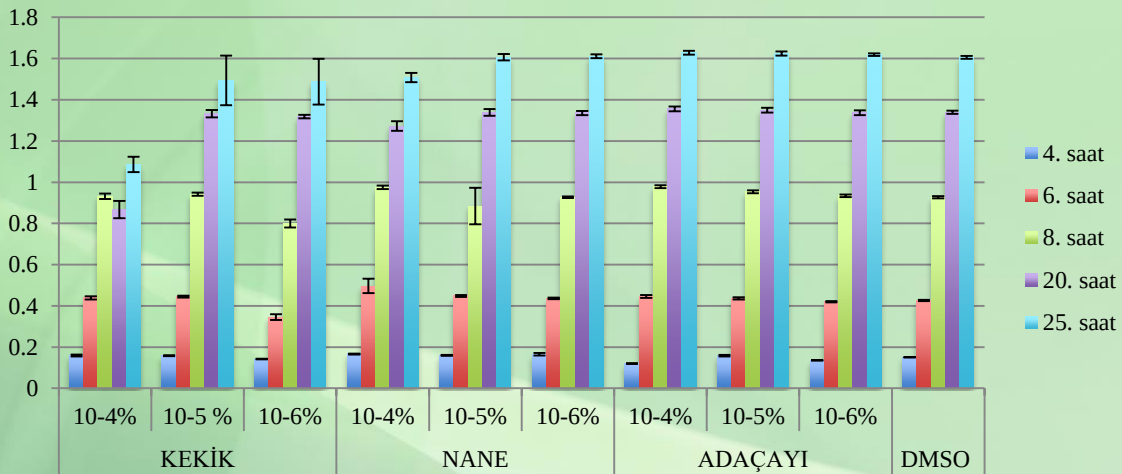
Çalışmada, öncelikle bitkisel yağların bitkiye uygulanacak konsantrasyonlarının tespit edilmesi amaçlanmıştır. Projenin başlangıcında yapılan çalışmalarda yüksek konsantrasyon bitkisel yağların ve genel çözücü olarak kullanılan asetonun bitkide yanıklık meydana getirdiği gözlemlenmiştir. Bu nedenle bitkisel yağları çözmek için aseton yerine DMSO kullanılmış ve %50'ye kadar DMSO'da çözözümlen esansiyel yağlar, ardından %0,1, %0,5, %0,01, %0,05 konsantrasyonlarına su ile seyreltilerek 3-4 yapraklı domates bitkilerine sprey yapılmıştır. Bitkilerde meydana gelen yanıklıklar 0-10 fitotoksitesite skalasına göre değerlendirilmiştir. 0-1: bitkinin sağlıklı olduğunu ifade ederken, 10: bitkide yanıklığın en yüksek seviyede olduğunu ve bitkinin öldüğünü ifade etmektedir. Yapılan çalışma sonucunda (Şekil 1) %0,5 konsantrasyonun kekik, nane, adaçayı ve DMSO çözücüsü için çok yüksek olduğu ve bitkide yüksek oranda toksisiteye sebep olduğu gözlemlenmiştir. Konsantrasyon azaldıkça bitkide gözlemlenen toksisitenin de aşamalı olarak azaldığı ve en düşük toksisitenin %0,01'de olduğu görülmüştür. Elde edilen veriler ışığında planlanan denemelerde %0,01 veya daha düşük dozlarda bitkisel yağ kullanılması gerektiği ön görülmüştür.



Şekil 1. %0,1, %0,5, %0,01, %0,05 konsantrasyonundaki nane, adaçayı ve kekik esansiyel yağlarının bitkideki yanıklık etkileri

Nane, adaçayı ve kekik bitkisel yağlarının antibakteriyel etkilerinin tespiti

Nane, adaçayı ve kekik bitkisel yağlarının antibakteriyel etkileri, sıvı KB besiyerine bitkisel yağların belirli konsantrasyonlarda katılması (10^{-4} , 10^{-5} ve 10^{-6}) ve bu ortamlarda *Pst* bakterisinin büyütülmesi ile yapılmıştır. Bu çalışmada besiyeri 26-28 °C derece oda sıcaklığında çalkalayıcıda 30 saat tutularak yapılmıştır. Bu testte amaç yukarıda uygulanan konsantrasyonlar da dahil olmak üzere, bitkisel yağların *Pst*'ye doğrudan etkisinin olup olmadığını test etmektir. Bu doğrultuda örnekler çalkalayıcıya koyulduktan sonra 4. 6. 8. 25. ve 30. saatlerde çalkalayıcıdaki besi yerlerinin bakteri konsantrasyonu spektrofotometrede ölçülerek, sonuçlar elde edilmiştir (Şekil 2). Buna göre; Kekik bitkisel yağlarının antibakteriyel etkisinin çok kuvvetli olduğu ve 10^{-4} , 10^{-5} ve 10^{-6} konsantrasyonlarının hepsinde bakteri büyümesinde yavaşlatmaya gittiği görülmüştür. En etkili antibakteriyel etki ise 10^{-4} (%0.0001) konsantrasyonda görülmüştür. Bunun yanı sıra, nane de kontrol grubu ile karşılaştırıldığında, 10^{-4} dozunda antibakteriyel etkiyi göstermiştir ama diğer konsantrasyonlarda kontrol grubu ile benzer tepkiler görülmüştür. Adaçayının ise bütün dozlarında DMSO kontrol grubu ile benzer davranışları göstermesi, bu belirtilen konsantrasyonlarda doğrudan antibakteriyel etkisinin olmadığını göstermektedir. Daha önce yapılan çalışmalar da farklı bitkisel yağların farklı etki seviyelerinin olduğunu göstermektedir (Yanar ve ark., 2011, 2016., Yılmaz ve ark., 2014). Bu bağlamda her bir bitkisel yağın antibakteriyel etkisinin görülmeyen dozlarla devamındaki çalışmaların yapılmasına karar verilmiştir.

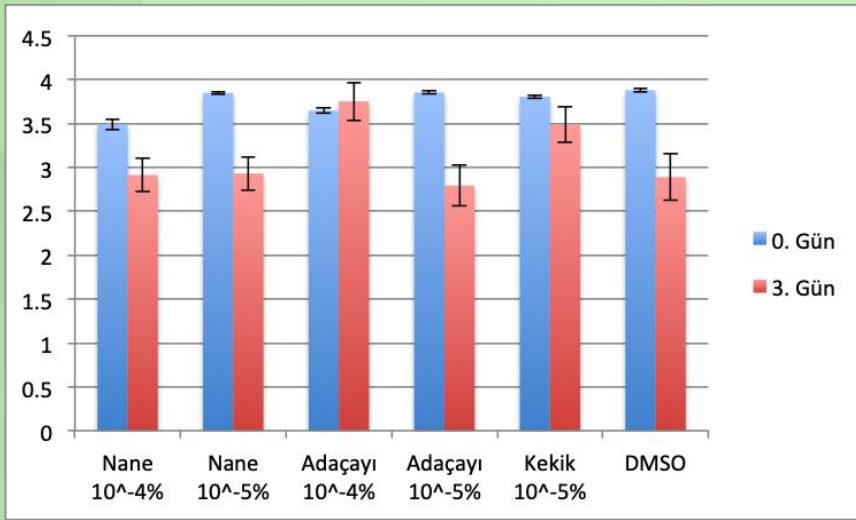


Şekil 2. Çeşitli bitkisel yağ konsantrasyonlarının *Pst* bakterisine doğrudan anti-bakteriyel etkisi

Belirli konsantrasyondaki nane, adaçayı veya kekik bitkisel yağlarının bitki aktivatörü olarak potansiyellerinin tespiti

Yüzde 10^{-4} ve 10^{-5} nane ve adaçayı, ile 10^{-5} kekik yağlarının domates bitkisinde bitki immün sistemini uyarıp uyarmadığı ve *Pst*'ye karşı etkisinin belirlenmesi amacıyla uygulamalar yapılmıştır. Bu çalışma en az 2 kez, her grup için 5'er bitki ile test edilmiştir. Patojen uygulamasından bir gün öncesinde (-1. gün) belirtilen bitkisel yağ konsantrasyonu domates fidelerinin yapraklarına sprey yapılmıştır. 0. günde bitkilere bakteri uygulanmış ve bitkisel yağ uygulamasının patojenin çoğalmasına ve bitki immünitesi üzerine etkisini anlamak için 0. günde ve 4.

günde bitki yapraklarından örnekler alınarak Tornero ve Dangl (2001) protokolüne göre analizi yapılmıştır. Elde edilen sonuçlar Şekil 3'te gösterilmiştir. Buna göre 0. gündeki bakteri konsantrasyonunun 10^{-4} nane ve 10^{-4} adaçayı deneme gruplarında DMSO kontrol grubuna göre daha düşük olduğu görülmüştür. Bu durum uygulanan konsantrasyonun hala antibakteriyel etkisinin olmasından kaynaklanabilir. Bu durumda bitkisel yağların bakteri ile yaprak yüzeyinde temas etmesinden dolayı, başlangıçta stomalardan içeriye giren kısmının azalmasına neden olmuş olabilir, bu da 0. gündeki bakteri sayısının azlığını gösterebilir. Bunun yanında 10^{-5} nane, adaçayı ve kekik bitkisel yağ konsantrasyonlarındaki 0. gün bakteri oranlarının kontrol grubu ile benzerlik gösterdiği görülmüştür. Başlangıçtaki bakteri oranlarının benzer olması, bu konsantrasyonda bitkisel yağların antibakteriyel etkisinin 0. günde tespit edilmediğini göstermesi ve bir önceki bölümdeki çalışmayı da desteklemesi açısından önemlidir. Uygulamanın 4. gününde belirli sayıda toplanan yapraklarla yapılan analizler sonucunda, 4. gündeki bakteri sayısının bütün deneme ve kontrol gruplarında 0. güne göre daha düşük olduğu ya da eşit seviyede olduğu gözlenmiştir. Bu durumun birden fazla sebebi olabilir. *Pst* bakterisi bitkiye stomalardan girmekte ve kolonize olarak bitkide çoğalmaktadır. Bakterinin kolonizasyonu patojenitesine bağlı olabilmekte ve zaman zaman bakterilerin virulanslık derecelerinde düşüşler ortaya çıkabilmektedir. Bu durumda, sonuçtaki bakteri sayısı verilen bakteri sayısından daha düşük olabilmektedir. Bunun yanı sıra; uygulanan bitkisel yağların yaprak yüzeyinde kalarak, bakteri üzerine doğrudan etki göstererek zaman içinde ölümlere sebep olması, ya da bitki immün sistemini uyarak bakteri gelişimini engellemesi de mümkündür (Şekil 3).

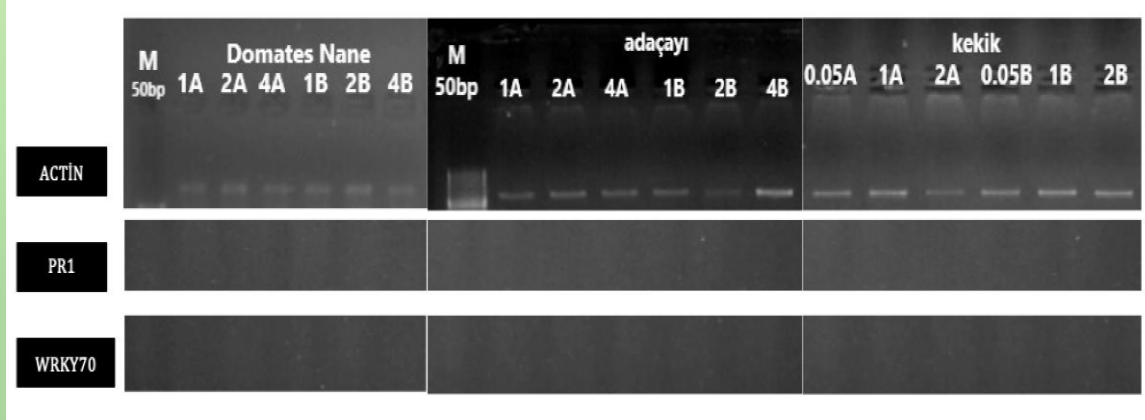


Şekil 3. 10^{-4} ve 10^{-5} % bitkisel yağ konsantrasyonlarının bitkilerdeki *Pst* bakterisi üzerine etkisi

Nane, adaçayı ve kekik bitkisel yağlarının bitki immün sistemi üzerine ve bazı immünite genlerinin ifadesi üzerine etkisinin test edilmesi

Çalışma kapsamında belirtilen bitkisel yağların bitki immün sistemi üzerine etkilerini test etmek amacı ile bitkisel yağlar uygulanmış ve *PR1* ve *WRKY70* genlerinin ifadelerine bakılmıştır. Uygulamadan 24 saat sonra, 0. günde bitki materyalleri RNA izolasyonu için toplanmıştır. Her deney grubundan toplam dokuz yaprak toplanıp, yapraklar sıvı nitrojen içinde hızla ezilmiş ve toz haline getirilmiştir. Ardından toplam RNA'yı çıkarmak için PureLink RNA Mini Kiti kullanılarak RNA izolasyonu yapılmıştır. Toplam RNA ekstraktlarının konsantrasyonu ve saflığı, Multiskan GO spektrofotometresi kullanılarak belirlenmiştir. 1 µg RNA kullanılarak ve RevertAid First Strand cDNA Sentez Kiti (Thermo Fisher Scientific) kullanılarak cDNA sentezlenmiştir. Domates savunması ile ilgili genlerden *WRKY70* ve *PR1* genlerinin primerleri kullanılarak gen ifadesine thermocycler (Thermo Fisher) ile semi-kantitatif olarak bakılmıştır. Yapılan çalışmada kontrol olarak housekeeping genlerden *Actin* kullanılmıştır. Şekil 4'te görüldüğü üzere actin geninin ifadesi bütün deney ve kontrol grubunda bulunurken, *PR1* ve *WRKY70* gibi bitki immün sisteminde etkili olduğu bilinen iki genin ifadesinde herhangi bir artış görülmemiştir. Yapılan bu çalışmada bitkisel esansiyel yağların bitki immünitesi üzerine etkisi görülmemekle birlikte, ileride yapılacak çalışmalar ile farklı konsantrasyonlardaki nane, adaçayı ve kekik bitkisel yağlarının yada farklı türlere ait bitkisel yağların bitki immün sistem üzerine etkisi ve bitki aktivatörü olarak potansiyelleri daha kapsamlı değerlendirilebilir.

Şekil 4: Çeşitli bitkisel yağ konsantrasyonlarının domates *WRKY70* ve *PR1* gen ifadeleri üzerine etkisi



Teşekkür

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A Review on Biocontrol of *Parthenium hysterophorus* using Allelopathy

Muhammad Ahsan Jamil, Zahid Manzoor, Tanveer Abbas, Anees Ur Rehman

Department of Plant Breeding and Genetics, University of Agriculture Faisalabad, Pakistan

Abstract

In the Asteraceae family (Heliantheae tribe), the gajjar grass, *Parthenium hysterophorus* L. is a vertical and densely branched annual herb that is well-known for its environmental and medicinal risks, as well as its agricultural hazard. It is a member of the Asteraceae family (Heliantheae tribe). In accordance with popular belief, it was introduced to India and Australia via North America, where it soon spread over Africa, Asia, and Australia, eventually becoming a scourge. While there were many biologists who attempted to hurt *P. hysterophorus* via biological ways, it was eventually established that allelopathy was the most effective method of controlling partheniums and other weeds. Scientists are experimenting with plants's allelopathic powers in order to reduce weeds. Many plants have shown allelopathic potential against the *Parthenium* weed such as *Cassia sericea* has been shown in several trials to lower parthenium accumulation by 70% and parthenium population by 52.5%. When it comes to biological control agents for *Parthenium* management, the leaves-feeding beetle has proven to be one of the most successful (*Zygogramma bicolorata* Pallister; Coleoptera: Chrysomelidae). According to research, extracts and residue from a number of allelopathic plant species (herbs, grasses, and trees) have been shown to effectively inhibit the germination and growth of the parthenium plant. There is no one administration solution that would be sufficient to deal with *Parthenium*, and it is necessary to integrate a diverse range of management options. When it comes to successfully eradicating this hazardous weed, bio-control is an essential component of any effective strategy.

Keywords:



The determination and risk assessment of Na, Ca, Mg, K, Fe, Pb, As, Cd and Hg levels in baby biscuits in the Turkish market

Burhan Başaran

Department of Travel, Tourism and Recreation Services, Ardeşen Vocational School, Recep Tayyip Erdogan University, Turkey.

Abstract

In this study, firstly, the consumption characteristics of 208 infants aged 13-36 months regarding baby biscuits in the 24-hour period retrospectively were determined by face-to-face interviews with their parents. In the light of the information obtained, the levels of Ca, Mg, Na, K and Fe metals necessary for a healthy life and Pb, Cd, Hg and As metals, which show toxic properties at certain doses, were determined in 15 different baby biscuits by ICP MS. The average Na, Mg, K, Ca and Fe levels of baby biscuits were found to be in the range of 225-13063, 186-1063, 1073-4967, 69-1866 and 8-112 mg/kg, respectively. The daily intake level of essential metals, except Mg, did not exceed the recommended daily intake for the same metals. Average Pb, As, Hg and Cd levels in baby biscuits were determined to be 3.92-28.5, 5.14-69.8, 0.02-1.11 and 4.35-17.9 µg/kg, respectively. The contribution of exposure to toxic metals to acceptable intake level is quite low. The data do not pose a health concern as the hazard index is <1.

Key Words: Baby biscuits, Ca, Fe, Mg, Na, K, Pb, Cd, As, Hg, Dietary exposure, Hazard index.

Türkiye pazarındaki bebek bisküvilerinin Na, Ca, Mg, K, Fe, Pb, As, Cd ve Hg düzeylerinin belirlenmesi ve risk değerlendirmesi

Özet

Bu çalışmada ilk olarak 13-36 ay yaş aralığındaki 208 bebeğin geriye dönük 24 saatlik dönemdeki bebek bisküvisi tüketim özellikleri ebeveynlerle yüz yüze görüşülerek belirlenmiştir. Elde edilen bilgiler ışığında 15 farklı bebek bisküvisinde sağlıklı yaşam için gerekli Ca, Mg, Na, K ve Fe metalleri ile belli dozlarda toksik özellik gösteren Pb, Cd, Hg ve As metallerinin düzeyleri ICP MS ile belirlenmiştir. Bebek bisküvilerinin ortalama Na, Mg, K, Ca ve Fe düzeyleri sırasıyla 225-13063, 186-1063, 1073-4967, 69-1866 ve 8-112 mg/kg aralığında belirlenmiştir. Mg hariç diğer gerekli metallerin günlük alım düzeyi aynı metaller için tavsiye edilen günlük alım miktarını aşmamıştır. Bebek bisküvilerinde ortalama Pb, As, Hg ve Cd düzeyleri sırasıyla 3.92-28.5, 5.14-69.8, 0.02-1.11 ve 4.35-17.9 µg/kg aralığında tespit edilmiştir. Toksik metallerle olan maruziyetin kabul edilebilir alım düzeyine katkısı oldukça düşüktür. Tehlike indeksi <1 olduğu için veriler sağlık açısından bir endişe oluşturmamaktadır.

Anahtar Kelimeler: Bebek bisküvisi, Ca, Fe, Mg, Na, K, Pb, Cd, As, Hg, Beslenmeye dayalı maruziyet, Tehlike indeksi.

Giriş

Son yıllarda Dünya genelinde artan refah ve eğitim seviyesiyle birlikte ebeveynlerin toplumdaki rollerinde büyük değişimler yaşanmıştır (Lee et al., 2017). Bu dönemde kadınların işgücüne katılımı artmış ve ebeveynlerin aile içindeki konumları farklılaşmıştır (Gaddis and Klasen, 2014). Bu durum beraberinde ailelerin beslenme alışkanlıklarını da etkilemiştir. Gerek iş gerekse özel hayatları nedeniyle ebeveynler yasal olarak güvenilirliği garanti edilen ticari bebek gıdalarını daha sık satın almaktadır (Başaran, 2020). Bebek gıdaları sağlıklı bir yaşam sürmek için gerekli besin öğelerini içermekle birlikte insan sağlığı için bazı potansiyel riskleri de bünyesinde barındırmaktadır (Arsalan et al., 2013; Var et al., 2021). Bu çalışmada insanlar için hem gerekli hem de toksik özellik gösterebilen metallerle odaklanılmıştır.

Sodyum (Na), magnezyum (Mg), potasyum (K), kalsiyum (Ca) ve demir (Fe) bebeklerin fiziksel ve zihinsel gelişimi doğrudan etkileyen ve insan vücudu için gerekli elementlerdir. Fakat bu elementlerin çokluğu bazı sağlık sorunlarına yol açabileceği de unutulmamalıdır (Domínguez et al., 2017). Kurşun (Pb), arsenik (As), civa (Hg) ve kadmiyum (Cd) ise genellikle doğa olayları, endüstriyel faaliyetler ve insan uygulamaları vb. faktörlerin gıda zincirini kontamine etmesi ve bu gıdaların tüketimiyle vücuda alınan ve insanlar için gerekli olmayan hatta ciddi sağlık sorunlarına yol açabilecek toksik metallerdir (Bragotto and Spisso 2018; Sall et al., 2020).

Türkiye’de çocukların önemli bir bölümü gıdalara erişimde güçlük ve yanlış beslenme nedeniyle makro ve mikro besin eksikliklerine bağlı olarak çeşitli sağlık sorunları yaşamaktadır (Örnek, 2019). Bu dengeyi sağlamak için bebek gıdalarına olan talep artmaktadır (Jeelani et al., 2020). Literatürde bebeklerin beslenme ve çevresel

kontaminantlara daha fazla maruz kaldığı bildirilmiş, bebek gıdalarına ve bu gıdaların tüketimiyle oluşan risklerin sistematik bir şekilde ele alınması gerekliliği vurgulanmıştır (WHO, 2009; EFSA, 2010; de Mendonça Pereira et al., 2020). Bu çalışmanın amacı Türkiye’de satışa sunulan bazı bebek bisküvilerinin gerekli ve toksik element düzeyini tespit etmek, bu gıdaların tüketimden kaynaklanan maruziyeti belirlemek ve potansiyel sağlık risklerini değerlendirmektir.

Materyal ve Yöntem

Etik

Recep Tayyip Erdoğan Üniversitesi etik kurulundan gerekli onay alınmıştır (Rapor No: 2020/05; 2021/99). Bu çalışma 24 Ocak 2020 ve 31 Nisan 2021 tarihleri arasında Helsinki Bildirgesi’nde tanımlı ilkelere göre yürütülmüştür. Tüm deneklerden yazılı bilgilendirilmiş onam alınmıştır.

Anket formu ve verilerin toplanması

Bebeklerin ilk 6 ay sadece anne sütü tüketmeleri tavsiye edilmektedir. 6. aydan itibaren ise anne sütüne ek tamamlayıcı gıdaların alınabileceği bildirilmiştir (WHO, 2011). Bu bilgilere ek olarak bebek bisküvisi tüketim alışkanlıkları da dikkate alınmış ve çalışma 13-36 ay yaş aralığındaki bebekleri kapsayacak şekilde hazırlanmıştır. Çalışmaya 13-36 ay yaş aralığında bebek sahibi olan, anketteki soruları kavrama yetisine sahip ve araştırmaya gönüllü katılan ebeveynler dahil edilmiştir.

Hazırlanan anket formu iki bölümden oluşmaktadır. İlk bölümde çalışmanın amacı ve kapsamına dair bilgilendirme metni bulunmaktadır. Ayrıca bu bölümde bebeklerin demografik özelliklerini belirlemeye yönelik sorular vardır. İkinci bölümde ise bebeklerin geriye dönük 24 saatlik dönemde bebek bisküvisi tüketip tüketmedikleri, tükettiyse miktar ve marka gibi tüketim özelliklerine belirlemeye yönelik sorular bulunmaktadır.

Anketler, 17 Toplum Sağlığı Merkezi’nde ve bir özel hastane de ebeveynlerle yüz yüze görüşülerek kaydedilmiştir (Rapor No: 64247179-799).

Bebek bisküvi örnekleri

Anket uygulamasıyla bebeklerin geriye dönük 24 saatlik dönemde 15 farklı bebek bisküvisi tükettiği tespit edilmiştir. Farklı içerik ve özelliklere sahip bebek bisküvilerinin 10 tanesi iki farklı markaya aittir. Geriye kalan 5 ürün ise 5 farklı markaya aittir. Söz konusu bebek bisküvisi markaları Türkiye genelinde faaliyet gösteren ulusal/yerel zincir market/bakkallar ile e-ticaret sitelerinde satışa sunulmaktadır. Her bir üründen farklı üretim tarihlerine sahip 2 ürün olmak üzere toplamda 30 bebek bisküvisi orijinal ambalajı ile Rize’de faaliyet gösteren bir marketten satın alınmıştır.

ICP MS analizi

Analiz öncesinde ICP-MS cihazına ait tüm parçalar temizlik prosedürüne uygun olarak temizlenmiştir. Her bir örnekten 0.5 g numune tartıldı, Üzerine 9 ml %65 HNO₃ ile 1 ml H₂O₂ ilave edildi ve kapalı bir sistem oluşturuldu. Cihazda 210 °C 1 saatlik metod uygulandı. Numuneler 15 mL’lik falkon tüplere alındı ve ultra saf su ile hacim 15 mL’ye tamamlandı. Numuneler 0.45 µm filtre ile süzülde ve ICP-MS’te analiz edildi. Analizler 3 paralel olarak gerçekleştirildi. Ölçümler; 1200 W RF gücünde, 1 L/dk taşıyıcı gaz akışında ve 0.30 rps nebulizer pompa hızında gerçekleştirildi. Taşıyıcı gaz olarak argon gazı kullanıldı. As, Pb, Cd ve Hg standart çözeltileri ile hazırlanan kalibrasyon eğrileri 0.9995’in üzerinde belirlenmiştir. As, Cd, Hg ve Pb için tespit limiti (LOD) ve tespit sınırı (LOQ) değerleri As için sırasıyla 0.008 ve 0.028 µg/kg, Cd için sırasıyla 0.036 ve 0.119 µg/kg, Hg için sırasıyla 0.078 ve 0.259 µg/kg, Pb için sırasıyla 0.041 ve 0.139 µg/kg olarak belirlenmiştir.

Risk değerlendirme

Bu çalışmada bebek gıdaları tüketiminden kaynaklanan gerekli ve toksik metal maruziyeti deterministik modele göre aşağıdaki formül kullanılarak hesaplanmıştır. M=maruziyet (mg-µg/kg V_a/gün), G_k= gıdadaki metal konsantrasyonu (mg-µg/kg), G_i=günlük gıda tüketim miktarı (g/gün), V_a=vücut ağırlığı (kg).

$$M = \frac{G_k \times G_i}{V_a}$$

Risk değerlendirmesi iki şekilde incelenmiştir. İlk olarak hesaplanan maruziyet düzeyinin bu elementler için kabul edilebilir günlük alım miktarı (ADI) ve tavsiye edilen günlük alım miktarı (RDI) içindeki yüzdelik payı (%ADI-%RDI) hesaplanmıştır ve yorumlanmıştır. Daha sonra her bir toksik metalin tehlike oranı (THQ) belirlenmiş ve karsinojenik olmayan tehlike indeksi (HI) aşağıdaki formüle göre hesaplanmıştır.

$$HI = [(THQ_1 = M_{Pb}/RfD) + (THQ_2 = M_{As}/RfD) + (THQ_3 = M_{Hg}/RfD) + (THQ_4 = M_{Cd}/RfD)]$$

M_n=metal türüne göre maruziyet, RfD=oral referans doz (mg/kg V_a/gün). Kurşun, arsenik, civa ve kadmiyum için RfD değerleri sırasıyla 4×10⁻³, 3×10⁻⁴, 3×10⁻⁴ ve 1×10⁻³ mg/kg V_a/gün olarak belirlenmiştir (US EPA, 2009; Su et al., 2020).

İstatistiksel analiz

Çalışma verileri IBM SPSS Statistics 26 programında analiz edilmiştir. Verilerin değerlendirilmesinde frekans dağılımları ve tanımlayıcı istatistiklerden yararlanılmıştır. Yaş grupları arasındaki maruziyet ve risk değerlendirilmesi Bağımsız Örneklem T Testi (t) ile incelenmiştir. p<0,05 istatistiksel olarak anlamlı kabul edilmiştir.

Bulgular ve Tartışma

Bebek bisküvilerinin ortalama metal düzeyleri

15 farklı bebek bisküvisinin gerekli ve toksik metal düzeyleri Tablo 1’de gösterilmiştir. Bebek bisküvilerinin ortalama Pb, As, Hg ve Cd düzeyleri sırasıyla 13,2, 18,1, 0,17 ve 8,11 µg/kg olarak belirlenmiştir. Ortalama Pb düzeyi en yüksek örnek 11’de, ortalama en yüksek As düzeyi Örnek 15’te, ortalama en yüksek Hg düzeyi Örnek 15’te ve ortalama en yüksek Cd düzeyi ise Örnek 12’de ölçülmüştür. Örnek 15’in Pb hariç diğer toksik metal düzeyleri diğer bisküvilere göre daha yüksek olup özellikle As ve Hg düzeyleri dikkat çekicidir. Bebek bisküvilerinde Al Khalifa and Ahmad (2010) As, Cd, Pb ve Hg 710, 7.00 ve 37.0 µg/kg, Hg ise tespit edilememiştir. Chekri et al., (2019) tahıl bazlı bebek gıdalarında As ve Cd düzeyini sırasıyla 3.13 ve 2.79 µg/kg, de Lima Tozo et al. (2021) bebek gıdalarında Pb, As ve Hg düzeylerini sırasıyla <31.0-70.0, <13.0-140, <2-9 µg/kg olarak tespit etmişlerdir.

Bebek bisküvilerinin ortalama Na, Mg, K, Ca ve Fe düzeyleri sırasıyla 4056, 746, 2190, 543 ve 54 mg/kg olarak belirlenmiştir. Örnek 12 ve 13 Mg ve Fe, Örnek 15 Ca ve Mg, Örnek 4 ve 5 ise Na metalleri için ortalama en yüksek değerlere sahiptir. Örnek 11’in K hariç Na, Mg, Ca ve Fe düzeyleri diğer bisküvilere göre daha düşüktür. Al Khalifa and Ahmad (2010) bebek gıdalarında Na, Ca, Mg, K ve Fe düzeylerini sırasıyla 1790, 4910, 420, 1160 ve 101 mg/kg, de Lima Tozo et al. (2021) ise Na, Mg, K, Ca ve Fe düzeylerini sırasıyla 84-2772, 23-784, 232-19164, 41-13475 ve 3.60-344 mg/kg olarak tespit etmişlerdir.

Tablo 1. Bebek bisküvilerinin ortalama metal düzeyleri

Bebek bisküvileri	Toksik metaller (µg/kg)				Gerekli metaller (mg/kg)				
	Pb	As	Hg	Cd	Na	Mg	K	Ca	Fe
Örnek 1	8.14	8.96	0.10	7.54	3026	386	1453	69.0	15.0
Örnek 2	8.34	17.6	0.03	4.76	3554	412	1502	81.0	18.0
Örnek 3	25.9	13.5	0.17	9.34	3757	541	3463	81.0	33.0
Örnek 4	12.3	11.0	0.08	10.7	11949	631	2283	76.0	25.0
Örnek 5	13.1	16.5	0.02	6.41	13063	400	1727	187	10.0
Örnek 6	18.5	23.0	0.24	6.83	3703	990	2366	957	77.0
Örnek 7	11.5	23.4	0.13	4.40	509	993	1586	589	106
Örnek 8	10.9	15.2	0.09	4.35	3710	387	1465	85.0	17.0
Örnek 9	17.6	12.8	0.14	8.84	4149	638	1237	717	50.0
Örnek 10	8.75	18.0	0.05	4.82	1766	1063	1073	547	86.0
Örnek 11	28.5	1.64	0.07	8.64	225	186	2520	80.0	8.00
Örnek 12	12.3	17.7	0.16	17.9	3584	1753	2369	941	109
Örnek 13	9.48	17.6	0.14	6.22	4128	2004	2717	1023	112
Örnek 14	8.75	5.14	0.04	12.2	2109	299	2121	849	59.0
Örnek 15	3.92	69.8	1.11	8.63	1615	511	4967	1866	90.0

Bu çalışmada ulaşılan değerler ile literatür karşılaştırıldığında bebek gıdalarında hem gerekli hem de toksik metallerin oldukça geniş bir aralıkta olduğu rahatlıkla söylenebilir. Bebek bisküvilerinin hammadde içeriği, formülasyon ve üretim şartları gıdalarda gerekli ve toksik metal düzeyini etkileyebilir. Bu durumun çalışmalar arasındaki farklılığın ana nedeni olacağı düşünülmektedir.

Risk değerlendirme

Çalışma kapsamında 13-36 ay yaş aralığında olan 208 bebeğin bebek bisküvi tüketim özellikleri kayıt altına alınmıştır. 13-24 ay yaş aralığındaki bebeklerin 60 (%48.7) ve 25-36 ay yaş aralığındaki bebeklerin ise 47’si (%55.3) geriye dönük 24 saatlik dönemde bebek bisküvisi tüketmiştir. Bebeklerin toksik metallerle maruziyeti ve %ADI değerleri Tablo 2’de gösterilmiştir.

Tablo 2. Toksik metallerin maruziyeti ve %ADI

Yaş Grubu	Kişi sayısı (%) (n=208)	Ortalama ağırlığı (kg)	Vücut Ort±SS (µg/kg V _a /gün)	ADI	ADI (%)
Arsenik (As)					
13-24 ay	123 (%59.2)	11.0	0.014	-	-
25-36 ay	85 (%40.8)	13.1	0.021	-	-
Genel	208	11.9	0.017	-	-
Kadmiyum (Cd)					
13-24 ay	123 (%59.2)	11.0	0.007	1 µg/kg ^a	0.70
25-36 ay	85 (%40.8)	13.1	0.007	1 µg/kg ^a	0.70
Genel	208	11.9	0.007	1 µg/kg ^a	0.70
Kurşun (Pb)					
13-24 ay	123 (%59.2)	11.0	0.011	3.57 µg/kg ^b	0.30
25-36 ay	85 (%40.8)	13.1	0.010	3.57 µg/kg ^b	0.28
Genel	208	11.9	0.011	3.57 µg/kg ^b	0.30
Civa (Hg)					
13-24 ay	123 (%59.2)	11.0	0.00011	0.57 µg/kg ^a	0.02
25-36 ay	85 (%40.8)	13.1	0.00025	0.57 µg/kg ^a	0.04
Genel	208	11.9	0.00017	0.57 µg/kg ^a	0.03

^a JECFA (2011), ^b EFSA (2010), Ort=Ortalama, SS=Standart sapma

25-36 ay yaş aralığındaki bebeklerin arsenik ve civa maruziyeti 13-24 ay yaş aralığındaki bebeklerin arsenik maruziyetinden istatistiksel olarak daha yüksektir ($p<0.05$). Arsenik için kabul edilebilir günlük alım düzeyi tanımlanmadığı için hesaplanan maruziyetin alım düzeyine katkısı hesaplanamamıştır. Civanın kabul edilebilir günlük alım düzeyindeki payı ise oldukça düşüktür. 13-24 ve 25-36 ay yaş aralığındaki bebeklerin Cd ve Pb maruziyetleri arasında istatistiksel olarak anlamlı bir farklılık bulunamamıştır ($p>0.05$). Her iki toksik metalin % ADI değeri 1'den düşüktür. Su et al. (2020) 13-36 yaş aralığındaki bebeklerin bebek gıdalarından kaynaklanan maruziyetini As, Pb ve Cd için sırasıyla 0.01-0.03, 0.006-0.018 ve 0.003-0.008 µg/kg V_a/gün aralığında hesaplamıştır.

Bebek bisküvisi tüketen bebeklerin maruziyeti o gıdada yer alan tüm metallerden kaynaklanmaktadır. Bu yüzden tehlike indeksi hesaplanmıştır. 13-36 ay yaş aralığındaki bebeklerin tüm metallerden kaynaklı karsinogenik olmayan risk değerlendirmesi Tablo 3'te gösterilmiştir.

Tablo 3. Karsinogenik olmayan risk değerlendirme

Yaş aralığı	THQ				Tehlike indeksi
	Arsenik	Kadmiyum	Kurşun	Civa	
13-24 ay	0.05	0.007	0.003	0.0004	0.06
25-36 ay	0.07	0.007	0.003	0.0008	0.08
Genel	0.06	0.007	0.003	0.0006	0.07

13-24, 25-36 ve 13-36 (genel) ay yaş aralığındaki bebeklerde THQ değeri en yüksek ve düşük metaller sırasıyla arsenik ve civaya aittir. Tüm yaş grupları için tehlike indeksi 1'den oldukça düşük olduğu için sağlık açısından herhangi bir sorun olmadığı rahatlıkla söylenebilir. Su et al. (2020) bebek gıdalarından kaynaklanan tehlike indekslerini As, Pb ve Cd için sırasıyla 0.027-0.103, 0.0015-0.0046 ve 0.0025-0.0090 aralığında hesaplamıştır. Bebeklerin gelişimleri için gerekli olan metaller olan maruziyeti ve %ADI değerleri Tablo 4'te gösterilmiştir. 13-36 ay yaş aralığındaki bebeklerin günlük Na, Ca, Mg, K ve Fe alımları sırasıyla 32.6, 71.5, 83.4, 18.8 ve 0.60 mg/gün olarak belirlenmiştir. Na maruziyeti bakımından yaş grupları arasında istatistiksel olarak anlamlı bir farklılık bulunamamıştır ($p>0.05$). 25-36 ay yaş aralığındaki bebeklerin Ca, Mg, K ve Fe maruziyetleri 13-24 ay yaş aralığındaki bebeklere göre istatistiksel olarak daha yüksektir ($p<0.05$). Tüm yaş grupları için günlük Mg maruziyeti tavsiye edilen günlük alım miktarının üzerindedir ($>100\%$). 13-36 ay yaş aralığındaki bebekler günlük Na, Ca, K ve Fe ihtiyacının sırasıyla 8.81, 13.6, 2.68 ve 7.50% bebek bisküvisinden karşılayabilmektedir. Mg hariç tavsiye edilen günlük alım düzeyleri aşılmadığı için potansiyel bir sağlık riskinden bahsedilemez. de Lima Tozo et al. (2021), 13-36 ay yaş aralığındaki bebeklerin bebek gıdalarından günlük Ca, Mg, K ve Fe alımlarını (tavsiye edilen tüketim miktarına katkısı%) sırasıyla 132 (%23.0), 163 (%18.0), 559 (%5.00) ve 34.0 (%89.0) mg/kg olarak belirlemiştir.

Çalışmaya dahil edilen bebeklerin yaklaşık olarak % 50.0'si geriye dönük 24 saatlik dönemde bebek bisküvisi tüketmemişlerdir. Ayrıca bebek bisküvileri dahil gıdaların tüketim özellikleri ülke, kültür, toplum, aile ve bireylere göre önemli ölçüde farklılık göstermektedir. Tüm bu durumlar gerekli ve toksik metaller için hesaplanan maruziyetin, % ADI değerlerinin ve tehlike indeksinin diğer çalışmalara kıyasla farklı olmasını açıklamaktadır.

Tablo 4. Gerekli metallere maruziyet ve risk değerlendirmesi

Yaş Grubu	Kişi sayısı (%) (n=208)	Ortalama Vücut ağırlığı (kg)	Ort±SS (mg/gün)	RDI	RDI (%)
Sodyum (Na)					
13-24 ay	123 (%59.2)	11.0	34.3	370 mg/gün ^c	9.27
25-36 ay	85 (%40.8)	13.1	30.0	370 mg/gün ^c	8.11
Genel	208	11.9	32.6	370 mg/gün ^c	8.81
Kalsiyum (Ca)					
13-24 ay	123 (%59.2)	11.0	55.5	525 mg/gün ^c	10.6
25-36 ay	85 (%40.8)	13.1	94.0	525 mg/gün ^c	17.9
Genel	208	11.9	71.5	525 mg/gün ^c	13.6
Magnezyum (Mg)					
13-24 ay	123 (%59.2)	11.0	78.0	75 mg/gün ^c	104
25-36 ay	85 (%40.8)	13.1	90.6	75 mg/gün ^c	121
Genel	208	11.9	83.4	75 mg/gün ^c	111
Potasyum (K)					
13-24 ay	123 (%59.2)	11.0	15.8	700 mg/gün ^c	2.26
25-36 ay	85 (%40.8)	13.1	23.1	700 mg/gün ^c	3.30
Genel	208	11.9	18.8	700 mg/gün ^c	2.68
Demir (Fe)					
13-24 ay	123 (%59.2)	11.0	0.55	8 mg/gün ^c	6.88
25-36 ay	85 (%40.8)	13.1	0.79	8 mg/gün ^c	9.88
Genel	208	11.9	0.60	8 mg/gün ^c	7.50

^c Domínguez et al. (2017)

Sonuç

Bebekler beslenmeye dayalı kontaminantlara karşı en savunmasız bireylerdir. Bu yüzden bebek gıdaları güvenirliliği yönünden dikkate izlenmesi gereken gıdaların başında gelmektedir. Bu çalışmada 15 farklı içeriğe sahip bebek bisküvisi insanlar için gerekli ve gerekli olmayan metaller bakımından incelenmiştir. Bebek bisküvilerinde tespit edilen gerekli ve toksik metallerin düzeyleri metal türüne göre literatürdeki çalışmalarla farklılaşmaktadır. Bebek bisküvilerinin tüketimiyle vücuda alınan bu metaller (Mg hariç) kabul edilebilir/tavsiye edilen tüketim miktarlarını aşmamışlardır. Toksik metaller için hesaplanan tehlike indeksinde sağlık risk endişesi çok düşüktür. Bebekler dahil diğer yaş gruplarını ve farklı gıdaları içine alan benzer çalışmaların yapılması toplum sağlığı açısından oldukça önemlidir.

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The use of ultrasound pretreatment in food drying

Ahmed Abdirahman Ahmed¹, Gökçen İzli¹

¹Department of Food Engineering, Faculty of Engineering and Natural Sciences, Bursa Technical University, Bursa, Turkey

Abstract

This research provides a current state of the art review of use of ultrasound technology throughout food drying, such as ultrasound pre-treatment. The impact of key factors and ultrasound technology on drying kinetics and food quality was investigated. The outcomes demonstrated that food products can gain or lose water as a result of ultrasonic pre-treatment, and that increasing ultrasonic parameters (amplitude, sonication duration, and ultrasound power) increased water loss or gain. Whenever ultrasound technology has been used before drying, it always resulted in a faster drying kinetics, however there were rare exceptions. The use of ultrasound reduces the drying time, enhances the warmth and mass transfer rate, and keeps the product's properties. Ultrasound-assisted drying has proven to be a superior alternative to traditional drying. The "sponge effect," which accelerates the flow of water from the inside to the product surface, allows liquid to evaporate. As a whole, ultrasound pre-treatment can minimize water activity, lower nutritional loss and enhance product color, in most cases.

Key Words: *Ultrasound, pre-treatment, drying*

Introduction

Water content is typically high in harvested food. Water provides optimum conditions for microorganisms to thrive and multiply, resulting in irreparable food damage. As a result, proper preserving procedures must be used to limit moisture content and nutrient loss. Food drying is a common method for preserving food. Moisture removal not just to inhibits microbiological growth, but it also decreases the overall weight of the product, reduces packaging space, and lowers packaging and transportation costs (Musielak et al., 2016).

Sun drying is the most conventional and straightforward technique of drying food. In the past, drying research and innovation was primarily focused on the method and technology, and food drying was done primarily to lengthen shelf life rather than to preserve nutritional and organoleptic properties. Consumers are becoming more choosy as a result of growing consumer awareness of food nutrition and health, as well as a large variety of dried foods, prompting researchers to create approaches to develop high-quality dry commodities (Mothibe et al., 2011). The quality of dried products has vastly increased thanks to the use of novel technology to improve and optimize existing procedures. Instead of sun drying, numerous innovative drying technologies such as microwave, hot air, vacuum, freeze drying, and hybrid techniques (hot air-vacuum, hot air-microwave, microwave-freeze, microwave-vacuum, etc.) have been widely used. However, these processes have a number of drawbacks, including high energy consumption and ultimate quality of product degradation for hot-air drying, inconsistent drying or overheating for microwave drying, and high cost expenditure for freeze and hybrid drying, among others (Elmizadeh et al., 2017; Musielak et al., 2016). As a result, pre-treatment is frequently used before drying. Pre-treatment before drying is a well-studied topic, with numerous ways devised. Deng et al. (2019), evaluated the chemical and physical pretreatments of fruits and vegetables. They concluded that, while chemical pre-treatment helps speed up the drying process, it also leads soluble nutrients to be lost and chemical residues to pose food safety issues. Thermal pre-treatment can inactivate microorganisms, soften the texture, and speed up the drying process. Nevertheless, it causes items to be of poor quality. Scientists and creative food centers are on the lookout for new food processing technologies that will enable the launch of new, safer, fresher, and higher-quality meals with longer shelf lives for both domestic and international markets. Among the emerging technologies that are gaining traction, ultrasonic process holds a lot of promise because the effects of high-powered ultrasound are more pronounced at low temperatures, lowering the risk of food spoilage (Povey and Mason, 1998).

The purpose of this study is to evaluate the ultrasound technology utilized in food drying such as ultrasound pre-treatment. The impact of ultrasound technology on the drying parameters such as effective moisture diffusivity, energy usage and drying rate, etc and the quality of dried products is thoroughly examined.

Ultrasound pre-treatment mechanism

The impacts of mechanical waves, that are primarily connected to the cavitation phenomena, are the basis of ultrasound application in liquid systems. When the ultrasonic power is high enough, the rarefaction cycle may outweigh the liquid molecules attraction forces, resulting in cavitation bubbles. These bubbles develop to a crucial size before becoming unstable and collapsing suddenly. This is thought to play a significant role in cellular disruption (Brennan and Grandison, 2012). Strong micro-streaming can be made by varying the bubble size and

then allowing the bubbles to collapse. Micro-streaming will provide a lot of agitation, which will improve heat and mass transmission during food processing. Furthermore, the bursting of cavitation bubbles near to the solid–liquid contact can produce a micro-jet into the bubble. By shattering the respective diffusion barrier layer, the micro-jet also improves mass and heat transmission between the liquid and the solid (Rodríguez et al., 2018).

Ultrasound waves are commonly transmitted through into aqueous media, such as distilled water, via an ultrasonic bath or by a probe for ultrasound pre-treatment. All power ultrasonography in food systems include three basic components: a generator, a transducer, and a couple (Gallego-Juarez et al., 1999).

The samples should be submerged in a liquid media and exposed to ultrasonic waves for an extended duration. Since ultrasonic waves can indeed be spread throughout the liquid media, mechanical agitation is not necessary. Even though greater temperatures do not improve the impacts of ultrasound, the operation can be conducted at room temperature. Because the fruit and liquid media have different sugar concentrations, mass transfer of sugar out from fruit to the liquid medium or vice versa is favored. Water-soluble solids flow from the fruit towards the medium when the liquid medium is distilled, and water travels into the fruit. Once an osmotic solution is employed rather than distilled water, the reverse mass transport results. These mass transfer processes are essential in pre-treatment as they affect the natural change in flavor in fruits and can be used to assess the effectiveness of drying pre-treatments (Simal et al., 1998).

Food drying with ultrasound pre-treatment

The ultrasonic power, sonication duration, amplitude and frequency of the sonicator probe and bath will all have a major impact on the drying characteristics and quality of food products during pre-treatment. On different fruit materials, ultrasound pretreatment has distinct effects. In Table 1, some fruits, increase water when exposed to ultrasound, while others lose water. Banana, water gain rose as sonication time increased, whereas drying time dropped. For melon samples submerged in distilled water showed negative water loss, whereas those immersed in sucrose solution showed positive water loss, which rose as the sonication time increased. For papaya, The amount of water lost grew as the sonication period went on. Quince demonstrated a greater retention of bioactive components as well as improved physical characteristics.

The rise in drying kinetics is always noticed when ultrasonic technology is used prior to drying, as shown in the Table 2. The overall drying time was reduced by roughly 27.3 %, while the effective diffusivity of water was increased by up to 28.1%, according to Oliveira et al. (2011). The water dispersion to the surface was improved, and the drying time was shortened (Dujmi et al., 2013). The efficient water diffusion coefficient was increased while the overall processing time of pulsed electric fields-ultrasound reduced by 6–31% (Wiktor et al., 2019).

Yildiz and Izli (2019) investigated the influence of ultrasonic (US) pre-treatment on the physical, chemical, and nutritional characteristics of freeze-dried quince slices. Untreated and ultrasonically pretreated quince samples showed a substantial difference. When compared to untreated quince slices, freeze-dried quince slices treated with a US (particularly 20 min—treatment) demonstrated a greater retention of bioactive components as well as improved physical characteristics.

The effects of ultrasonic pre-treatment were studied by Nowacka et al. (2012). In compared to untreated tissue, the ultrasound-treated apples had a 9–11 % larger shrinkage, 6–20 % lower density, and 9–14 % higher porosity than the untreated ones.

The effects of ultrasound and blanching on polyacetylene (faltarinol, faltarindiol, and faltarindiol-3-acetate) and carotenoid chemicals in hot air and freeze dried carrot discs were studied (Rawson et al., 2011). In comparison to blanching followed by hot air drying, ultrasound pre-treatment followed by hot air drying at the greatest amplitude and treatment period studied resulted in higher retention of polyacetylenes and carotenoids in dried carrot discs.

The goal of the study by da Silva et al. (2016) was to see how ultrasound, osmotic dehydration, and vacuum as pretreatments affected melon drying and quality. The dried pretreatment samples that were treated with ultrasound or a combination of ultrasound and vacuum dried faster. The total carotenoids content of dried melon processed with ultrasonic and vacuum combined was higher, the texture was softer, and the total color difference was equivalent to the untreated dried fruit.

Table 1. Summary of the parametric effects of ultrasonic pre-treatment on the drying of food

Food type	Pre-treatment conditions	Major outcome	Reference
Banana	Immersion in water, $f = 25$ kHz, $T = 30$ °C, $t = 10, 20$, and 30 minutes	Water gain rose as sonication time increased, whereas drying time dropped.	(Azoubel et al., 2010)
Carrot	Immersion in water; $A = 24.4, 42.7$, and 61 μ m, $f = 20$ kHz, $P = 1.5$ kW, $T = 25$ °C, $t = 3$ and 10 minutes.	Polyacetylene retention was improved by using higher ultrasound amplitudes and a relatively long sonication period.	(Rawson et al., 2011)
Apple	Immersion in water, $f = 35$ kHz, $T = 25$ °C, $t = 10, 20$, and 30 minutes	As the sonication period was reduced, the weight loss increased. After 30 minutes of ultrasound pre-treatment, the drying rate was the fastest, followed by 10 and 20 minutes.	(Nowacka et al., 2012)
Cranberry	Immersion in water; $f = 35$ and 130 kHz	Hardness and water activity were reduced as ultrasound frequency was increased.	(Shamaei et al., 2012)
Blackberry	Immersion in water at $A = 45$ and 90 m, $f = 24$ kHz, $P = 400$ W, $T = 15$ °C, $t = 10, 20$, and 30 minutes	Antioxidant retention was reduced as the value of ultrasonic parameters (amplitude and sonication period) increased.	(Romero and Yépez, 2014)
Mushroom	Immersion in water; $f = 25$ kHz, $P = 154$ W, $T = 26$ °C, $t = 20$, and 25 minutes	The amount of water gained increased when the sonication period was increased.	(Çakmak et al., 2016)
Onion	Immersion in water at $A = 24.4, 42.7$, and 61 m, $f = 20$ kHz, $T = 70$ °C, $t = 1, 3$, and 5 minutes.	Longer sonication times resulted in increased oxidative and thermal deterioration.	(Ren et al., 2018)
Quince	Immersion in water, $f = 28$ kHz, $P = 50$ W, $t = 10, 20$, and 30 min	When compared to untreated quince slices, freeze-dried quince slices treated with a US (particularly 20 min—treatment) demonstrated a greater retention of bioactive components as well as improved physical characteristics.	(Yildiz and Izli, 2019)
Papaya	Osmotic dehydration and water immersion; $f = 25$ kHz, $I = 4870$ W/m ² , $T = 30$ °C, $t = 10, 20$, and 30 minutes.	The amount of water lost grew as the sonication period went on;	(Rodrigues et al., 2009)
Melon	Osmotic dehydration and water immersion; $f = 25$ kHz, $I = 4870$ W/m ² , $T = 30$ °C, $t = 10, 20$, and 30 minutes.	Those submerged in distilled water showed negative water loss, whereas those immersed in sucrose solution showed positive water loss, which rose as the sonication time increased.	(da Silva et al., 2016)

Table 2. The effects of ultrasonic pre-treatment on the kinetics of food drying

Food type	Drying conditions	Major outcomes	References
Apple	Hot-air $T = 60$ °C	The overall drying time was lowered by around 27.3 %, while the efficient diffusivity of water was raised by up to 28.1 %.	(Oliveira et al., 2011)
Guava	Hot-air $T = 70$ °C, $v = 0.06$ m/s	The ultrasound pre-osmotic pre-treatments shortened drying time by 11–33% and enhanced water effective diffusivity by 18–35%.	(Kek et al., 2013)
Carrot	Hot-air $T = 70$ °C, $v = 2$ m/s.	The efficient water diffusion coefficient was raised while the overall processing time of PEF-US and US-PEF was lowered by 6–31%.	(Wiktor et al., 2019)
Pear	Infrared $T = 70$ °C.	The water dispersion to the surface was improved, and the drying time was reduced.	(Dujmić et al., 2013)
Potato	Infrared $T = 100$ °C	With US + ethanol and US + water, the drying time was lowered by 30% and 23%, correspondingly.	(Rojas and Augusto, 2018)

Conclusion

Food products may gain or lose water as a result of ultrasonic pre-treatment, and this is owing to the cumulative effect of ultrasound pre-treatment and the concentration gradient among food products and the liquid medium. Water loss or gain increased as ultrasonic parameters (sonication time, amplitude, and ultrasound power) were raised. The ultrasound pretreatment also sped up the drying process; however there were some mixed outcomes. As a whole, ultrasound pre-treatment can minimize water activity, lower nutritional loss and enhance product color, in most cases.

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Investigation of Sulfonamide Antibiotic Residues in Some Animal Source Foods

Hilal Türkan¹, Burak Demirhan²

¹Department of Food Analysis and Nutrition, Institute of Health Sciences, Gazi University, Ankara, Turkey

²Department of Pharmaceutical Basic Sciences, Faculty of Pharmacy, Gazi University, Ankara, Turkey

Abstract

Antibiotics are natural, synthetic or semi-synthetic compounds that cause the destruction of microorganisms or slow their growth. In addition to its therapeutic use, it also led to its use in the 1950s to increase growth and feed efficiency in food animals. Antibiotics belonging to the sulfonamide family are used against most Gram-positive and many Gram-negative microorganisms and protozoa. High or continuous use of sulfonamides in veterinary applications causes residues in meat, eggs, milk, honey and other edible tissues of animals. Many sulfonamides generally have a long half-life and can cause serious health problems as a result of allergic or toxic reactions. At the same time, it is stated that some sulfonamides are potential carcinogens and cause significant risks in food safety. In order to protect consumers from the risks of drug residues due to these harmful effects, legal regulations in many countries have determined the maximum residue limits for antibiotics to be found in foods. As a result, monitoring of antibiotic residues in food is a very important in terms of the effects of sulfonamide group antibiotics on public health and the prevention, control and reduction of drug residues in food animals.

Key Words: Food safety, Sulfonamide, Antibiotic residue

Bazı Hayvansal Kaynaklı Gıdalarda Sülfonamid Antibiyotik Kalıntılarının Araştırılması

Özet

Antibiyotikler, mikroorganizmaların yok olmasına neden olan veya büyümelerini yavaşlatan doğal, sentetik veya yarı sentetik bileşiklerdir. Tedavi edici kullanımının yanı sıra 1950'li yıllarda yıllardır gıda değeri olan hayvanlarda büyüme ve yem verimini artırmak için de kullanılmıştır. Sülfonamid ailesine ait antibiyotikler çoğu Gram pozitif ve birçok Gram negatif mikroorganizma ve protozoaya karşı kullanılmaktadır. Sülfonamidlerin veterinerlik uygulamalarında yüksek veya sürekli kullanımı hayvanların et, yumurta, süt, bal ve diğer yenilebilir dokularında kalıntılara neden olabilmektedir. Çoğu sülfonamid grubu antibiyotikler genellikle uzun bir yarı ömre sahiptir ve alerjik veya toksik reaksiyonlar sonucunda ciddi sağlık sorunlarına neden olabilmektedir. Aynı zamanda, bazı sülfonamidlerin potansiyel kanserojen olduğu ve gıda güvenliğinde önemli riskler oluşturduğu belirtilmektedir. Bu zararlı etkileri nedeniyle tüketicileri ilaç kalıntısı risklerinden korumak için birçok ülkede yasal düzenlemelerle gıdalarda bulunabilecek antibiyotikler için maksimum kalıntı limitleri belirlenmiştir. Sonuç olarak, sülfonamid grubu antibiyotiklerin halk sağlığı üzerindeki etkileri ve gıda değeri olan hayvanlarda ilaç kalıntılarının önlenmesi, kontrolü ve azaltılması açısından gıdalarda antibiyotik kalıntılarının izlenmesi oldukça önem taşımaktadır.

Anahtar Kelimeler: Gıda güvenliği, Sülfonamid, Antibiyotik kalıntısı

Effects of Resveratrol on Health

Hanife Altınsoy¹, Burak Demirhan²

¹Department of Food Analysis and Nutrition, Institute of Health Sciences, Gazi University, Ankara, Turkey

²Department of Pharmaceutical Basic Sciences, Faculty of Pharmacy, Gazi University, Ankara, Turkey

Abstract

Resveratrol (3, 5, 4p-trihydroxystilbene) is a phenolic micronutrient compound naturally formed by 70 different plant species such as grapes, strawberries, peanuts and pine trees. It was first isolated from the plant *Veratrum grandiflorum* in the 1940s. Resveratrol is a stilbenoid polyphenol having two phenol rings connected by an ethylene bridge. The chemical structure of resveratrol is defined as two isomeric forms, cis- and trans-resveratrol. Due to its stability, only the trans form of resveratrol participates in most biological activities. Due to its chemical structure, resveratrol has a low solubility in water, and ethanol or organic solvents can be used to increase its solubility. Resveratrol metabolites can be detected by HPLC, and the fluorescent properties of resveratrol are important for studying its stability, binding and distribution. The effectiveness of resveratrol may be reduced as a result of low bioavailability. Factors such as dose amount, food matrix, particle size and the role of intestinal microflora in resveratrol metabolism affect the bioavailability and pharmacokinetics of resveratrol. Resveratrol has health benefits in both humans and animals. Anti-diabetic, anti-obesity, antioxidant, anti-platelet aggregation, anti-inflammatory, hypoglycemic, anti-cancer effects have been demonstrated in both humans and animals. Future studies will contribute to the understanding of the underlying mechanisms in the health effects of resveratrol.

Key Words: Resveratrol, Biological activity, Bioavailability, Human health

Resveratrolün Sağlığa Etkileri

Özet

Resveratrol (3, 5, 4p-trihidroksistilben), üzüm, çilek, yer fıstığı ve çam ağaçları gibi 70 farklı bitki türünün doğal olarak oluşturduğu fenolik bir mikro besin bileşimidir. İlk olarak 1940'larda *Veratrum grandiflorum* bitkisinden izole edilmiştir. Resveratrol, bir etilen köprüsü ile birbirine bağlanan iki fenol halkasına sahip stilbenoid bir polifenoldür. Resveratrolün kimyasal yapısı, cis- ve trans- resveratrol olmak üzere iki izomerik form olarak tanımlanmaktadır. Stabilesi nedeniyle, çoğu biyolojik aktiviteye sadece resveratrolün trans formu katılmaktadır. Resveratrolün kimyasal yapısı nedeniyle suda çözünürlüğü düşüktür ve çözünürlüğünü artırmak için etanol veya organik çözücüler kullanılabilir. Resveratrol metabolitleri HPLC ile tespit edilebilir ve resveratrolün floresan özellikleri, stabilesini, bağlanmasını ve dağılımını incelemek için önemlidir. Düşük biyoyararlanımı nedeniyle resveratrolün etkinliği azalabilmektedir. Doz miktarı, gıda matriksi, partikül boyutu ve bağırsak mikroflorasının resveratrol metabolizmasındaki rolü gibi faktörler resveratrolün biyoyararlanımını ve farmakokinetiğini etkilemektedir. Resveratrol, hem insanlarda hem de hayvanlarda sağlık üzerine yararlı etkilere sahiptir. Anti-diyabetik, anti-obezite, antioksidan, anti-trombosit agregasyonu, anti-inflamatuar, hipoglisemik, anti-kanser etkileri hem insanlarda hem de hayvanlarda gösterilmiştir. Gelecekteki çalışmalar, resveratrolün sağlık üzerindeki etkileri ile ilgili mekanizmaların anlaşılmasına katkıda bulunacaktır.

Anahtar Kelimeler: Resveratrol, Biyolojik aktivite, Biyoyararlanım, İnsan sağlığı

Determination of Phenolic Compounds in Some Fruit Extracts by High Performance Liquid Chromatography (HPLC)

Hanife Altınsoy¹, Burak Demirhan²

¹Department of Food Analysis and Nutrition, Institute of Health Sciences, Gazi University, Ankara, Turkey

²Department of Pharmaceutical Basic Sciences, Faculty of Pharmacy, Gazi University, Ankara, Turkey

Abstract

Phenolic compounds or polyphenols are secondary metabolites of plants and are chemical substances with various chemical structures and activities. Phenolic compounds are substances having one or more hydroxide groups, an aromatic ring and a benzene ring, including functional derivatives such as esters, methyl esters, glycosides. The most common phenolic compounds are phenolic acids, flavonoids, stilbenes, lignans, coumarins and tannins. It is stated that phenolic compounds have strong antioxidant activity and are abundant in fruits. Due to their pronounced antioxidant activity, phenolic compounds have the ability to directly bind (“catch”) free radicals. It is also stated that phenolic compounds reduce blood pressure and provide positive effects in diseases such as obesity, microbial infections and cancer. Phenolic compounds are molecules with great potential in terms of balanced nutrition and positive effects in the treatment of various diseases, and fruits and vegetables have an important place in the diet as they are the most important source of natural phenolic compounds. In the last decades, the importance of “food and health” has gaining increased public interest in many developed countries. The most widely used method for determination of phenolic compounds is high performance liquid chromatography (HPLC). In the literature, there are studies examining the bioactive components of some local fruits grown in different parts of the world with HPLC, which is one of the advanced techniques. In this study, it is aimed to give general information about the phenolic compounds in some local fruits (such as hawthorn, leaf pear, rosehip, barberry, apple, pear, blackberry, plum).

Key Words: Phenolic compounds, Health benefits, Fruit, HPLC

Bazı Meyve Ekstraktlarındaki Fenolik Bileşiklerin Yüksek Performanslı Sıvı Kromatografisi (HPLC) ile Belirlenmesi

Özet

Fenolik bileşikler veya polifenoller, bitkilerin ikincil metabolitleridir ve çeşitli kimyasal yapı ve aktivitelere sahip kimyasal maddelerdir. Fenolik bileşikler, esterler, metil esterler, glikozitler gibi fonksiyonel türevler dahil olmak üzere bir veya daha fazla hidroksit grubuna, bir aromatik halkaya ve bir benzen halkasına sahip maddelerdir. En yaygın fenolik bileşikler fenolik asitler, flavonoidler, stilbenler, lignanlar, kumarinler ve tanenlerdir. Fenolik bileşiklerin güçlü antioksidan aktiviteye sahip olduğu ve meyvelerde yüksek miktarda bulunduğu belirtilmektedir. Belirgin antioksidan aktivitelerinden dolayı fenolik bileşikler, serbest radikalleri doğrudan bağlama (“yakalama”) yeteneğine sahiptir. Ayrıca, fenolik bileşiklerin kan basıncını düşürdüğü ve obezite, mikrobiyal enfeksiyonlar ve kanser gibi hastalıklarda olumlu etkiler sağladığı belirtilmektedir. Fenolik bileşikler, dengeli beslenme ve çeşitli hastalıkların tedavisinde olumlu etkileri açısından büyük potansiyele sahip moleküllerdir ve meyve ve sebzeler, doğal fenolik bileşiklerin en önemli kaynağı oldukları için diyetle önemli bir yere sahiptir. Son yıllarda, halkın “gıda ve sağlığın” önemi konusunda ilgisi, birçok gelişmiş ülkede artış göstermektedir. Fenolik bileşiklerin belirlenmesi için en yaygın olarak kullanılan yöntem, yüksek performanslı sıvı kromatografisidir (HPLC). Literatürde dünyanın farklı bölgelerinde yetişen bazı yerel meyvelerin biyoaktif bileşenlerini geliştirmiş tekniklerden HPLC ile inceleyen çalışmalar bulunmaktadır. Bu çalışmada, bazı yöresel meyvelerde (alıç, armut yaprağı, kuşburnu, kızamık, elma, armut, böğürtlen, erik gibi) bulunan fenolik bileşikler hakkında genel bilgi verilmesi amaçlanmıştır.

Anahtar Kelimeler: Fenolik bileşikler, Sağlık yararları, Meyve, HPLC

Determination of Prevalence and Reservoir Weed Species of *Tomato spotted wilt tospovirus*-TSWV on Peppers Grown in Greenhouses in Kumluca District of Antalya, Turkey

Serkan Yeşil¹, Özder Gömlekli

¹Department of Plant Protection, Faculty of Agriculture, Selçuk University, Konya, Turkey

Abstract

Pepper (*Capsicum annuum* L.) is a member of the *Capsicum* genus of the *Solanaceae* family, and is known as an annual plant in warm climates and a perennial plant in tropical climates. There are many viruses that infect pepper and limit its production. Among these viruses, *Tomato spotted wilt tospovirus* (TSWV) infects crops in 35 plant families that are economically important, including pepper. The scope of the study; in September-December 2020, totaly 156 leaf samples were collected, including 57 from pepper plants showing virus-like symptoms and 99 from weeds and/or plants other than peppers in and around the greenhouse, through surveys carried out in pepper greenhouses in Kumluca district of Antalya province. Then, plant samples were tested to determine TSWV infections by the Double Antibody Sandwich Enzyme-linked Immunosorbent Assay (DAS-ELISA) method. According to result of the tests, it was determined that 55.76% of the tested leaf samples were infected with TSWV, while this rate was determined as 96.49% for pepper samples and 32.32% for other plant samples. During the survey studies, it was revealed that the leaf samples of 13 out of 31 weed and different plant species except pepper were infected with at least one of the viruses. In addition, pepper plants showing symptoms TSWV-like symptoms in pepper greenhouses were counted during the survey, and the prevalence of this virus disease was calculated on the basis of Kumluca district and neighborhoods. As a result of these calculations, the prevalences of TSWV; for Kumluca, Mavikent, Beykonak, Salur, Hacíveliler, Adrasan, Merkez, and Kavakköy were determined as 26.93%, 26.92%, 32.27%, 20.66%, 21.13%, 17.66%, 13%, and 25%, respectively.

Key Words: DAS-ELISA, Kumluca, Pepper, TSWV, Weeds

Determination of Virus Diseases on Lettuce Plants in Konya Province, Turkey

Serkan Yeşil^{1*}, Halime İrgin Ağca²

¹Department of Plant Protection, Faculty of Agriculture, Selçuk University, 42031, Konya, Turkey

²Turkish Sugar Factories (Türkşeker), Erciş Sugar Factory, Van

*Corresponding author e-mail: serkanyesil@selcuk.edu.tr

Abstract

Lettuce (*Lactuca sativa* L.) is a member of the family *Compositae* (*Asteraceae*). This plant, which is grown for its leaves, is grown in open field and greenhouse conditions almost everywhere in the world and in Turkey. With the present study virus diseases of lettuce and their prevalence in Konya province was revealed for the first time. For this purpose, leaf samples were taken from lettuce plants showing virus diseases symptoms with surveys carried out in Konya province lettuce planting areas from May to August in 2020. Then the collected lettuce leaf samples were tested in laboratory conditions by Double Antibody Sandwich Enzyme-linked Immunosorbent Assay (DAS-ELISA) method to reveal infections of *Cucumber mosaic virus* (CMV), *Mirafiori lettuce big vein virus* (MiLBVV), *Lettuce mosaic virus* (LMV), and *Tomato spotted wilt virus* (TSWV). According to the information obtained from the results of the study, it was determined that 40 out of 97 (41.23 %) lettuce plant samples and all (6) weed samples were infected with at least one of the viruses. In lettuce leaf samples; TSWV (27,83 %), LMV (12,37 %), CMV (10,31 %) and MiLBVV (5,15 %) infections have been detected. In weed samples; infections of CMV (83,33 %), LMV (66,66 %), and TSWV (50 %) have been revealed. The infections of TSWV, LMV, CMV, and MiLBVV on lettuce plants in Konya province were reported firstly with the study.

Key Words: DAS-ELISA, Konya, Lettuce, LMV, Relative incidence, TSWV

Konya İli Marul Ekim Alanlarında Sorun Olan Virüs Hastalıklarının Belirlenmesi

Özet

Marul (*Lactuca sativa* L.) *Compositae* (*Asteraceae*) familyası içerisinde yer almaktadır. Yaprakları için yetiştirilen bu bitki, Dünya’da ve ülkemizin hemen hemen her yerinde açıkta ve sera koşullarında yetiştirilmektedir. Gerçekleştirilen bu tez çalışması ile; Konya ili marul ekim alanlarında sorun olan virüsler ve bunların sebep oldukları hastalıkların marul ekim alanlarındaki yaygınlıkları da ilk defa ortaya konulmuştur. Bu çalışma kapsamında; 2020 yılı Mayıs ile Ağustos ayları arasında Konya ili marul ekim alanlarında gerçekleştirilen sürveyler ile virüs belirtisi gösteren marul bitkilerinden yaprak örnekleri alınmıştır. Daha sonra toplanan marul örnekleri laboratuvar koşullarında double antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA) yöntemi ile *Cucumber mosaic virus* (CMV), *Mirafiori lettuce big vein virus* (MiLBVV), *Lettuce mosaic virus* (LMV) ve *Tomato spotted wilt virus* (TSWV) enfeksiyonlarını ortaya koymak amacıyla testlenmiştir. Çalışma sonuçlarından elde edilen bilgilere göre 97 adet marul bitki örneğinin 40 tanesinin (%41,23), 6 adet yabancı ot örneğinin ise tamamının (%100) söz konusu virüslerden en az bir tanesi ile bulaşık oldukları tespit edilmiştir. Marul yaprak örneklerinde; TSWV (%27,83), LMV (%12,37), CMV (%10,31) ve MiLBVV (%5,15) enfeksiyonları saptanırken, yabancı ot örneklerinde ise; CMV (%83,33), LMV (%66,66) ve TSWV (%50) enfeksiyonlarının varlıkları ortaya konulmuştur. Gerçekleştirilen bu çalışma ile Konya ili marul yetiştirme alanlarında TSWV, LMV, CMV ve MiLBVV enfeksiyonlarının varlıkları ilk kez ortaya konulmuştur.

Anahtar kelimeler: DAS-ELISA, Konya, LMV, Marul, TSWV, Yaygınlık oranı

Determination of Some Quality Characteristics of Dairy Cow Milk Produced in Kastamonu Province

Ertuğrul Kul¹, Samet Hasan Abacı^{2*}, Ali Ayhan Barut³

¹Department of Animal Science, Faculty of Agriculture, Kırşehir Ahi Evran University, Kırşehir, Turkey

²Department of Animal Science, Faculty of Agriculture, Ondokuz Mayıs University, Samsun, Turkey

³Cattle Breeders' Association of Kastamonu Province, Kastamonu, Turkey

Abstract

This study was carried out to determine the raw milk quality of dairy cattle raised in 156 private dairy farms in Kastamonu province. For this purpose, a total of 1697 milk samples were taken from 849 cows in the first 100 days of lactation, which are considered as early lactation period in November 2020 and December 2020. In the study, the sample month (November and December) and parity (1-5) were examined as environmental factors. The effect of sample month on fat content, protein content and somatic cell count (log₁₀ SCC) was found to be significantly important ($P<0.01$). The highest fat content and protein content was determined in December, and SCC in milk produced in November. The effect of parity on protein content and log₁₀ SCC was significant ($P<0.05$). In the study, mean fat content, protein content, SCC and log₁₀ SCC means were determined as 3.97%, 3.55%, 199862 cells/ml and 5.07 log₁₀ cell/ml, respectively. As a result, raw cow milk produced in Kastamonu province is within the limits specified in the Turkish Food Codex and the relevant communique of the European Commission.

Key Words: *Kastamonu, Fat Content, Protein Content, Somatic Cell Count, Sample Month*

Determinants of Mobile Phones Usage for Agricultural information and Social Networking among Farmers in Oyo State, Nigeria

Olakanmi, E¹., Olaniyi, O.A¹., Oladipo, I.F¹., and Ibitunde, I.O²

¹Department of Agricultural Extension & Rural Development, Ladoke Akintola University of Technology, Ogbomosho

^{**} Department of Agricultural Extension & Rural Development, Osun State University, Osogbo

Abstract

Mobile phone is a major component of Information and Communication Technology (ICT) which makes the world a global village. However, its potential has not been fully maximised for agricultural information and social networking among farmers in Nigeria. This study, therefore, assessed the use of mobile phone for agricultural information and social networking among maize farmers in Oyo state, Nigeria. Multistage sampling technique was employed to select 180 maize respondents in the study area. Data were collected with the use of interview schedule. Frequency counts, percentages, mean and Regression analysis was used statistical tools. Mobile phones enhanced social interaction among maize farmers, transporters (WMS = 2.30), agro input dealer (WMS = 2.29), and market middlemen (WMS = 2.27). The identified constraints to mobile phone usage for agricultural information and social networking include complexity of operation (WMS = 1.80), poor network coverage for mobile connectivity (WMS = 1.50) and erratic power supply (WMS = 1.80). Age ($\beta=0.041$); years of farming experience in maize production ($\beta=0.065$); average income per cycle of production ($\beta=0.00$); distance from house to farm ($\beta=0.054$); ownership of mobile phone ($\beta=4.470$); number of mobile phones owned ($\beta=0.999$) and household size ($\beta=0.306$) significantly determined the extent of mobile phone usage for agricultural information communication and social networking among the farmers. It was concluded that the maize farmers used mobile phones moderately for agricultural information and social networking and do have social interaction with other stakeholders within and outside their domains.

The study therefore recommend among others that building the capacity of maize farmers by the extension institutions is necessary for optimal utilisation of mobile phone for communicating agricultural information and social networking among stakeholders.

Keywords: *Agricultural information, Mobile phone use, Maize farmers*

Nigeria is part of developing country in Africa with a population of 195 million (World Population Review, 2018). Agriculture is the base of the country's economy and has been the main source of livelihood for most inhabitants (FAO, 2017). It has also contributed significantly to the improvement of Nigeria's Gross Domestic Product (GDP) over the last 10 years (Sertoglu *et al.*, 2017). The Nigerian agriculture sector grew by 18.58% year on-year in 2018 showing an increase of 8.45% from the same quarter of 2017, and 0.26% increase from the third quarter of 2018. Ogunniyi and Ojebuyi (2016) opined that over 80 percent of the population lived in rural areas while about 70 percent of the population engaged in agriculture and they are farmers who cultivated at least less than five hectares (Ofana *et al.*, 2016). These farmers produce over 80 percent of all agricultural produce in Nigeria.

According to Nwajiuba (2012), Nigeria has about 79 million hectares of arable land, and over 32 million hectares are cultivated for both crop and livestock production. Recently, current production rate has been unable to feed Nigerian's growing population leading to food scarcity issues which has resulted to high food importation. As at April 2018, the population of the country has increased by 1.6 million with an annual growth rate of 2.63 percent (World Population Review, 2018). A review of agricultural productivity in Nigeria by the International Food Policy Research Institute IFPRI (2009) showed that inconsistent provision of farm inputs and services by government, marketing of farm commodities, use of traditional management practices, absence of GPS for livestock productivity, inadequate information on the use of modern technology and practices, as well as poor extension service delivery were among the factors that hindered agricultural productivity. IFPRI findings revealed that these challenges were more pronounced because the majority of farmers in Nigeria are smallholders who cannot afford the cost of using modern technologies and farm practices.

Arable crops enjoy remarkable dominance, playing significant roles in the socioeconomic lives of both rural and urban dwellers. Arable crops include a wide range of annual crops of primary importance such as maize, rice, sorghum, millet, cassava, cowpea, wheat, soybeans, melon, groundnut yam, vegetables just to mention a few asserted by (Lambrou and Laub, 2006). In Nigeria, production of arable crops is essentially the prominent feature of agricultural activities. Indeed, almost all farmers in Nigeria cultivate one or more arable crops such as maize, cassava, yam for food and income as cited by Olaniyi (2016)

Presently, agriculture in Nigeria has been of great importance to the economy, it is affected by most of the challenges that hinder agricultural development this include: a low level of mechanisation in agriculture, high

illiteracy levels among the farmers, lack of credit facilities for farmers, weather vagaries, low technology diffusion, poor infrastructure, inadequate access to markets, defective research and extension services, implementation inefficiency, practice of tenure ownership, pests and diseases and imperfect information (Abutu, 2014; Ofana *et al.*, 2016; UN, 2013). Aker *et al.*, (2016) opined that most of the agricultural problems as described by many researchers and the United Nations (UN) (2013) that hamper agricultural productivity and development in developing countries could be addressed or managed effectively through the use of mobile phone and mobile applications been used by the farmers.

The use of mobile phones has been identified as one of the existing forms of Information and Communication Technologies (ICTs) that can improve agricultural productivity and accelerate rural development processes as opined by (Asa & Uwem, 2017). Similarly, Chukwunonso and Tukur (2012) also recognised mobile phone as a form of Information and Communication Technologies that can contribute to poverty reduction and socio-economic development through its application in agriculture.

It has been sometimes predicted that mobile phones would be the Information and communication technology that will have the greatest diffusion and impact on the poor masses which include rural dwellers. It was presume that mobile phones will help to reduce the marginalisation of rural farmers by promoting communication that is not restricted by time, distance, volume and medium, thereby surmounting the obstacles created by territory and social standing. There has been a growing awareness of the usefulness of mobile phones and this has drawn the attention of individuals, businesses, governmental and non-governmental organisations to the myriad of purposes a mobile phone can serve in various sectors such as agriculture, health, business, education and the entertainment sector asserted by Baumüller, (2015).

In agricultural sector there are some of the important services that could be achieved through the use of mobile phones which include weather forecasting for farmers, agricultural product market prices, information for agricultural machinery and equipment, agricultural business news, management of irrigation systems, yield forecasting and monitoring, dairy farming, management of agricultural products and crop sensors and registration of soil types, all these services can be achieved through mobile phones as mobile phone is needed to provide a platform where various mobile applications can be installed before one can be using it.

Within the last decade, mobile phones has become part of peoples' daily lives and most essential in how they carry out their daily activities. It has helped in real-time information acquisition, communication, entertainment and for productive purposes. According to the Pew Research Center (2016), mobile phones are gadget that can be used to access the internet and support application installation. According to Qiang *et al.*, (2012) identified some of the advantages of mobile phones.

Olaniyi (2016) opined that access to adequate and timely information has been stretched and emphasized for agricultural practices, the extent to which farmers use mobile phone to access agricultural information for social networking remains unclear as well as what they use mobile phone for, in terms of improving agricultural practices. Unfortunately, the potentials of mobile phones have not been adequately exploited by farmers as a result of their level of education, inability to establish a platform for information delivery and retrieval as well means of social networking with other stakeholders in agriculture.

One of the stakeholders in agriculture is agricultural extension agents and they play important roles through their social interactions with farmers, researchers and other co-farmers through diffusion of research findings and dissemination of new techniques for better farming practices. The main method of achieving this is through the face to face dissemination of information to farmers but adequate and efficient communication is not achieved because of the obsolete method of fortnight visits to farmers as this could not meet up with the information needs of farmers. Also, farmers does not stand alone in the process of agricultural production, they interact with others such as research, agro-input dealers, privates and non-governmental agencies for social networking and for information on improve practices in agricultural production. Although, farmers information needs are diverse and mobile phone as an ICT component is one of the medium through which information could be delivered to farmers opined by Adamides and Stylianou (2013).

In most of the developing countries Nigeria inclusive, it is worthy to note that agricultural technology are disseminated through a variety of communication channels. ICT especially mobile phones are used for receiving, disseminating agricultural information as well as social networking among farmers. Some researchers had carried out studies on the use of mobile phone in dissemination of agricultural information among farmers in Nigeria. Ariyo *et al.*, (2013) and Bolarinwa (2013) carried out various studies on mobile phone and its impact on adoption of technologies but enfeebled the potentials of mobile phone usage for agricultural information and social interaction among the stakeholders in the farming system. Therefore, there is need to determine the mobile phone usage among maize farmers for agricultural information and social networking in Oyo state Nigeria. Based on the above background, this study provided answers to the following research questions;

- i. What are the socio economic characteristics of maize farmers in the study area?
- ii. Which other stakeholders does maize farmers interact with, using their mobile phone?
- iii. What type of information exchange takes place between maize farmers and other stakeholders?
- iv. To what extent does maize farmers use mobile phone for agricultural information and social networking in the study area?
- v. What are the constraints to mobile phone usage for agricultural information and social networking?

General Objective of the Study

The study determine mobile phone usage for agricultural information and social networking among maize farmers in Oyo State, Nigeria.

Specific Objectives

The specific objectives of the study are to:

- i. describe the socio-economic characteristics of maize farmers in the study area.
- ii. identify other stakeholders that maize farmers interact with, using their mobile phone.
- iii. ascertain the type of information that takes place between maize farmers and other stakeholders through mobile phone.
- iv. determine the extent of mobile phone usage for agricultural information and social networking in the study area.
- v. identify the constraints to mobile phone usage for agricultural information and social networking.

Hypotheses of the Study

Ho₁ There is no significant relationship between selected socio economic characteristics of respondents and extent of mobile phone usage for agricultural information and social networking.

Methodology

This study was carried out in Ibadan/Ibarapa agricultural zone of Oyo State. The State falls within rainforest and savannah agro-ecological zones of the country. It comprises of thirty three (33) Local Government Areas (LGA's) and four (4) agricultural zones. These zones are Oyo, Ogbomoso, Ibadan/Ibarapa and Saki agricultural zones. Ibadan/Ibarapa agricultural zone consist of eight LGA's. These Local Government Area are as follows: Akinyele, Egbeda, Ido, Ona- Ara, Lagelu, Ibarapa Central, Ibarapa East and Ibarapa North. Fifty percent (50%) of the LGA's constituents of Ibadan/Ibarapa agricultural zone were randomly selected for the study. These include: Akinyele, Egbeda, Ona-Ara and Ibarapa East Local Government Areas.

From each of the selected Local Government areas, 5 villages from Akinyele, 2 villages from Egbeda, Ona-Ara and Ibarapa East Local Government Areas respectively, this makes a total of eleven (11) villages selected from the study. In each of the selected villages, 30% of the registered maize farmers were randomly sampled which makes a total number of 180 maize farmers from the study area.

Other Stakeholders maize farmers interacted with was measured at nominal level, Yes as 1 and 0 as No. and level of interaction very often =4, often =3, sometimes =2, rarely =1, never =0. Frequency counts, percentages, mean and standard deviation were employed in data analysis.

Multiple regression was used to determine the factors that influence the extent of mobile phone usage for agricultural information and social networking among maize farmer in Oyo State.

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, e)$$

Y – Extent of mobile phone usage for agricultural information (dependent variable)

X- Represents selected socio economics characteristics of the respondent

e - Error term, that is, errors which occur in the sampling procedure, data collection

Results And Discussion

Age

Table 1, It was revealed that 25.6% of the respondents were between the ages of 51 and 60 years, 23.9% were between 41 and 50 years of age while 21.7% were above 60 years of age. The mean age of the respondents was revealed to be 49.4 years. This result implies that majority of the respondents were still active and in the productive years. The age of the respondents may probably influence the rate at which they deploy phone for assessing agricultural information and social networking because people of this age categories are more inquisitive, innovative and have flair for information retrieval. This finding is similar to that of FAO. (2005) who reported that people below 50 years constitute the major work force that can be productive.

Sex

Majority (78.3%) of the respondents sampled are male and 21.7% are female. This result implies that maize production in the study are male dominated, though it was established that both sex are involved in maize production. The dominance of male may be as a result of drudgery involved in maize production. The finding corroborate with Adamides and Stylianou (2013) that a high percentage of mobile phone users for farming activities were male

Marital status

It was also revealed that a large number (78.9%) of the respondents were married, 8.3% were widowed while 7.2% were single and only a few (5.6%) were separated. This result implies that majority of the respondents were married. The marital status of the respondents is likely to influence the size of land cultivated because household with fair size of members are likely to cultivate expanse of land greater than a household with lesser number of member due to the numerical advantage of having more people to work on their farmland. Ezech (2013) reported that 84.2% of the respondents were married and this provide more workforce in maize production.

Educational level

Table 1 further revealed the years spent in school by the respondents, it was revealed that above average (51.7%) of the respondents spent between 7 and 12 years on school, while 30.5% and 17.8% spent between 13 and above and 1 and 6 years respectively. This result implies that majority of the respondents have beyond elementary education an indication that majority of the respondents are literate. Education is expected to influence the adoption of innovation and the use of mobile phone for agricultural information and social networking. The result is in line with the findings of Adamides and Stylianou (2013) reported that literacy is an important function in the usage of mobile phone innovatively especially among farmers.

Household size

Majority (71.7%) of the respondents had between 1 and 5 members as constituents of their households while 25.6% and 2.8% have between 6 and 10 and above 10 members as their household size. The mean household size in the study area was revealed to be 5 members. This result implies that respondents in the study area have a fair household.

Years of experience

From Table 1 it could be seen that 36.0% of the respondents had between 6 and 10 years of experience on maize production. The mean years of experience on maize cultivation in the study area was revealed to be 11.9 years. This result implies that respondents in the study area had vast experience in maize production. This is expected to influence their level of production. Also, maize farmers with more experience in maize production are expected to know the exact information to source for through the use of mobile phone. This finding is as similar to that of Agbamu (2006) who laid emphasis on mobile phone usage for effective communication in agricultural activities been essential to farmers to boost their production.

Social media platforms available and used by respondents

Table 2 revealed the social application available and use by the respondents on their mobile phone. Majority (71.1%) of the respondents indicated the availability of whatsapp on their mobile phone, likewise 67.2% indicated that facebook is available on their mobile phone. Also, 30.0%, 18.33% and 13.8% indicated the availability of instagram, twitter and linkedin on their mobile phone. The availability of these social applications on the mobile phone of the respondents might be connected to the fact that the social applications are factory installed on majority of the mobile phones used by the respondents in the study area. Meanwhile, 66.7% and 54.4% indicated that they make use of the social applications on the mobile phone. The dominance in the usage of this social application might be to the fact that they generally accepted and use, also group chats are easily coordinated in these platforms, with the ease in the use of these social application a likely factor in the level of influence it has on the usage level. Also, 14.4%, 10.6%, and 3.3% indicated the use of Instagram, Twitter and LinkedIn on their mobile phone. The low percentage of respondent social application for agricultural purposes might be attributed to the fact that these social applications function well on refined mobile phones that might be classified as expensive by majority of the respondent. Also, the rate of data consumption by these social applications might discourage the respondents to make use of it. Hence, agricultural information is widely sought after through the use of whatsapp and facebook among farmers in the study area. This result is in line with the findings of Oladipo and Olaniyi 2020 who reported that the most frequently used social media for agricultural information among stakeholder and poultry farmers in the poultry industries are facebook and whatsapp.

Stakeholders that maize farmers interact with and frequency of interaction through mobile phone

Result in table 3 revealed the stakeholders maize farmers interact and the level at which they interact with the stakeholders through the use of mobile phone. Almost all (98.3%), 96.1%, 95.6% and 90.6% of the respondents indicated that they interact with friends and neighbors; transporters; other farmers and agriculture input dealer respectively. Majorly (89.4%), 88.9%, 85.6%) of the respondents interact with processors of output, middle men in markets, and extension agents respectively with the use of mobile phone. This result implies that sales of farm produce are also done through the use of mobile phone by interacting with stakeholders involved. Lastly, above average (52.3%) of the respondents indicated that they communicate with researchers through the use of mobile

phone. Generally, this result implies that respondents in the study area interact with various stakeholders through the use of mobile phones in the study area, an indication that mobile phone is frequently in use by respondents in the study area.

Furthermore, the level at which the respondents interact with stakeholders through mobile phone was revealed. Friends and neighbours with weighted mean score (WMS) of 3.11 was ranked 1st as the stakeholders which maize farmers interact with most through mobile phone. This result implies that respondents interact mostly with friends and neighbor through mobile phone. This is an indication that respondents communicate freely, have easy access and get needed or required information on maize production mostly from friends and neighbours. Other farmers (WMS=2.90); agricultural input dealer (WMS=2.29); transporters and middlemen in the markets with WMS of 2.27 each were all ranked 2nd, 3rd and 4th respectively on the frequency of interaction respondents had with stakeholders through mobile phone. In addition, processors with WMS of 1.90 and extension agents with WMS of 1.50 were ranked 6th and 7th respectively.

Lastly, researcher was ranked least (8th) with WMS of 1.0 on the frequency at which respondents interact with stakeholders through the use of mobile phone. This result implies that wide gap exist between research institute and maize farmers as the level of communication is revealed to be low.

Generally, the result revealed that that mobile phone is used as a channel of communication between maize farmers and relevant stakeholders needed for maize production though, the stakeholders were communicated with through mobile phone on a varied level and this might be due to the level of importance attached to each stakeholder. The results substantiate Folitseet *al.*, (2018) where fellow farmers was indicated as a major stakeholder that farmers interact with through the use of mobile phone.

Table 1. Distribution of respondents by Socio-economics Characteristicsn=180

Age	Frequency	Percentage	Mean
<30	17	9.5	49.4
31-40	35	19.5	
41-50	43	23.9	
51-60	46	25.6	
>60	39	21.7	
Sex			
Male	140	78	12
Female	39	22	
Marital status			
Single	13	7.2	
Married	142	78.9	
Separated	10	5.6	5
Widowed	15	8.3	
Years spent in school			
1-6	32	17.8	
7-12	93	51.7	
13 and above	55	30.5	11.9
Religion			
Christianity	84	46.7	
Islam	89	49.4	
Traditional	7	3.9	
Household size			
1-5	129	71.7	11.9
6-10	46	25.6	
Above 10	5	2.8	
Years of experience			
1-5	53	30.1	
6-10	66	36.0	11.9
11-15	20	21.7	
16 and above	39	12.2	

Source: Field survey, 2018

Table 2. Distribution of respondents on the availability of social media platforms and its use

Social Application	Available		Use	
	*Frequency	Percentage	*Frequency	Percentage
Facebook	121	67.2	98	54.4
Whatsapp	128	71.1	120	66.7
Linkedin	25	13.9	6	3.3
Twitter	33	18.3	19	10.6
Instagram	54	30.0	26	14.4

Source: Field survey, 2018 *Multiple responses

Table 3. Distribution of respondents according to stakeholder's interaction

Stakeholders'	F	%	Very often F (%)	Often F (%)	Sometimes F (%)	Rarely F (%)	Never F (%)	WMS	Rank
Friends and neighbors	177	98.3	85 (47.2)	68 (37.8)	15 (8.3)	5 (2.8)	7 (3.9)	3.11	1 st
Other farmers	172	95.6	56 (31.1)	77 (42.8)	32 (17.8)	7 (3.9)	8 (4.4)	2.90	2 nd
Agriculture input dealer	163	90.6	19 (10.6)	57 (31.7)	72 (40.0)	22 (12.2)	10 (5.6)	2.29	3 rd
Transporters	173	96.1	24 (13.3)	36 (20.0)	99 (55.0)	14 (7.8)	7 (3.9)	2.27	4 th
Middle men in the markets	160	88.9	21 (11.6)	57 (31.7)	63 (35.0)	30 (16.7)	9 (5.0)	2.27	4 th
Processors of output	161	89.4	21 (11.7)	30 (16.7)	64 (35.6)	42 (23.3)	23 (12.8)	1.90	6 th
Extension Agents	154	85.6	4 (2.2)	19 (10.6)	72 (40.0)	57 (31.7)	28 (15.6)	1.50	7 th
Researchers	95	52.8	9 (5.0)	11 (6.1)	38 (21.1)	39 (21.7)	83 (46.1)	1.00	8 th

Source:Field survey, 2018, F: Frequency, WMS = Weighted Mean Score, %:Percentages, WMS: Weighted mean score.

Types of Information Exchange of Mobile Phone usage for Agricultural Information and Social Networking

Table 4 revealed the purpose mobile phone is used for and the extent of its use for the various purposes. Almost all (98.3%) and 95.6% of the respondents indicated that mobile phone is use to acquire market prices of maize crop products and provide other farmers with information on outbreak of diseases and pests invasion on maize farm respectively. This result implies that information of market prices of maize product is sought after by majority of the respondents through mobile phone in the study area. Also, 95.0% indicated acquiring information on market days for sales of products and making enquiry on location and availability of improved maize seeds each as purposes they use mobile phone for while 94.4% indicated seeking of information on maize farm input and contacting family members/ relatives for social engagement each as purposes mobile phone served for the respondents. This result is an indication that mobile phone is used for both social activities and business engagement by the maize farmers. In addition, 93.3%, 91.7% and 90.0% indicated that mobile phone serves the purpose of acquiring information on best practices of maize crop production, seek information on transportation of output from farm to market places and accessing information on control of maize crop diseases/pest management respectively. Majority (84.4%) of the respondents indicated that mobile phone is used to make request for chemicals when needed from agro-input dealers while 70.6% indicated that it is used to make contact with the use of social applications for available maize crop products for sale.

Lastly, 66.1% indicated that mobile phone is use to source for credit/loans for maize production. Generally, this result implies that majority of the respondents used mobile phone for various purposes, an indication that mobile phone is an important factor which has aid the smooth production of maize in the study area.

Extent of Mobile Phone Usage for Agricultural Information and Social Networking

Furthermore, table 5 revealed the extent of usage of mobile phone for the various purposes was revealed. Seeking information on availability of maize farm input through the use of mobile phone was ranked 1st with a weighted mean score (WMS) of 2.36. This result implies that respondents get channels or links to input needed for maize farm cultivation through the use of mobile phone, this is expected to reduce the cost of production as money is not wasted through transportation in searching around for needed input. Availability of input is done through the use of mobile phone, hence significant cost is only incurred on transportation when going to purchase and pick up the inputs to the farmland. Furthermore, information on transportation of output from farm to market places with WMS of 2.30; acquiring market prices of maize crop products with WMS of 2.01 and contacting family members/

relatives for social engagement with WMS of 1.99 were all ranked 2nd, 3rd and 4th respectively on the extent mobile phone is used to execute the various purposes or functions.

Meanwhile, purposes such as seeking information on sources of credit/loans for maize production with WMS of 1.46 and acquiring information on market days for sales of maize products with WMS of 1.36 were ranked 11th and 12th respectively. Lastly, seeking information from other farmers on location and availability of improved maize seeds with WMS of 1.13 was ranked least (13th). This implies that information on location and availability of improved maize seeds are not frequently sourced through the use of mobile phone. The rare usage of mobile phone to seek for location and availability of improved maize seeds might be related to the fact that majority of maize farmers get seeds for their plantation from their harvest from the last production cycle if the output is encouraging in order to achieve the feat of bumper harvest witnessed in the last production cycle.

Generally, it can be concluded that respondents engages the use of mobile phone for execution of various purposes needed for a hitch free production cycle of maize on their farmland.

Table 4. Distribution of respondents according to types of information exchange usage of mobile phone for agricultural information and social networking

Types of information	Frequency	Percentage
Availability of information on maize farm input	170	94.4
Information on transportation of output from farm to market places	165	91.7
Acquiring market prices of maize crop products	177	98.3
Contacting family members /relatives for social engagement	170	94.4
Providing other farmers with information on outbreak of diseases and pests invasion	172	95.6
Accessing information on control of crop diseases /pest management	162	90.0
Acquiring information on best practices of maize crop production	168	93.3
Request for chemicals when needed from agro-input dealers	152	84.4
Information on training/seminar /workshop on value addition of maize crop	126	70.0
Contacting others on social media for available for maize crop products for sales	127	70.6
Sources of credit/Loans for maize crop production	119	66.1
Acquiring information on market days for sales of products	171	95.0
Asking other farmers on location of cheap fertilizer/chemicals	171	95.0

Source: Field Survey, 2018

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Meanwhile, purposes such as seeking information on sources of credit/loans for maize production with WMS of 1.46 and acquiring information on market days for sales of maize products with WMS of 1.36 were ranked 11th and 12th respectively. Lastly, seeking information from other farmers on location and availability of improved maize seeds with WMS of 1.13 was ranked least (13th). This implies that information on location and availability of improved maize seeds are not frequently sourced through the use of mobile phone. The rare usage of mobile phone to seek for location and availability of improved maize seeds might be related to the fact that majority of maize farmers get seeds for their plantation from their harvest from the last production cycle if the output is encouraging in order to achieve the feat of bumper harvest witnessed in the last production cycle.

Generally, it can be concluded that respondents engages the use of mobile phone for execution of various purposes needed for a hitch free production cycle of maize on their farmland.

Table 5. Distribution of respondents according to extent of mobile phone usage for agricultural information and social networking

Types of information	Extent of Usage of mobile phone for Agricultural information and social networking					Rank
	Never F (%)	Rarely F (%)	Occasionally F (%)	Always F (%)	WMS	
Availability of information on maize farm input	12 (6.7)	8 (4.4)	72 (40.0)	88 (48.9)	2.36	1 st
Information on transportation of output from farm to market places	5 (2.8)	18 (10.0)	80 (44.4)	77 (42.8)	2.30	2 nd
Acquiring market prices of maize crop products	5 (2.8)	28 (15.6)	105(58.3)	42 (23.3)	2.01	3 rd
Contacting family members /relatives for social engagement	14 (7.8)	26 (14.4)	85 (47.2)	55 (30.6)	1.99	4 th
Providing other farmers with information on outbreak of diseases and pests invasion	9 (5.0)	31 (17.2)	95 (52.8)	45 (25.0)	1.97	5 th
Accessing information on control of crop diseases /pest management	19 (10.6)	24 (13.3)	89 (49.4)	48 (26.7)	1.91	6 th
Acquiring information on best practices of maize crop production	26 (14.4)	20 (11.1)	78 (43.3)	56 (31.1)	1.90	7 th
Request for chemicals when needed from agro-input dealers	20 (11.1)	23 (12.8)	104(57.8)	33 (18.3)	1.82	8 th
Information on training/seminar /workshop on value addition of maize crop	27 (15.0)	42 (23.3)	50 (27.8)	61 (33.9)	1.79	9 th
Contacting others on social media for available for maize crop products for sales	41 (22.8)	39 (21.7)	72 (40.0)	28 (15.6)	1.47	10 th
Sources of credit/Loans for maize crop production	63 (35.0)	8 (4.4)	69 (38.3)	40 (22.2)	1.46	11 th
Acquiring information on market days for sales of products	31 (17.2)	69 (38.3)	63 (35.0)	17 (9.4)	1.36	12 th
Asking other farmers on location of cheap fertilizer/chemicals	32 (17.7)	96 (53.3)	47 (26.1)	5 (2.8)	1.13	13 th

Source:Field survey, 2018, F: Frequency%:Percentages WMS: Weighted mean score

Constraints to mobile phone usage for agricultural information and social networking

Table 6 revealed the constraints encountered by maize farmers to mobile phone usage for agricultural information and social network. Erratic power supply for charging mobile phone and poor network coverage for mobile connectivity was ranked 1st with weighted mean score (WMS) of 1.8 each. This result implies that power supply and network coverage has been a limiting factor to the efficient use of mobile phone by respondents in the study area. Also, risk of theft of mobile phone with WMS of 1.5 was ranked 3rd, complexity of technological knowledge required to use mobile phone innovatively for social networking and high cost of maintenance/ repair of mobile phone gadget with WMS of 1.4 were ranked 4th each, High cost of procurement of mobile phone for use was ranked 6th with a WMS of 1.3. Lastly, lack of interest in mobile phone ownership and use for agricultural information and social networking was ranked least (7th) with WMS of 1.1.

Generally, this result implies that the respondents encounter constraints in the use of mobile phone for agricultural production, though on a varied level of severity. The result agrees with the findings of Ofuoku, Isife and Emah (2007) who reported that cost of running mobile phone; inadequate network coverage and high cost of mobile

phone were major constraints to the adoption of mobile phones among farmers. Likewise, the result conforms to the findings of Bolarinwa and Oyeyinka (2011) whose respondents identified erratic power supply, poor network coverage, difficulty in the repair of technical fault and fluctuating service as the major constraints encountered with the use of mobile phones by farmers for crop production. For farmers to gain from the benefit of mobile phone is entails of, solutions should be provided to the identified problems as these will contribute to the improved rate of maize production in the study area.

Table 6. Distribution of respondents based on constraints encountered in the use of mobile phone

Constraints to mobile phone usage for agricultural information and social network among maize farmers	Very severe F (%)	Severe F (%)	Fairly severe F (%)	Not severe F (%)	WMS	Rank
Erratic power supply for charging mobile phone	55 (30.5)	66 (36.6)	44 (24.4)	15 (8.3)	1.80	1 st
Poor network coverage for mobile connectivity	42 (23.3)	72 (40.0)	59 (32.7)	7 (3.8)	1.80	1 st
Risk of theft of mobile phone	40 (22.2)	56 (31.1)	63 (35.0)	21 (11.6)	1.50	3 rd
Complexity of technological knowledge required to use mobile phone innovatively for social networking	44 (24.4)	29 (16.1)	73 (40.5)	34 (18.8)	1.40	4 th
High cost of maintenance / repair of mobile phone gadget	38 (21.1)	37 (20.5)	85 (47.2)	20 (11.1)	1.40	4 th
High cost of procurement of mobile phone for use	30 (16.6)	51 (28.3)	66 (36.6)	33 (18.3)	1.30	6 th
Lack of interest in mobile phone ownership and use for agricultural information and social networking	37 (20.5)	25 (13.8)	69 (38.3)	49 (27.2)	1.10	7 th

Source: Field survey, 2018, F: Frequency, %:Percentages, WMS: Weighted mean score

Hypothesis 1: There is no significant relationship between the selected socio-economic characteristics of the Maize farmers' and the extent of mobile phone usage for agricultural information and social networking.

Table 7 shows the factor that influences the usage of mobile phone for agricultural information and social networking. The result of the analysis revealed that some of the socio-economic variables established significant relationship with the extent of mobile phone usage for agricultural information and social networking. The significant variables include Age ($\beta=0.041$); years of experience in maize production ($\beta=0.065$); average income per cycle of production ($\beta=0.00$); distance from house to farm ($\beta=0.054$); ownership of mobile phone ($\beta=4.470$); number of mobile phone owned ($\beta=0.999$), household size ($\beta=0.306$), Stakeholders' interaction ($\beta=0.44$), Amount spent on mobile phone ($\beta=0.01$), Farm size ($\beta=0.01$) and Visitation to nearby town ($\beta=0.28$) respectively all exhibited positive and significant relationship with the extent to mobile phone usage for agricultural information and social networking except. The above results implied that all the aforementioned socio-economic variables have decisive influence on the extent of mobile phone usage for agricultural information and social network.

The findings may be true because as farmers ages increases, the years of farming experience increase and need to deploy production and marketing skill increases which mobile phone innovation stand for. A fact that supported the significant variables (age and years of experience). Increase in the years of experience is expected to guide the farmers on the use of appropriate production technologies through recommendations from both governmental and non-governmental organization via mobile phone. The income of individual farmers may determine the mobile phone usage as personal income may give a conviction on whether to own a personal phone or otherwise. All these factors may be considered as determinants to mobile phone usage for Agricultural information and social networking among maize farmers.

The adjusted R-square is 0.5043 which implies that 50.43% of the variation in the dependents variables (extent of mobile phone usage) is accounted for by the explanatory variables included in the regression model. Therefore, the multiple regression hypothesis is rejected hence alternative hypothesis is accepted in the like manner.

Conclusion and Recommendations

The importance of mobile phone cannot be underestimated as farming involved a lot of communication exchange between the stakeholders and other farmers in agricultural sectors. The study concluded that the respondents were adult with various years of farming experiences with majority of them been married means they were responsible and were dominated by male maize farmers. The study concluded that facebook and whatsapp

were the major social media they used most to link up other farmers and stakeholders in agricultural sector. It was concluded that the maize farmers used mobile phones moderately for agricultural information and social networking and do have social interaction with other stakeholders within and outside their domains. Based on the findings, it is therefore recommended that weak linkages exists between farmers, researchers and extension agent so there's a call to strengthen this linkages as it will help in building strong relationship between these actors and infrastructural facilities such as adequate electricity and good network coverage should be facilitated by various stakeholders such as Government, non-governmental organization, network provider companies e.t.c

Table 7. Summary of multiple regression analysis showing determinants of extent of mobile phone usage for agricultural information and social networking.

Socio-economic characteristics	Coefficient	Str. ErrCoefficient	t-value	p-value	Remarks
Constant	-	-	2.21	0.028	Significant
Age	0.93	0.41	2.28	0.024	Significant
Years of experience in maize production	0.16	0.64	3.14	0.002	Significant
Average income per cycle of production	0.00	0.45	4.92	0.000	Significant
Distance of house to farm	0.15	0.54	2.74	0.007	Significant
Ownership of mobile phone	0.89	0.45	2.00	0.047	Significant
Number of mobile phone owned	0.21	0.99	2.17	0.032	Significant
Years of education	0.16	0.64	0.25	0.799	Not significant
Household size	0.91	0.31	2.99	0.003	Significant
Stakeholders' interaction	0.75	0.44	1.72	0.088	Significant
Amount spent on mobile phone	0.01	0.01	1.42	0.158	Significant
Farm size	0.36	0.46	0.77	0.443	Significant
Visitation to nearby town	0.47	0.28	1.68	0.095	Significant

Source: Field survey, 2018, Adjusted R² = 50.43%, R²= 0.5043

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The Effect Of Vacuum Packaging On Protein Oxidation In Chicken Meats

Ece Akgül¹, Burak Demirhan²

¹Department of Food Analysis and Nutrition, Institute of Health Sciences, Gazi University, Ankara, Turkey

²Department of Pharmaceutical Basic Sciences, Faculty of Pharmacy, Gazi University, Ankara, Turkey

Abstract

Although chicken meat has rich nutritional content, it is a very sensitive food against spoilage. For this reason, some preservation techniques such as vacuum packaging, modified atmosphere packaging, and controlled atmosphere packaging are applied in order to consume chicken meat in a healthy way. Vacuum packaging refers to the complete removal of air from the packaging environment. Lipid and protein oxidation that occurs during the storage and processing of meat and meat products are important factors affecting the quality and acceptability of products. As a result of protein oxidation in meat and meat products, the bioavailability of proteins, the nutritional value, and the quality of meat may be affected, and there may be a risk in food safety due to potentially toxic compounds. When the literature is examined, it has been concluded that the processing of the products, the storage conditions, and the packaging material or method used during storage have a direct or indirect effect on the protein oxidation that occurs in the meat structure. In this study, it is aimed to give information about vacuum packaging on meat products and protein oxidation.

Key Words: Vacuum packaging, Oxidation, Protein oxidation, Meat products, Meat quality

Tavuk Etlerinde Vakum Paketlemenin Protein Oksidasyonuna Etkisi

Özet

Tavuk eti zengin besin içeriğine sahip olmasına rağmen bozulmaya karşı oldukça hassas bir gıdadır. Bu nedenle, tavuk etini sağlıklı bir şekilde tüketebilmek için vakum paketleme, modifiye atmosfer paketleme, kontrollü atmosfer paketleme gibi bazı muhafaza teknikleri uygulanmaktadır. Vakum paketleme, paketleme ortamından havanın tamamen çıkarılmasını ifade etmektedir. Et ve et ürünlerinin depolanması ve işlenmesi sırasında meydana gelen lipid ve protein oksidasyonu, ürünlerin kalitesini ve kabul edilebilirliğini etkileyen önemli faktörlerdir. Et ve et ürünlerinde protein oksidasyonu sonucunda proteinlerin biyoyararlanımı, besin değeri ve etin kalitesi etkilenebilir ve potansiyel olarak toksik bileşikler nedeniyle gıda güvenliği açısından risk oluşturabilir. Literatür incelendiğinde ürünlerin işlenmesi, muhafaza koşulları ve muhafaza sırasında kullanılan paketleme materyali veya paketleme yönteminin et yapısında meydana gelen protein oksidasyonu üzerinde doğrudan veya dolaylı etkisinin olduğu sonucuna varılmıştır. Bu çalışmada, et ürünlerinde vakum paketleme ve protein oksidasyonu hakkında bilgi verilmesi amaçlanmıştır.

Anahtar Kelimeler: Vakum paketleme, Oksidasyon, Protein oksidasyonu, Et ürünleri, Et kalitesi

Investigation of the Efficacy of Ganciclovir in Van Cats with Eye Infection and Lacrimation

Fatma Ertaş^{1*}, Ahmet Cihat Öner²

1 Iğdır University, Tuzluca Vocational School, Department of Medical Services and Techniques Iğdır, Turkey

2 Van Yüzüncü Yıl University, Faculty of Veterinary Medicine Department of Pharmacology and Toxicology, Van, Turkey

Abstract

The eye is a sensitive and complex organ that performs vision. It is the most sensitive organ to external factors and factors. The eyes of animals work by a mechanism similar to that of humans. Eye and eyelid diseases also progress similarly to people's. It is important to protect this highly sensitive organ in terms of diseases, and to apply medical or surgical procedures for treatment in case of possible disease. Eye and eyelid diseases are frequently encountered in cats due to congenital or acquired reasons. These diseases can be caused by infection or trauma, as well as due to immune system, hormonal and allergic reactions. The eye is an organ that is open to significant effects in the body systemically. Sometimes systemic diseases can be clinically reflected in the eye. Many factors such as environment, age, geography, habitat and season have been reported to affect the composition of the conjunctival flora or low immunity. It is clear that there are many causes in the etiological factors of eye infections. The treatment protocol to be made should also be chosen according to the cause. The aim of this study was to investigate the efficacy of ganciclovir based on inspection in Van cats with eye infection and lacrimation. A group of 10 Van cats with complaints such as lacrimation, tenderness and keratitis were used and Virgan (1.5mg/g ophthalmic gel) was demonstrated for 1 week and followed up. Virgan is an eye gel containing ganciclovir, an antiviral substance. It is also used in the eye for the treatment of infection called acute herpetic keratitis. In the study, gel was applied to the eyes of the cats every day, and the eyes of the cats were examined and photographs were taken on the zero, third and seventh days. At the end of the study, it was determined that there was a visible clinical improvement and it was concluded that the drug could be an alternative application in veterinary medicine in eye infections. Since the data obtained are made as inspection and general condition control, it is important in terms of forming the infrastructure for other studies to be done. In addition, after this study, more precise results and information will be obtained in line with the samples to be taken from the cats and the analyzes to be made.

Keywords: Antiviral drug¹, Ganciclovir², Eye infection³, Van Cat⁴

Göz enfeksiyonu ve Lakrimasyonu olan Van Kedilerinde Gansiklovir'in Etkinliğinin Araştırılması

Özet

Göz, görme olayını gerçekleştiren hassas ve karmaşık bir organdır. Dış etmenlere ve hastalıklara karşı en duyarlı olan organdır. Hayvanların gözleri insanlarınkine benzer bir mekanizma ile çalışır. Göz ve göz kapağı hastalıkları da yine insanlardakine benzer şekilde seyreder. Oldukça hassas olan bu organın hastalıklar bakımından korunması, olası hastalık durumunda tedavi için uygulanacak medikal veya cerrahi işlemler önemlidir. Kedilerde konjenital veya edinsel sebeplerle göz ve göz kapağı hastalıklarına sıklıkla rastlanmaktadır. Bu hastalıklar enfeksiyon veya travma kaynaklı şekillenebileceği gibi immün sistem, hormonal ve alerjik reaksiyonlara bağlı olarak şekillenebilir. Göz sistemik olarak vücutta önemli etkilere açık bir organdır. Bazen sistemik hastalıklar klinik olarak göze yansiyabilmektedir. Çevre, yaş, coğrafya, habitat ve mevsim gibi birçok faktörün konjunktival floranın bileşimini veya düşük bağışıklığı etkilediği bildirilmiştir. Göz enfeksiyonların etiyolojik faktörlerinde birçok neden olduğu ortadadır. Yapılacak tedavi protokolü de nedene göre seçilmelidir. Bu çalışmanın amacı, göz enfeksiyonu ve lakrimasyonu olan Van kedilerinde gansiklovir'in inspeksiyona dayalı etkinliğinin araştırılmasıdır. Hastalık hikayesinde lakrimasyon, hassasiyet ve keratit gibi şikayetleri olan Van kedilerinden 10 tanesi bir grup oluşturularak Virgan (1.5mg/g oftalmik jel) 1 hafta süresince göze uygulanmış ve takibi yapılmıştır. Virgan, antiviral bir madde olan gansiklovir içeren bir göz jelidir. Ayrıca akut herpetik keratit adı verilen enfeksiyon tedavisi için gözde kullanılır. Çalışmada, kedilerin gözlerine jel her gün uygulanmış ve sıfırıncı, üçüncü ve yedinci günlerde kedilerin gözleri muayene edilip fotoğraflar çekilmiştir. Çalışmanın sonunda, klinik olarak gözle görülür iyileşmenin olduğu tespit edilmiş ve ilacın veteriner hekimlikte göz enfeksiyonlarında alternatif bir uygulama olabileceği kanısına varılmıştır. Elde edilen veriler inspeksiyon ve genel durum kontrolü olarak yapıldığı için yapılacak diğer çalışmalara alt yapı oluşturması açısından önemlidir. Buna ek olarak bu çalışma sonrasında kedilerden alınacak örnekler ve yapılacak olan analizler doğrultusunda daha kesin sonuç ve bilgiler elde edilecektir.

Anahtar kelimeler: Antiviral ilaç¹, Gansiklovir², Göz enfeksiyonu³, Van Kedisi⁴

Queen Breeding and Factors Affecting Queen Bee Quality

Nuray Şahinler ¹, Nesibe Özge Toy²

¹Uşak University Faculty of Agriculture and Natural Sciences, Department of Animal Science

²Uşak University Graduate School of Natural and Applied Sciences / Department of Animal Science

Abstract

It is of great importance to change the queen bee every two years in order to breed colonies with high economic efficiency. Queen bee production in Turkey is done by natural methods. The fact that the production method is not used commercially in terms of production also brings some problems. Problems such as not applying breeding programs, using a large number of worker bees in the production phase, and not feeding the queen adequately during the larval stage cause the quality of the queen bee to decrease. Since the queen bee is the mother of the colony, it is of great importance in terms of high quality, high quality and productivity of the existing colony, and raising colony individuals that are more resistant to adverse conditions. For this reason, some parameters should be considered while breeding queen bees. Some of these parameters are; queen bee breeding season and technique; The genotype of the queen and the breeding program applied, the age of the transferred larva, the population of the starter and finisher colonies, the presence of sufficient number and quality drones in the mating area, whether the queen bee is contaminated with diseases and pests are the most important genetic factors that directly or indirectly affect the quality of the queen bee. are also environmental factors. In this review, the factors affecting the queen bee production and the quality of the queen were evaluated. Points to be considered in order to raise a high quality queen bee in terms of efficiency are emphasized.

Key Words: Queen bee, quality factors, honey bee

Introduction

Queen, 1000-2000 drones in the swarming season, and between 80,000 and 20,000 worker bees, the numbers of which vary according to the season. All individuals in the colony do all the work necessary for the continuity of the colony by sharing regularly (Doğaroğlu and Doğanoglu, 2015). While the drones in the colony undertake the task of mating only with the queen in the colony, the worker bees fulfill all the duties that must be done in the colony such as care, feeding and cleaning. The queen bee, which is alone in the colony, is the individual that ensures the continuity of the colony. In other words, the queen is involved in creating a strong, robust worker population and sufficient number of drones to do all the work in the colony. The queen lays eggs and ensures the continuity of the colony. The queen bee is a female individual with developed reproductive organs in the colony. Worker bees are sterile females. The characteristics of the colony such as being aggressive or calm, productive and resistant to diseases depend on the genetic structure of the queen and the drones mating with the queen. Because they are the determinants of the characteristics of the colony, as they are responsible for the contributions of male parents to the inheritance of both itself and its female offspring (Öder, 2006). These characteristics are actually inherited from the spermatozoa of the drones during mating and from the mother's ancestors. Another task of the queen bee is to provide order inside the hive with the pheromones it secretes. 9-oxodec-trans-2-enoic acid [CH₃CO-(CH₂)₅-CH=CHCO-OH] and 9-hydroxydec-trans-2-enoic acid [CH₃-CHOH-(CH₂)₅-CH-COOH] two pheromones are effective. With these pheromones it secretes, it regulates the inside of the hive, attracts worker bees, prevents the formation of false queens, attracts drones sexually, and helps bees to form a tight cluster when they need it (Korkmaz and Öztürk, 2005). Considering the duties of the queen bee in the colony, it is of great importance for the efficiency, life and reproduction of the colony. However, in Turkey, based on the data of the last ten years, although we are in a very good condition in terms of colony existence, it is seen that we are not at a sufficient level in terms of honey yield obtained from these colonies. The yield obtained from honey bees is approximately 20 kg per hive worldwide and this production value is approximately 14.3 kg in our country (Anonymous, 2013). One of the reasons for this low yield is that our beekeepers do not use young and high quality queen bees at a sufficient level. These bee individuals, who take on important tasks in the colony, are actually directly related to the profit of the beekeepers from the colony (Delaney et al., 2011).

The strength of the individuals in the colony and their resistance to diseases are related to the quality of the queen bee. In fact, genetic and environmental factors affecting this quality have been known for many years. However, the production and use of queen bees cannot be carried out correctly, not only in Turkey, but also abroad and in the country. Considering the production and use of high quality queen bees in Turkey, this process started in the 2000s, and between 2003 and 2007, government supports began to be given for commercial queen bee breeding. The meaning of the word quality in queen bees depends on the ability to lay enough eggs to keep the colony strong in different seasons of the year, and the productivity of the colony depends on its population level (Öztürk, 2014).

The production of the queen bee is carried out in two ways. The first of these is natural methods, in the production of queen bees made with this method, inefficient queen bees raise worker bees and decrease in colony yield may occur. The second method is commercial queen rearing. Commercial queen breeding is healthier than the natural method, and it provides the opportunity to produce queens by selecting breeds with superior efficiency in terms of efficiency. Quality queen breeding is both economically and the first stage of successful beekeeping. In other words, the quality of the queen bee; defined as reproductive potential, can be evaluated as the level of colony performance and beekeeper satisfaction. (Tarpay et al., 2000; Delaney et al. 2011).

1.2. Factors Affecting Queen Bee Quality

There are many factors that affect queen bee quality. Considering the environmental factors, factors such as the breeding season, the age of the larva to be transferred, the characteristics of the mating colonies, the structure of the foster colonies affect the quality of the queen bee. Considering the genetic factors; The selection of the race and ecotype with the appropriate genetic structure is specified as the selection program applied to this determined race and ecotype. In addition to these, physical characteristics such as the queen's hatching weight, sperm sac volume and spermatozoite amount and the time to start laying affect the queen bee quality (Doğaroğlu, 2009; Köseoğlu et al., 2017).

As Pettis et al. (2016) stated; They reported that in honey bee colonies described as “poor quality”, sperm viability of queens is low, and that 50% or more of the sperm stored in the spermatheca can die when queens are exposed to different temperatures (40 °C) during the transportation of the hives.

The Breeding Colony in which the Queen Bee Will Be Raised

Breeder colony selection is the first and most important initial stage of quality queen breeding. Because even if all other steps are followed in queen rearing, all procedures will not have a positive effect if the selection of breeders is not paid attention to. Genetic characteristics will be transferred from generation to generation with the breeding queen to be selected. The queen bee to be produced from it is responsible for the characteristics of the new queen, the performance and quality of the new queen. If we explain the characteristic features of the new queen, it includes features such as calmness, temper, honey production efficiency, resistance to diseases, wintering ability, low swarming tendency (Morse, 1982; Scott-Dupree, 1989).

It is necessary to produce the queen bee with the breeding methods we call artificial insemination. In Turkey, suitable breeds and ecotypes adapted to the region should be selected. Selection of breeding breeders is important in order to obtain high yields in beekeeping and bee products.

In short, queen bees should be raised from productive breeding colonies that have been improved in terms of the beekeeping product or products desired to be produced. In addition, the breeds or ecotypes adapted to the region should be selected and queen bee should be raised and more productive colonies should be created by using them in breeding.

There are many studies on larval age that affects queen bee quality. Gencer et al. (2000) reported in their study that queen bees reared from 1-day-old larvae are heavier than queens reared from 2-day-old larvae. In another study, when the effect of larval age on the time before queen laying was examined, they found that the lowest average life span was obtained from queen bees produced from 1-day-old larvae (Zirhloğlu and Kara, 2004).

Because as the transferred larva age decreases, the hatching weight of the reared queen bees, the live weight after mating, the number of ovarioles, the diameter and volume of the spermatheca and the amount of semen increase.

Queen Bee Breeding Technique

The DOOLITTLE Method, which is widely used among the methods used to raise quality queen bees. In this method, the quality of the reared queen bees also increases, since the age and genetic characteristics of the larvae are known and even tested by some breeders. In general, the quality of naturally reared queen bees is higher when compared to the quality of queens reared using natural methods. It is known to be good.

Queen Bee Breeding Season

Due to the fact that Turkey is a region where four seasons are experienced, seasonal differences can be seen according to the regions. However, the reported optimum time to raise a quality queen is the swarming period for all regions. Because during this period, all the conditions necessary for the rearing of a new queen bee are provided. Plenty of pollen, suitable temperature, and the presence of plenty of drones are among these conditions (Korkmaz and Öztürk, 2004).

In their study, Arslan and Cengiz (2020) examined the quality characteristics of queens they bought from commercial queen bee breeding enterprises from different provinces of Turkey in August-September. In the study, live weight, spermatheca diameter, spermatheca volume and spermatozoa count were examined as quality characteristics. However, in the results of the research, they reported that the quality of the queen bees reared in this period was quite low.

In another study, they stated that the queen rearing period significantly affected the amount of spermatozoites in the sperm sac, the period before laying and the weight of the queen, and the quality of the queen decreased from April to August (Koç and Karacaoğlu, 2011). Dağaroğlu (2009) reported that the most suitable period for quality queen production is spring.

Turkey's geographical characteristics and climatic changes should be taken into account when determining the appropriate season for quality queen production.

Structure of the Starter and Finisher Colonies

The starter colony is the colonies without a queen, which provides nutrition to the larvae from the quality queen production stage. It has been reported that the higher the number of young worker bees (7-12 days old) in the starter colonies, the higher the hatching rates of the transferred larvae (Korkmaz and Öztürk, 2004).

The feature that distinguishes the queen bee from other individuals in the colony is the way of feeding. Since the amount of food consumed by the transferred larva in the first 24 hours is important in the production of high quality queen bees, it is appropriate to choose the starter colonies among the strong colonies. Frame arrangement should be observed in starter colonies. Since the larvae will be fed by the starter colonies for 10 days, the starter colonies should be arranged to include closed brood frame, young larvae frame, transfer frame, pollen frame, closed brood frame and honey frame. Finishing colonies are; These are the colonies where the larvae kept in the starter colonies for 24-48 hours are kept until they are transferred to the mating colonies. In the seasons when pollen scarcity is experienced in the starter and finisher colonies, the colonies, cake and sugar syrup feeding should be added. According to the studies, it has been reported that the life span of the queens raised in the seasons with pollen scarcity is shorter (Di Pasquale et al., 2013; Güneşdoğdu and Şekeroğlu, 2020).

Characteristics of Queen Bee (Live Weight, Sperm sac size and Spermatozoite amount, Spawning Time, Queen's Age)

It has been proven by many studies that the live weight of the queen, the size of the sperm sac and the laying period are important in quality queen rearing. Kaftanoğlu et al. (1988) examined the growth rate in colonies with young queens, high egg laying rates, and 1-2-3 year old queens. As a result of the research, they reported that there was no significant difference between colonies with 1 and 2 years old queens in terms of development and vitality, but these differences were lower in colonies with 3 years old queen bee compared to 1 and 2 years old colonies. 93% at the end of 1-2-3 years, respectively. They determined that it has 67% 33% life forces.

Woyke (1971), The live weight of *Apis mellifera caucasica* queen bees is 209 mg on average in queen bees reared by egg transfer, 189 mg on average in queens raised by transferring 1-day old larvae, 172 mg in 2-day old larvae, 147 mg in 3-day old larvae, 4-day old larvae They reported that the queen bees reared with the larvae was 119mg. Taber (1976) 171-272 mg of live weight of newly hatched queen bees. They reported that it was between and their medium was 213 mg. In another study, it was reported that the longevity of the queen bee and the weight of the hatching were related. In this study, they found an average of 300±31.32 and 596.66±167.65 days in naturally mated queens with light and heavy hatching weights, respectively. They stated that this difference obtained as a result of the research may be due to the capacity of queen bees with higher hatching weight to store more semen (De Souza et al., 2013).

Şahinler and Kaftanoğlu (1997) compared the quality of queen bees reared by egg and larva transfer method in their study. According to the research findings, a total of 120 larvae and 120 eggs were transferred and the inoculation efficiency was found to be 83% and 64%, respectively. reported that these values were 169.6 mg, 1.039 mm, 3.8 million and 289.83 in queen bees reared by larva transfer, respectively.

In another study, it was reported that the spermatheca diameter and spermatozoa number of queen bees reared by larva transfer were superior to naturally reared queen bees (Kaftanoğlu et al., 1988).

Kahya et al. (2008) found the sperm sac volume to be 0.62, 0.69 and 0.73 mm³ in light, medium and heavy queen bee groups, respectively, and the spermatozoite amount to be 4.821, 4.927 and 4.892 million, respectively. In general, it was observed that the sperm sac volume increased as the queen weight increased.

Kaftanoğlu and Kumava (1988) reported that queen bees with larger spermatozoa volume will lay more fertile eggs for a longer period of time because they store more sperm, and that the most important factors affecting the spermatheca diameter are the transferred larval age and the genetic structure of the queen bee.

In some studies, it has been reported that the average time until the queen bee begins to lay eggs is 10.4 days, while it has been reported that the period before spawning is more than 15 days in the winter months (Crane, 1949; Taber and Poole, 1974).

Kaftanoğlu and Peng (1982) found that artificially inseminated queen bees started to lay eggs earlier. Yet another study reported that the spawning period of queens mated naturally and using artificial insemination was 8 and 10 days.

Arslan and Hamgiri (2010) reported that the reproductive period has a significant effect on larva acceptance rate, hatchability, pre-mating body weight, pre-ovulation time, mating efficiency and spermatheca diameter. In this study, the pre-laying period (9.96 days) was short in queen bees produced in the 1st period, while the II. and III. It has been reported that the queen bees produced in this period are longer (10-12 days).

Other Factors

One of the other factors affecting the quality of the queen bee is the air temperature. As a result of the researches, it was reported that the most suitable air temperature for the queen bee to go on a mating flight with the drone is 18-20 °C, and in one study, the optimum temperature is 26-35 °C. It is reported that the breeding rate generally depends on the climatic conditions, the season, the topographic structure of the region, the color of the breeding

hives and the arrangement in the apiary. Again, in the study carried out in April and May-June, it was reported that mating rates increased to 89% in the periods after the first week of April, and the queens that took flight in May and June began to lay eggs earlier (Kaftanoğlu and Kumova, 1988; Ruttner, 1983; Lensky et al. Demter, 1985). Disease status of colonies is a very important issue for beekeeping. The queen bee is highly susceptible to Nosema and Trachea mites. Queen bees infected with Nosema apis start laying eggs later. Again in this disease, although it causes a decrease in the queen bee acceptance rate, it causes degeneration of the queen's oocytes, short life span, rapid death of the adult bees in the colony and low productivity in the colony (Loskotova et al., 1980; Ribiere et al., 2000; Amiri et al., 2014).

Kumova et al., (2006) investigated the effect of filling queen cells with royal jelly in the Doolittle method used in queen rearing. They reported that it was 45 and 58.33%, and the pupa live weight was 267, 30 and 246.70. As a result of the research, they reported that inoculation of larvae with 100% royal jelly was more efficient than dry inoculation.

Results and Discussion

It is important to raise high quality queen bee breeds in terms of efficiency and if the economic gain to be obtained from beekeeping is high.

When the researches are examined, there are some problems in commercial queen bee production in Turkey. These problems are manifested as a low acceptance rate in the queen bee, low hatching weight, low sperm storage capacity, being killed or replaced over time, low spermatozoite quantity, late onset of egg laying, low egg laying rate, decreased lifespan, disorder in brood pattern, increase in infertile egg laying rate. comes out.

For a quality queen bee breeding, commercial breeding should be preferred instead of natural methods. Again, in the commercial method, attention should be paid to the selection of breeding queen and drone colonies, the breeding season, the age of the transferred larvae, the selection of starter colonies from strong colonies, the presence of sufficient drones in the mating area, the absence of disease and pests, and the age of the queen. Since the yield of the queen bee is 2 years, the queen bee should be renewed every 2 years. Care should be taken to use young and high quality queen bees.

References

Neuroprotective effect of *Acorus calamus* Linn. Extract on rat model of chronic constriction injury of median nerve

Urmila Aswar, Shubhecha Bansod, Shubhash Bodhankar

Department of Pharmacology, Poona College of Pharmacy, Bharati Vidyapeeth Deemed to Be University, Pune- 38, India

Abstract

Background: In Ayurveda, *Acorus calamus* Linn. (Vacha) has a number of benefits and purposes, including improving health and treating illnesses. The Vata and Kapha doshas are balanced by Vacha. In the Charak Samhita, it's named Lekhaniya (scrapes excess body fat), Arshoghna (heals heaps), and Sheet prashamana (relieves cold). Present study focuses on the evaluation of ethanolic extract of *Acorus calamus* (EAC) in chronic constriction injury (CCI) of median nerve induced neuropathic pain and work-related musculoskeletal disorder (WMSD) in rats.

Methods: Rats were subjected to surgical procedure of exposure and ligation of median nerve (chronic constriction injury) at the forearm level. The pain sensitive tests, i.e., hot plate test, randall stiletto test and walking track analysis, were performed on the different days, i.e., days 1, 7, 14, and 21. Tissue total protein, superoxide anion generation levels were estimated to assess biochemical changes. Histopathological evaluations were also performed. EAC (20 and 40 mg/kg) and gabapentin (50 mg/kg, serving as a positive control) were administered orally for 14 consecutive days from the day of surgery.

Results: CCI produced significant ($P<0.005$) increase in thermal and mechanical hyperalgesia, rise in median functional index (walking track analysis), decrease biochemical and histopathological changes. Oral administration of EAC (40 mg/kg) and gabapentin significantly ($P<0.05$) ameliorated CCI-induced nociceptive pain threshold and median nerve functional index. Further, tissue biochemical and histopathological changes were also attenuated.

Conclusion: EAC has shown ameliorative effect in CCI-induced neuropathic pain which may be attributed to its multiple actions including anti-oxidative, anti-inflammatory and neuroprotective actions.

Keywords: *Acorus calamus*, footprint analysis, rat, neuroprotection

Recovery of Phytochemicals from Saudi Date Fruit using Innovative Processing Methods

Kashif Ghafoor

Department of Food Science and Nutrition, College of Food and Agricultural Sciences, King Saud University, Riyadh 11451, Saudi Arabia

Abstract

The nutraceuticals obtained from various plant matrices are getting considerable scientific, industrial, and consumer attention due to their health benefits and potential applications in different pharmaceutical and functional food products. The organic solvents usually applied for their manufacture are detrimental to human health and the environment, and hence regulatory authorities are scrutinizing their use in the food and pharmaceutical industry. Therefore, the industry is now focusing on using innovative and green technologies that require no or minimal use of such toxic solvents. The products have higher quality and better consumer acceptance. Some of these technologies include supercritical fluid, microwave-assisted, and ultra-sonication technologies. The recovery of better quality nutraceuticals and functional food ingredients, with appreciable potential for application in the development of functional foods and health-benefiting products, is possible using these green techniques. The phytochemicals obtained using green technologies from fruits including Saudi date fruit may yield more economic gains for the nutraceutical and date (*Phoenix dactylifera*) fruit processing industry. The presentation explains the mechanism, advantages, applications, research findings, and prospects of these techniques for application in Saudi date fruit processing.

Key Words: Saudi date fruit, Supercritical fluid extraction, Organic-solvent based extraction, Nutraceuticals, Functional foods

Studies of Phenolic Compounds Coupled to Minerals in Cocoa Beans of the "Mercedes" and "Forastero" Varieties from the Divo and Abengourou Regions (Côte d'Ivoire)

Karim Kouablan Jean Constant ^{1*}, Saki Suomion Justin ¹, Sea Tehi Bernard ¹, Kra Kouassi Aboutou Severin ¹, Yoboue Guillaume Arthur Kouassi Loh ¹

¹UFR Biosciences, Laboratoire de Biotechnologie, Agriculture et Valorisation des Ressources Biologiques (LBAVRB), Université Félix Houphouët-Boigny (UFHB), Cocody Abidjan, 22 BP 582 Abidjan 22, Côte d'Ivoire.

Abstract

The aim of this study is to contribute to the valorization of the cocoa bean varieties "Mercedes" and "Forastero" grown in Côte d'Ivoire. A comparative characterisation of phenolic compounds and minerals in the beans of the "Mercedes" and "Forastero" varieties from two major cocoa production areas of Côte d'Ivoire were determined. The phenolic compounds of cocoa beans were determined by high performance liquid chromatography (HPLC) and the minerals by atomic absorption spectrophotometer. The study showed that a significant difference at the 5% level ($P \leq 0.05$) was observed in the averages of minerals, cinnamic acid, protocatechic acid, quercetin, coumaric acid, rutin, ellagic acid, veratric acid, epicatechin, ferulic acid and naringenin. On the other hand, no significant difference at the 5% level ($P \geq 0.05$) was observed in the averages of arbutin, catechin, vanillic acid and caffeic acid in the bean kernels analysed in the Divo and Abengourou regions. The proportion of cinnamic acid is (6.18 ± 0.63 mg/100g "Mercedes" Divo), that of ellagic acid is (18.48 ± 0.44 mg/100g "Mercedes" Divo) and that of naringenin is (5.95 ± 0.35 mg/100g "Mercedes" Divo). The amount of potassium is (7569.97 ± 1.51 mg/kg "Forastero" of Abengourou) and that of iron is (179.9 ± 0.70 mg/Kg "Forastero" of Divo). The phenolic compounds and minerals in the cocoa bean samples analysed are highly correlated and rich in antioxidants. They would be beneficial for many biological functions. They can be recommended in pharmacology and cosmetics to fight against oxidative stress and cardiovascular diseases.

Key Words: Phenolic compounds, Minerals, Mercedes variety, Forastero variety, cocoa beans

Introduction

Cocoa is the mainstay of the economies of the various cocoa-producing countries. It generates large export revenues and is the main source of income for millions of smallholder farmers who grow 90% of the world's cocoa. West Africa is the main producer with more than 68% of world production (International Cocoa Organization: ICCO, 2012). With 40% of world production, Côte d'Ivoire remains the world's leading producer and exporter of cocoa with more than two million one hundred and eighty thousand tons (FAO, 2019). Cocoa's richness in nutrients (lipids, fiber, polyphenols, minerals) and economic elements make it and its by-products a highly prized food. According to Chartron (2005), chocolate is a source of energy that contains nutrients and flavonoids that are important for people's health. Its antioxidants and its richness in vitamin E help to fight against skin ageing. Cocoa is used in various foods (cakes, biscuits, chocolates, children's food, etc.) for its therapeutic and nutritional values, especially its high antioxidant content (Guehi et al., 2007).

Today, we note the resurgence of diseases linked to oxidative and cardiovascular stress such as high blood pressure and type 2 diabete, which are a public health problem. In Côte d'Ivoire, the National Metabolic Disease Control Program (PNLMM) estimated the prevalence of metabolic syndromes at 44.7% in 2015. As for its components, their prevalence was 4.2% for diabetes and 20.4% for hypertension (Ministry of Health and Public Hygiene, 2015; Kouakou et al., 2020).

Numerous studies have demonstrated the beneficial nutritional effects of a diet rich in cocoa and its derivatives, particularly chocolate. Consumed in large quantities, they are associated with a reduced risk of cardiovascular disease. These benefits are attributed to a high antioxidant content. An antioxidant is defined as a substance which, when present in low concentrations relative to oxidisable substrates, significantly retards or prevents the oxidation of that substrate (Gutteridge et al., 1994; Sevindik et al., 2017; Sevindik, 2018; Sevindik, 2019). Oxidisable substrates can be lipids, proteins, carbohydrates or nucleic acids. Phenolic compounds have in common the presence of one or more benzene rings bearing one or more hydroxyl functions. They can be divided into several classes, depending on the complexity of their basic skeleton, the degree of modification of this skeleton and the possible bonds of these compounds with other molecules. They are classified into simple phenols (C_6), hydroxybenzoic (C_6-C_1), hydroxycinnamic (C_6-C_3), naphthoquinones (C_6-C_4), stilbenes ($C_6-C_2-C_6$), flavonoids

(C₆-C₃-C₆), lignans (C₆-C₃)₂, lignins (C₆-C₃)_n and tannins (C₁₅)_n (Macheix et al., 2005). The interaction of phenolic compounds with transition metal ions such as iron and copper is a phenomenon of great biological interest. It plays an important role in the antioxidant power of phenolic compounds.

Indeed, iron and copper ions are likely to enter redox cycles, which under aerobic conditions produce reactive oxygen species or ROS (superoxide, hydrogen peroxide, hydroxyl radical, Fe⁴⁺ species).

Phenolic compounds can inhibit this oxidative stress, not only by trapping ROS by reduction, but also by forming inert complexes with iron and copper ions (Nkhili, 2009; Sevindik, 2021).

This article aims to contribute to the valorization of the cocoa bean varieties "Mercedes" and "Forastero" grown in Côte d'Ivoire. To achieve this objective, a comparative characterisation of phenolic compounds and minerals in the beans of the "Mercedes" and "Forastero" varieties from the localities of Divo (Lôh-djiboua region) and Abengourou (Indenie-djuablin region) will be conducted.

To achieve this, we will need methods and materials.

Materials and Methods

Material

The plant material used in this study consisted of cocoa beans of the "Mercedes" variety from the National Center for Agronomic Research (CNRA) and the "Forastero" variety (Figure 1). The beans were sampled in the locality of Divo (5°50' North latitude and 5°22' West longitude) precisely in the villages of Behiri and Ble and in the locality of Abengourou (6°43'47" North latitude and 3°29'47" West longitude) in the villages Kouacoudramankro and Tchegbekro.



Figure 1: Photograph of dried beans of the "Forastero" (A) and "Mercedes" (B) varieties. (shot: Karim Kouablan, 2017).

Methods

High performance liquid chromatography (HPLC) was used to quantify phenolic compounds and their profile. The mineral content of cocoa bean kernels was determined by an atomic absorption spectrophotometer.

Chromatographic profile and phenolic content of cocoa beans

The phenolic compound content of the foodstuffs was determined according to the method of Donovan et al. (1998) with some modifications. Twenty μ L of methanolic extract diluted one third in distilled water and filtered through a millipore filter were analyzed on an HPLC system (Shimadzu Corporation, JAPAN) equipped with a binary pump (LC-6A) coupled to a UV-VIS detector (SPD-6A). The phenolic compounds twenty μ L were separated on an ICsep ICE ORH-801 column (length 25 cm) at a temperature set at 30 °C.

The mobile phase consisted of 50 mM NaH₄H₂PO₄ pH 2.6 (eluent A), acetonitrile/NaH₄H₂PO₄ solution (80:20, v/v) (eluent B) and o-phosphoric acid (200 mM) pH 1.5 (eluent C).

The running time was 70 min with a flow rate of one mL/min. All external standards were prepared under the same conditions from pure powders of the reference phenolic compounds (gallic acid, salicylic acid, benzoic acid, tannin-ol, cinnamic acid, p-coumaric acid, protocatechic acid, caffeic acid, parahydroxybenzoïc acid, resveratrol, quercetin and catechin).

The concentrations of the individual phenolic compounds of the different samples were estimated using the average of the peak areas of each of the standards. Thus, the EC concentration of each phenolic compound of each sample expressed in mg/100g of dry matter is given by the following mathematical relationship

$$EC = \frac{Area\ E \times TC}{Area\ T}$$

With:

EC: Concentration of each phenolic compound in the sample
Area T: Average area of the standard phenolic compound peaks
Area E: peak area of the phenolic compound in the sample
TC: Concentration of standard phenolic compound

Mineral content of cocoa beans

- Mineralization

The AOAC method (1980) is used for the determination of minerals. A mass of 0.1 g of ash obtained after mineralization of the sample is dissolved in six mL of nitric acid (65%, v/v). The resulting mineralization is then transferred to a volumetric flask and the volume is made up to 50 mL with demineralized water.

- Determination of the minerals

For the preparation of the mineral calibration solutions, dilutions of standard solutions of each mineral (100 mg/L) (Mn, Mg, Fe, Cu, Zn, K, P, Ca, Na, Cd, Pb) are carried out by making the various initial volumes (0.1; 0.25; 0.5; 1; 1.5 and 2 mL) up to 50 mL with demineralized water so as to obtain respective concentrations of 0.2; 0.5; 1; 2 and 4 mg/L. These calibration solutions are then used to calibrate the flame atomic absorption spectrophotometer. To a five-mL solution of the previously obtained mineralisate, two mL of 3% lanthanum solution are added in a 50-mL volumetric flask and the whole is made up to the mark with 65% nitric acid. The determination of the individual minerals is carried out using an atomic absorption spectrophotometer (SPECTRAA-5, VARIAN) at specific wavelengths. Quantification of each mineral is performed using an external calibration based on the standard solution (100 mg/mL) of each mineral.

Statistical analysis

The tests relating to the analysis of the minerals and phenolic compounds of the beans were carried out in triplicate and the numerical values obtained are expressed as the arithmetic mean affected by the corresponding statistical standard deviation. An analysis of variance (ANOVA) of the different characteristics studied was carried out using the R Studio software version 1.1.456. The separation of the means was done using Duncan's test at the 5% threshold. The Pearson correlation allowed us to see how the different parameters evolve between them. Principal component analysis (PCA) was used to compare the cocoa beans of the "Mercedes" and "Forastero" varieties from the Divo and Abengourou regions on the basis of the variables phenolic compounds and minerals measured. PCA allows the measured variables to be grouped into new variables called components. This grouping is based on the correlation of the variables. This analysis allowed us to determine the links between the parameters evaluated and the similarities and proximities between the varieties.

Results and Discussion

Results

Phenolic compounds in cocoa beans of the "Mercedes" and "Forastero" varieties

The phenolic compounds present in the beans of the "Mercedes" and "Forastero" varieties from the Lôh-Djiboua (Divo) and Indenie-Djuablin (Abengourou) regions were identified by High Performance Liquid Chromatography (HPLC).

The chromatographic profiles of the phenolic compounds of the beans from both regions are shown in Figure 2.

The phenolic contents of the "Mercedes" and "Forastero" beans from both regions are given in Table 1.

The comparison of the standard chromatogram with those obtained with the samples clearly shows that there are fourteen (14) peaks. The retention times of these peaks correspond to the retention times of the standard. This shows the existence of fourteen compounds in the samples.

The different phenolic compounds listed according to their retention time are protocatechic acid (C₇H₆O₄), caffeic acid (C₈H₁₀N₄O₂), vanillic acid (C₈H₈O₄), veratric acid (C₉H₁₀O₄), coumaric acid (C₉H₈O₃), cinnamic acid (C₉H₈O₂), ferulic acid (C₁₀H₁₀O₄), ellagic acid (C₁₄H₆O₈), arbutin (C₁₂H₁₆O₇), quercetin (C₁₅H₁₀O₇), epicatechin (C₁₅H₁₄O₆), catechin (C₁₅H₁₄O₆), naringenin (C₁₅H₁₂O₅) and rutin (C₂₇H₃₀O₁₆).

In terms of hydroxycinnamic acids, cinnamic and ferulic acids are the most abundant phenolic compounds. The level of cinnamic acids varies from (1.08 ± 0.09 mg/100g) for the variety "Mercedes" of Abengourou to (6.18

± 0.63 mg/100g) for the variety "Mercedes" of Divo. A significant difference in cinnamic acid content at the 5% threshold was observed within the same region for both varieties.

The level of ferulic acids varied from (1.46 ± 0.06 mg/100g) for the variety "Mercedes" from Abengourou to (3.09 ± 0.02 mg/100g) for the variety "Mercedes" from Divo. A significant difference at the 5% threshold in ferulic acid content was observed in the Divo region for both varieties. On the other hand, in the Abengourou region, the level of ferulic acids was statistically identical for both varieties.

As regards hydroxybenzoic acids, ellagic and veratric acids are the most important. The level of ellagic acid is higher (18.48 ± 0.44 mg/100g) for the variety "Mercedes" from Divo and lower (4.18 ± 0.36 mg/100g) for the variety "Mercedes" from Abengourou. A significant difference at the 5% threshold in ellagic acid content was observed in the Divo region for both varieties. In contrast to the Abengourou region, the two varieties are statistically identical.

The veratric acid content varies from (0.63 ± 0.01 mg/100g) for the Abengourou variety "Forastero" to (4.09 ± 0.05 mg/100g) for the Divo variety "Mercedes". A significant difference at the 5% threshold in veratric acid content was observed in the Divo region for both varieties. Contrary to the Abengourou region, the two varieties are statistically identical.

Finally, in terms of flavonoids, the most important phenolic compounds are naringenin and epicatechin. The naringenin level varies from (0.95 ± 0.06 mg/100g) for the Abengourou "Forastero" variety to (5.95 ± 0.35 mg/100g) for the Divo "Mercedes" variety. In the same region, the naringenin level is statistically identical whatever the variety. A significant difference in naringenin content at the 5% threshold was observed from one region to another for the same variety.

The epicatechin content was higher (3.84 ± 0.08 mg/100g) for the variety "Mercedes" from Divo and lower (0.95 ± 0.02 mg/100g) for the variety "Forastero" from Divo. A significant difference in epicatechin content at the 5% threshold was observed in the Divo region for both varieties. In contrast to the Abengourou region, the two varieties have statistically the same content. From one region to another the epicatechin content differs significantly for the variety "Mercedes" and is statistically identical for the variety "Forastero".

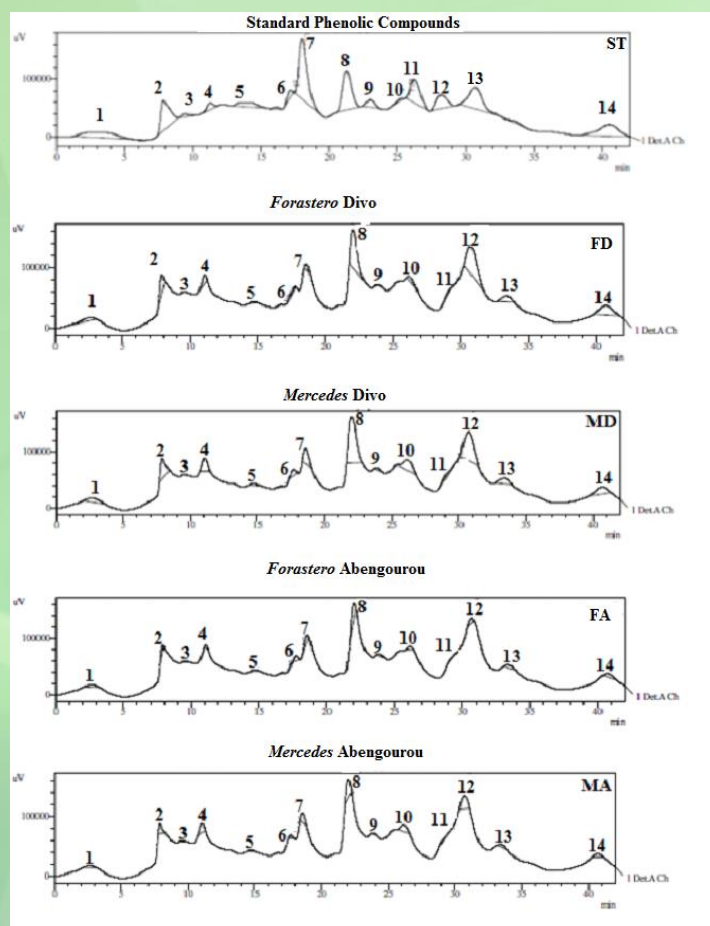


Figure 2. Chromatogram of phenolic compounds of beans of "Forastero" Divo (FD), "Mercedes" Divo (MD) and "Forastero" d'Abengourou (FA) varieties, "Mercedes" d'Abengourou (MA). ST: standard phenolic compounds.

Peaks detected: 1(Protocatechic acid); 2(Caffeic acid); 3(Vanillic acid); 4(Veratric acid); 5(Coumaric acid); 6(Cinnamic acid); 7(Ferulic acid); 8(Arbutin); 9(Ellagic acid); 10(Quercetin); 11(Epicatechin); 12(Catechin); 13(Naringenin); 14(Rutin).

Table 1: Phenolic composition of beans from Löh-Djiboua (Divo) and Indenie-Djuablin (Abengourou) regions

Phenolic Compounds (mg/100g)	Retention times (min)	DM	AM	DF	AF
Caffeic acid	7.906	0.88 ±0.02 ^a	0.24 ±0.06 ^b	0.55 ±0.05 ^{ab}	0.52 ±0.04 ^{ab}
Coumaric acid	14.711	1.51 ±0.05 ^a	0.35 ±0.05 ^c	0.79 ±0.02 ^b	0.65 ±0.08 ^{bc}
Cinnamic acid	16.727	6.18 ±0.63 ^a	1.08 ±0.09 ^c	1.75 ±0.20 ^{bc}	3.39 ±0.09 ^b
Ferulic acid	17.734	3.09 ±0.02 ^a	1.46 ±0.06 ^b	1.48 ±0.02 ^b	1.52 ±0.04 ^b
Protocatechic acid	2.653	1.74 ±0.05 ^a	0.41 ±0.09 ^c	1.32 ±0.09 ^b	0.43 ±0.04 ^c
Vanillic acid	9.573	1.30 ±0.02 ^a	1.47 ±0.08 ^a	0.70 ±0.25 ^a	2.10 ±0.07 ^a
Veratric acid	11.067	4.09 ±0.05 ^a	1.35 ±0.02 ^{bc}	2.18 ±0.03 ^b	0.63 ±0.01 ^c
Arbutin	18.575	0.31 ±0.05 ^a	0.18 ±0.01 ^a	0.07 ±0.04 ^a	0.33 ±0.07 ^a
Ellagic acid	22.028	18.48 ±0.44 ^a	4.18 ±0.36 ^c	13.08 ±0.11 ^b	4.43 ±0.25 ^c
Quercetin	23.846	0.49 ±0.01 ^b	0.41 ±0.03 ^b	0.19 ±0.03 ^b	0.85 ±0.05 ^a
Epicatechin	26.163	3.84 ±0.08 ^a	1.44 ±0.01 ^b	0.95 ±0.02 ^b	1.68 ±0.05 ^b
Catechin	29.517	1.45 ±0.09 ^a	1.35 ±0.08 ^a	0.77 ±0.02 ^a	1.62 ±0.04 ^a
Naringenin	30.710	5.95 ±0.35 ^a	1.11 ±0.05 ^b	5.34 ±0.50 ^a	0.95 ±0.06 ^b
Rutin	40.697	1.41 ±0.05 ^b	0.36 ±0.01 ^c	2.00 ±0.02 ^a	0.59 ±0.04 ^c

For each component, on the rows, the means ± standard deviation assigned to different letters are significantly different from each other at the threshold of $p \leq 0.05$ according to the Duncan test. DM: Divo "Mercedes", AM: Abengourou "Mercedes", DF: Divo "Forastero", AF: Abengourou "Forastero"

Minerals in cocoa beans of the "Mercedes" and "Forastero" varieties

The mineral content of the beans of the "Mercedes" and "Forastero" varieties from the Löh-Djiboua (Divo) and Indenie-Djuablin (Abengourou) regions is given in Table 2.

Bean minerals from both regions were grouped into macro and micro elements. The macro-elements are magnesium (Mg), sodium (Na), potassium (K) and calcium (Ca) and the microelements are iron (Fe), copper (Cu), manganese (Mn), zinc (Zn).

The magnesium content of the beans varies from (2410.34±0.98 mg/kg) for the "Forastero" variety of Divo to (4093.26 ± 0.41 mg/kg) for the "Forastero" variety of Abengourou. In the same region, a significant difference in magnesium content at the 5% threshold was observed for both varieties. The magnesium content of the "Mercedes" and "Forastero" varieties showed a significant difference at the 5% threshold from one region to another.

The sodium level of the beans was lower (352.57±3.06 mg/kg) for the "Mercedes" variety in Divo and higher (4056.73±1.22 mg/kg) for the "Forastero" variety in Abengourou. From one variety to another and from one region to another, sodium levels are statistically different at the 5% level.

The potassium level of the beans varies from (6426.60±1.09 mg/kg) for the variety "Forastero" of Divo to (7569.97±1.51 mg/kg) for the variety "Forastero" of Abengourou. The values are statistically different at the 5% threshold from one variety to another and from one region to another.

The calcium content of the beans of the varieties varies from (396.58±0.70 mg/kg) for the variety "Mercedes" of Abengourou to (1045.77±1.61 mg/kg) for the variety "Mercedes" of Divo. Calcium levels are statistically different from one variety to another and from one region to another at the 5% level.

The iron content of the beans is lower (140.69±1.30 mg/kg) for the "Forastero" variety of Abengourou and higher (179.9±0.70 mg/kg) for the "Forastero" variety of Divo. The iron levels are statistically different from one variety to another and from one region to another at the 5% level.

Copper levels in beans ranged from (21.75±0.24 mg/kg) for the variety "Mercedes" from Abengourou to (26.34±0.15 mg/kg) for "Forastero" from Divo. The copper level is statistically identical for the variety "Mercedes" in both regions. On the other hand, a significant difference at the 5% level in copper content was observed for the variety "Forastero" in both regions.

The manganese level of the beans was lower (20.23±0.56 mg/kg) for the 'Forastero' variety of Abengourou and higher (52.85±1.36 mg/kg) for the "Forastero" variety of Divo. No significant difference at the 5% level was observed for the "Mercedes" variety in the two regions. On the other hand, a significant difference at the 5% level was observed for the "Forastero" variety in both regions.

Zinc levels in beans ranged from (12.28±0.48 mg/kg) for the "Forastero" variety in Divo to (21.57±1.09 mg/kg) for the "Mercedes" variety in Abengourou. From one variety to another and from one region to another, zinc levels are statistically different.

Table 2. Mineral composition of "Mercedes" and "Forastero" beans from the Lôh-Djiboua (Divo) and Indenie-Djuablin (Abengourou) regions

		DM	AM	DF	AF
Macrolem ents	Mg (mg/kg)	3277.86 ± 2.90 ^b	2593.41 ± 3.90 ^c	2410.34 ± 0.98 ^d	4093.26 ± 0.41 ^a
	Na (mg/kg)	352.57 ± 3.06 ^d	1189.15 ± 0.27 ^b	417.87 ± 1.44 ^c	4056.73 ± 1.22 ^a
	K (mg/kg)	7291.26 ± 2.76 ^b	6718.10 ± 3.16 ^c	6426.60 ± 1.09 ^d	7569.97 ± 1.51 ^a
	Ca (mg/kg)	1045.77 ± 1.61 ^a	396.58 ± 0.70 ^d	767.01 ± 1.99 ^b	439.82 ± 1.85 ^c
Microlem ents	Fe (mg/kg)	169.71 ± 1.03 ^b	150.42 ± 1.40 ^c	179.9 ± 0.70 ^a	140.69 ± 1.30 ^d
	Cu (mg/kg)	22.15 ± 0.89 ^c	21.75 ± 0.24 ^c	26.34 ± 0.15 ^a	24.48 ± 1.54 ^b
	Mn (mg/kg)	36.65 ± 0.64 ^b	35.95 ± 0.54 ^b	52.85 ± 1.36 ^a	20.23 ± 0.56 ^c
	Zn (mg/kg)	13.07 ± 0.59 ^c	21.57 ± 1.09 ^a	12.28 ± 0.48 ^d	19.04 ± 0.43 ^b

For each component, on the rows the assigned means ± standard deviations of different letters are significantly different from each other at the threshold of $p \leq 0.05$ according to the Duncan test. DM: Divo "Mercedes", AM: Abengourou "Mercedes", DF: Divo "Forastero", AF: Abengourou "Forastero"

Interactions between phenolic compounds and minerals in cocoa beans

Pearson correlation of phenolic compounds and minerals in cocoa beans

The Pearson correlation matrix of all quantitative parameters is shown in figure 3. Only values greater than or equal to 0.50 for positive correlations and values less than or equal to -0.50 for negative correlations are shown. This matrix indicated negative correlations between micro-minerals (iron, manganese and zinc) and flavonoids (quercetin, naringenin, catechin, rutin), hydroxybenzoic acids (veratric acid, arbutin, protocatechic acid, ellagic acid) and macro-minerals (magnesium, sodium, potassium, calcium). In addition, zinc is negatively correlated with the other micro-minerals (iron, copper, manganese). Negative correlations were observed between sodium and hydroxybenzoic acids (protocatechic acid, veratric acid, ellagic acid) and flavonoids (naringenin, rutin). Finally, a negative correlation between calcium and sodium.

All other parameters show positive correlations with each other. However, there is a group of variables that are strongly positively correlated with each other. These are flavonoids (epicatechin, catechin, naringenin, rutin, quercetin) which are positively correlated with hydroxycinnamic (caffeine, ferulic acid, coumaric acid, cinnamic acid) and hydroxybenzoic (protocatechic acid, veratric acid, ellagic acid, arbutin, vanillic acid). Then macro-minerals (magnesium, sodium, calcium, potassium) and micro-minerals (iron, manganese, and zinc) are strongly correlated to hydroxybenzoic and flavonoids. Finally, hydroxycinnamic acids are strongly correlated with each other. And hydroxybenzoic acids are strongly correlated with hydroxycinnamic acids.

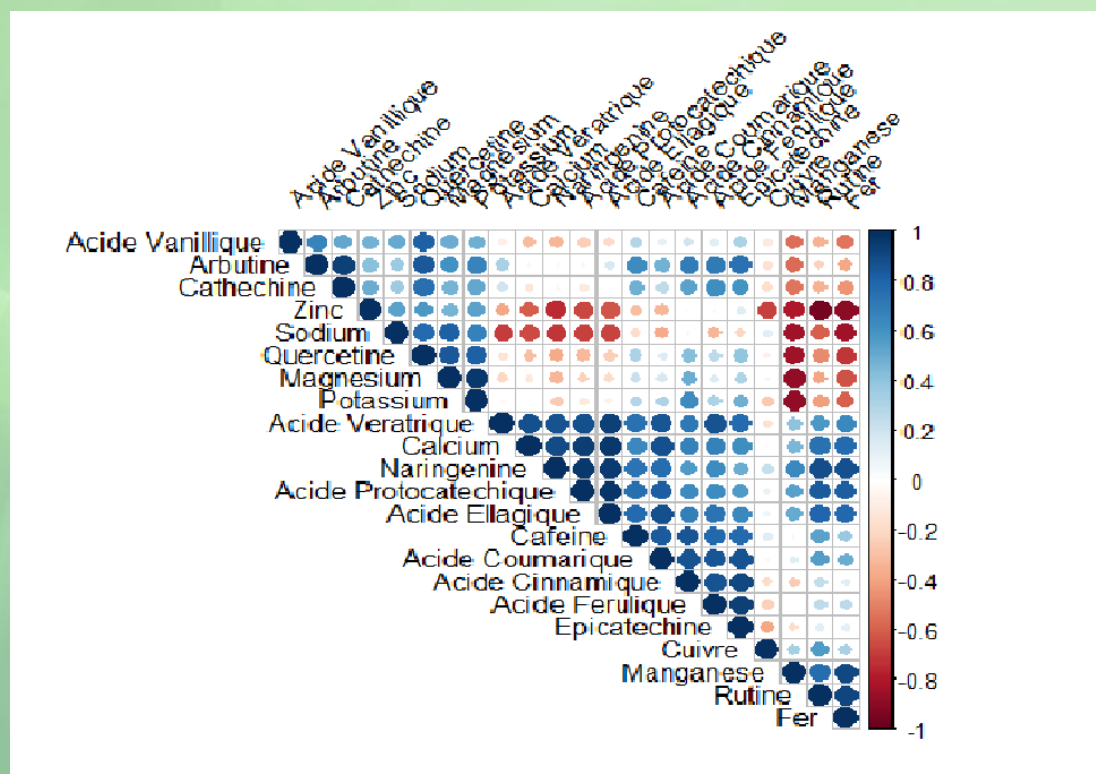


Figure 3. Correlation matrix of phenolic compounds and minerals in cocoa beans

PCA of phenolic and mineral compounds in cocoa beans

Percentage of inertia

A Principal Component Analysis (PCA) was carried out on the basis of the phenolic and mineral compounds measured in the bean samples from the regions studied. All variables were considered as active variables and all individuals were also considered as active. In our sample, the first two axes present a cumulative variance of 82% of the total variance with 47.6% of the variance explained by axis 1 and 34.4% of the variance carried by axis 2 (Figure 4).

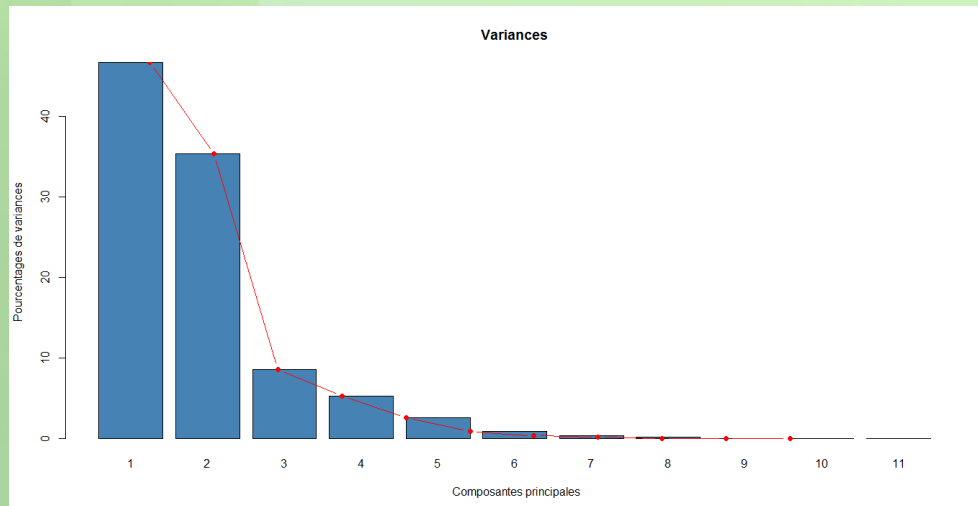


Figure 4. Scree plot

Contribution of individuals and variables to the construction of axes 1 and 2

The "Mercedes" variety from the Divo region and the "Forastero" variety from the Abengourou region contribute most to the construction of axes 1 and 2 (figure 5). The variables that contribute most to the formation of axis 1 and 2 are the hydroxy-benzoic acids consisting of (ellagic acid, protocatechic acid, veratric acid and arbutin), the hydroxy-cinnamic acids consisting of (cinnamic acid, coumaric acid, ferulic acid and caffeic acid), flavonoids consisting of (quercetin, naringenin and epicatechin) and minerals such as iron and calcium (Figure 6).

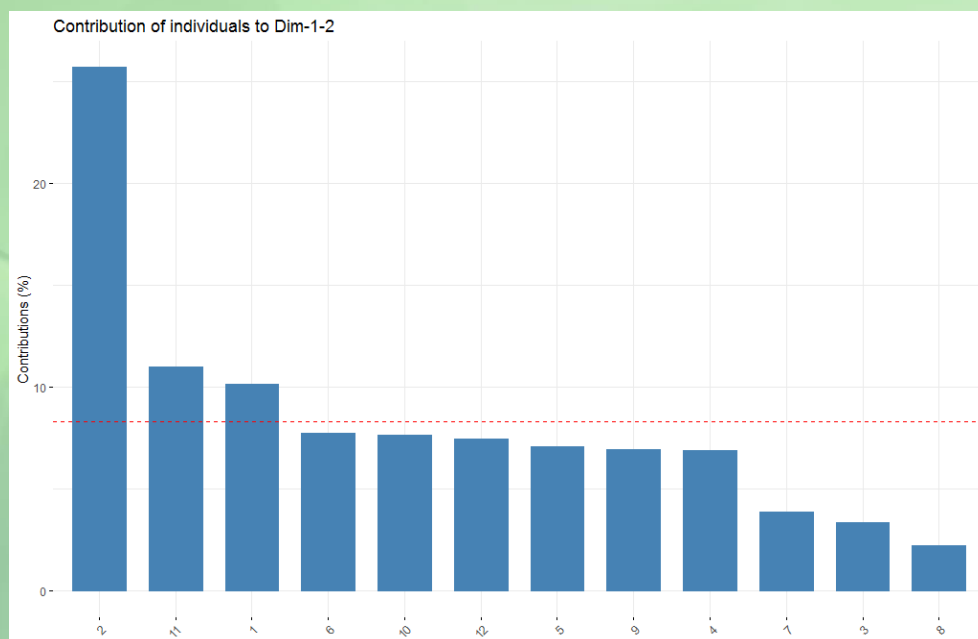


Figure 5: Contribution of bean samples to the formation of axes 1 and 2

Individuals 1, 2, 3 = "Mercedes" variety from Divo
Individuals 4, 5, 6 = "Forastero" variety from Divo
Individuals 7, 8, 9 = "Mercedes" variety from Abengourou
Individuals 10, 11, 12 = "Forastero" variety from Abengourou

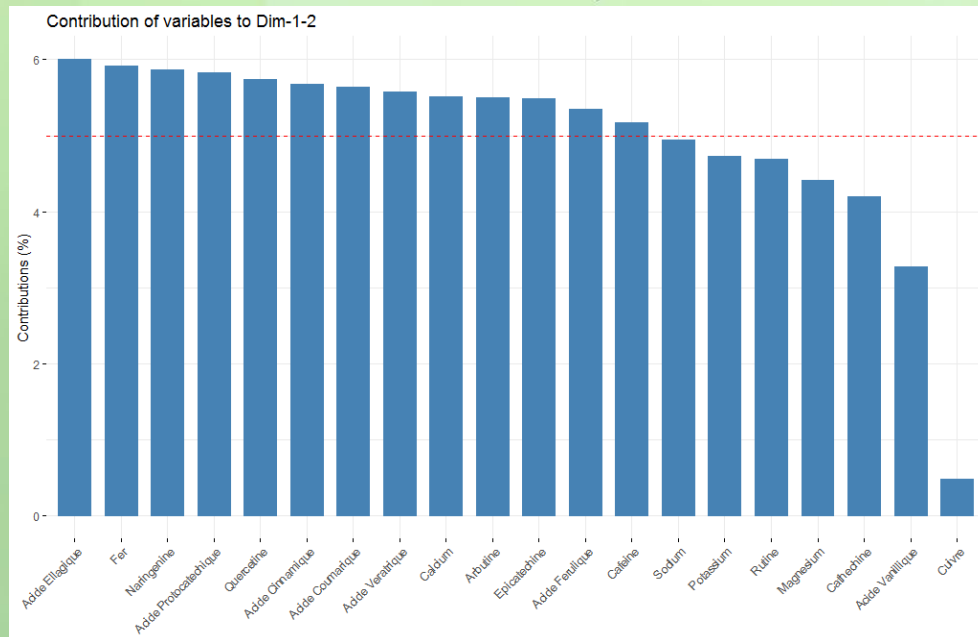


Figure 6. Contribution of phenolic and mineral compounds in cocoa beans to the formation of axes 1 and 2

Correlation between the variables and the coordinates of axes 1 and 2

Caffeic acid, ferulic acid, coumaric acid, cinnamic acid, protocatechic acid, veratric acid, ellagic acid, epicatechin, naringenin, rutin, calcium and iron are the variables that are negatively correlated with axis 1. Vanillic acid, arbutin, quercetin, catechin, magnesium and potassium are the variables positively correlated to axis 2 (Table 3).

Table 3. Correlation between the variables and the coordinates of axes 1 and 2

	Axis 1	Axis 2
Caffeic acid	-0.82	0.41
Ferulic acid	-0.81	0.47
Coumaric acid	-0.91	0.30
Cinnamic acid	-0.75	0.61
Protocatechic acid	-0.96	-0.17
Vanillic acid	0.15	0.72
Veratric acid	-0.95	0.04
Arbutin	-0.26	0.91
Ellagic acid	-0.98	-0.09
Quercetin	0.17	0.95
Epicatechin	-0.73	0.60
Catechin	-0.12	0.82
Naringenin	-0.95	-0.25
Rutin	-0.74	-0.48
Magnesium	-0.15	0.83
Sodium	0.64	0.62
Potassium	0.02	0.88
Calcium	-0.94	-0.13
Iron	-0.74	-0.65
Copper	-0.03	-0.28

Distribution diagram of "Mercedes" and "Forastero" varieties according to phenolic compounds and minerals in cocoa beans in the Divo and Abengourou regions

The distribution diagram of varieties in the two regions studied according to phenolic compounds and minerals in cocoa beans showed two groups of varieties according to geographical area: the Divo cocoa bean varieties and the Abengourou cocoa bean varieties. The "Mercedes" variety from Divo and the "Forastero" variety from Divo are very close in terms of the variables studied. The "Mercedes" variety of Abengourou and the "Forastero" variety of Abengourou are also very close in terms of the variables studied (figure 7).

The "Mercedes" variety of Divo and the "Forastero" variety of Abengourou are located on either side of axis 1. Moreover, the Divo "Mercedes" variety is richer in caffeine, ferulic acid, coumaric acid, cinnamic acid,

protocatechic acid, veratric acid, ellagic acid, epicatechin, naringenin, rutin, calcium and iron than the Abengourou "Forastero" variety. The "Forastero" varieties of the two regions are opposite with respect to axis 2. The Abengourou "Forastero" variety is richer in arbutin, quercetin, catechin, magnesium and potassium than the Divo variety.

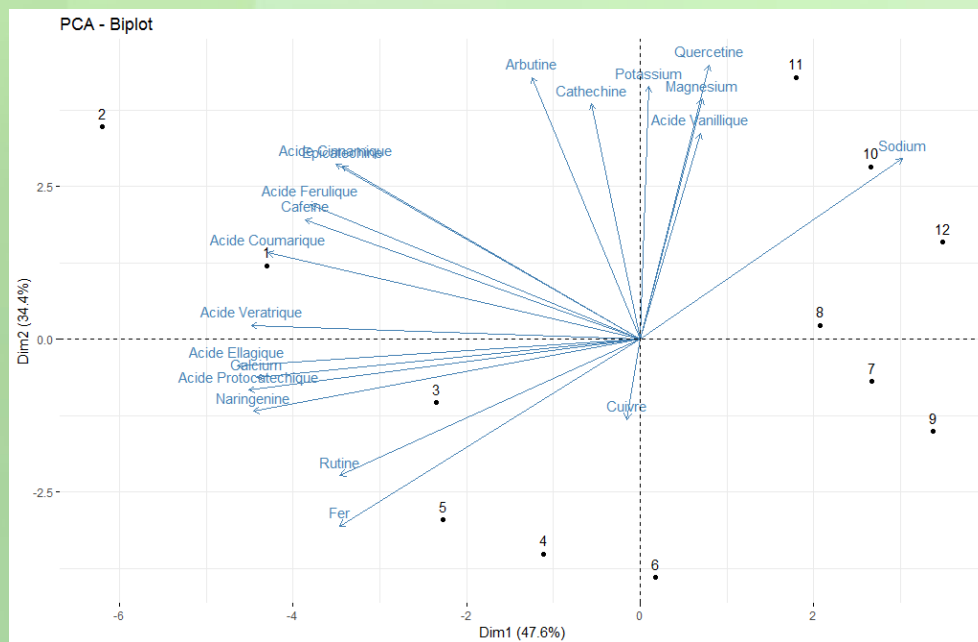


Figure 7. Distribution diagram of cocoa bean varieties in Divo and Abengourou according to phenolic and mineral compounds on axes 1 and 2 of the PCA at 82% inertia

Individuals 1, 2, 3 = "Mercedes" variety from Divo
Individuals 4, 5, 6 = "Forastero" variety from Divo
Individuals 7, 8, 9 = "Mercedes" variety from Abengourou
Individuals 10, 11, 12 = "Forastero" variety from Abengourou

Discussion

Phenolic compounds are secondary metabolites that represent an important source of molecules used by humans in pharmacology or food processing (Mohammed et al., 2019). The phenolic compounds found in the different bean samples were classified into hydroxycinnamic acids, hydroxybenzoic acids and flavonoids.

Concerning hydroxycinnamic acids, cinnamic and ferulic acids are the most important phenolic compounds. The level of cinnamic acids varies from $(1.08 \pm 0.09 \text{ mg/100g})$ to $(6.18 \pm 0.63 \text{ mg/100g})$. The level of cinnamic acids in our beans is higher than that found by Ehala et al. (2005) which varies from 0.10 to 4.12 mg/100g in berries. For ferulic acids, the level varies from $(1.46 \pm 0.06 \text{ mg/100g})$ to $(3.09 \pm 0.02 \text{ mg/100g})$. The work of Counet et al. (2006) on dark chocolate found a high level of ferulic acid of 24 mg/100g.

The variable composition of hydroxycinnamic acids would be due to the composition of the soil or the use of pesticides or the substratum (Hoffmann, 2003).

Cinnamic acid is the precursor of a large number of phenolic compounds and has plant growth regulating properties such as elongation activities, inhibition of root growth in cereals, role in ripening of bananas or seed germination (Wong et al., 2005).

It is used in perfumery and pharmacology for its antiseptic and antifungal properties, as a flavour enhancer, and enters the biosynthetic pathway of shikimic acid and phenylpropanoids. It should also be noted that derivatives of cinnamic acid have better antioxidant activity (Cuvelier, 1992; Rice-Evans, 1996; Natella, 1999).

As for ferulic acid, it plays a preponderant role in the fight against oxidative stress and the reduction of blood cholesterol. It acts effectively against free radicals, lipid peroxidation and increases the level of trace elements during nicotine-induced toxicity (Sudheer et al., 2005). Ferulic acid is a super antioxidant. It has many physiological functions, including anti-inflammatory, antimicrobial, anticancer (lung, breast, colon and skin cancer), anti-arrhythmic, anti-thrombotic and anti-diabetic activity. Ferulic acid has a protective role for the main structures of the skin: keratinocytes, fibroblasts, collagen, elastin (Zduńska et al., 2018).

As far as hydroxybenzoic acids are concerned, ellagic and veratric acids are the most important. The ellagic acid content varies from $(4.18 \pm 0.36 \text{ mg/100g})$ to $(18.48 \pm 0.44 \text{ mg/100g})$.

The veratric acid content varies from $(0.63 \pm 0.01 \text{ mg/100g})$ to $(4.09 \pm 0.05 \text{ mg/100g})$. This could be explained by the type of soil and its mineralogical composition. The work of Wang et al. (2002) and Wada et al. (2002) showed

high levels of ellagic acid ranging from 1.24 to 43.67 mg/100g in berries. High levels of veratric acids up to 20 mg/Kg/day are safe for the body.

Ellagic acid is an antioxidant polyphenol with pharmacological properties; it combines with glucose to form tannins known as ellagitannins. It is hydrolysable tannin with the ability to scavenge free radicals and superoxide ion (Rios et al., 2018).

Veratric acid (3,4-dimethoxybenzoic acid), a simple benzoic acid derived from plants and fruits, has antioxidant, anti-inflammatory and hypotensive effects (Saravanakumar et al., 2011).

Veratric acid reduces the regulated expression of protein-expressing cyclooxygenase-2 (COX-2), prostaglandin-2 (PGE2) and interleukin (IL-6) levels after UVB (ultraviolet) irradiation. Veratric acid can reduce UV-induced skin damage (DNA damage, redox imbalance and inflammation) and is safe to use. Veratric acid may be an effective therapeutic agent offering protection against UVB-induced skin disorders (Seoung-Woo et al., 2013).

For flavonoids, the most important phenolic compounds are naringenin and epicatechin. The naringenin content varies from (0.95 ± 0.06 mg/100g) to (5.95 ± 0.35 mg/100g). The epicatechin content varied from (0.95 ± 0.02 mg/100g) to (3.84 ± 0.08 mg/100g). These results are in agreement with those of Portillo (2006) who found epicatechin values between 0.96 and 3.27%. According to Hooper (2008), the acceptable daily intake of naringenin and epicatechin are 14.4 mg/day and 156.9 mg/day. The consumption of cocoa powders could meet the body's needs for naringenin and epicatechin.

Naringenin is a flavanone which is a subgroup of flavonoids. It is responsible for drug interactions through cytochrome inhibition. Several biological activities have been attributed to naringenin, including antioxidant, anti-tumour, antiviral, antibacterial, anti-inflammatory, anti-adipogenic and cardio-protective effects. The work of Salehi et al. (2019) showed the ability of naringenin to improve endothelial function. Naringenin is one of the flavonoids produced from phenylalanine and has many beneficial effects on the human body, including aiding metabolism, as well as preventing cardiovascular disease (Yao et al., 2004).

Epicatechin has various biological properties, such as anti-oxidant, anti-inflammatory antimicrobial, anti-tumour, anti-diabetic and cardio-protective activity (Prakash et al., 2019). Indeed, in vitro studies have suggested that the anti-oxidant activity of epicatechin is mainly due to its ability to scavenge free radicals through multiple attached phenolic groups. Similarly, epicatechins have also shown significant antimicrobial activity against various multi-drug resistant pathogens, which is a serious need in today's healthcare system. Preclinical studies have shown an excellent chemopreventive and anti-tumour effect of epicatechins present in green tea. In addition, epicatechin has also shown cardio-protective, anti-diabetic and neuro-protective activity (Bernatova, 2018).

Epicatechin is a flavanol monomer found in foods such as tea, apples, berries and cocoa. Work by Haskell-Ramsay et al. (2018) showed an association between consumption of these foods and cognitive function, as well as improved blood flow.

The cocoa bean kernels studied can be used in the treatment of cardiovascular disease and in the fight against oxidative stress. According to Scalbert and Williamson (2000), they are capable of fighting all types of cancer. Thus, numerous anti-carcinogenic, anti-inflammatory, anti-atherogenic, anti-thrombotic, analgesic, antibacterial, antiviral, anti-cancer (Babar et al., 2007), anti-allergenic, vasodilator (Falleh et al., 2008) and anti-oxidant (Gomez-aravaca et al., 2006; Azizah et al., 2007) activities are associated with them.

The cocoa bean kernels of the "Mercedes" and "Forastero" varieties are characterised by their richness in macroelements, particularly potassium and magnesium, without neglecting sodium and calcium, although they have relatively lower contents (Karim et al., 2020).

The magnesium content of the beans varied from 2410.34 ± 0.98 mg/kg to 4093.26 ± 0.41 mg/kg. The sodium level varied from 352.57 ± 3.06 mg/kg to 4056.73 ± 1.22 mg/kg. The potassium level of the beans varied from 6426.60 ± 1.09 mg/kg to 7569.97 ± 1.51 mg/kg. The calcium content of the beans varied from 396.58 ± 0.70 mg/kg to 1045.77 ± 1.61 mg/kg.

Relatively high values of macroelements were reported by USDA (2011) for dark chocolate containing 70-85% cocoa mass with the proportions of 715 mg/100g potassium (K), 228 mg/100g magnesium (Mg), 73 mg/100g calcium (Ca) and 20 mg/100g sodium (Na).

These macroelements play very important roles in the body. Indeed, potassium is essential in the regulation of cell osmotic balance and the maintenance of membrane potentials, so it plays a very important role in cardiovascular health in toning up biochemical and vascular pathways (Murray et al., 2000).

Cocoa products are richer in magnesium than black tea, red wine and apples Steinberg et al. (2003). Magnesium is an important cofactor in many reactions of cellular metabolism, thus it catalyses many biological reactions, such as protein synthesis, transmission of nerve impulses, muscle movements, energy production and in the fixation of bones and teeth (Soetan et al., 2010 and Colombo et al., 2011).

Calcium is involved in muscle contraction, transmission of nerve impulses and in the formation of bones and teeth (Soetan et al., 2010).

Sodium and potassium form a pump that is involved in the restoration of membrane permeability. Cocoa bean kernels can therefore be recommended to ensure a good balance and proper functioning of the body (Askari, 2019).

Cocoa bean kernels of the "*Mercedes*" and "*Forastero*" varieties are characterised by their richness in mineral microelements, particularly iron and manganese (Karim et al., 2020).

The iron content of the beans varies from 140.69 ± 1.30 mg/kg to 179.9 ± 0.70 mg/kg. The copper content of the beans varied from 21.75 ± 0.24 mg/kg to 26.34 ± 0.15 mg/kg. The manganese content of the beans varied from 20.23 ± 0.56 mg/kg to 52.85 ± 1.36 mg/kg. The zinc content of the beans ranged from 12.28 ± 0.48 mg/kg to 21.57 ± 1.09 mg/kg.

Relatively high values of microelements have been reported by the USDA (2011) for dark chocolate containing 70-85% cocoa mass containing the proportions of 11.90 mg/100 g of iron (Fe), 1.948 mg/100 g of manganese (Mn), 1.766 mg/100 g of copper (Cu) and 3.31 mg/100 g of zinc (Zn).

These microelements are essential because they contribute to the proper functioning of the body through their involvement in physiological and metabolic functions.

In fact, the iron contained in the cocoa bean kernel samples studied can be recommended to pregnant and breastfeeding women because the quantity obtained (16 mg/100 g) is greater than that contained in beef or beef liver (3 mg/100 g).

However, the non-haem iron in cocoa limits intestinal absorption by 5 to 10%, compared with the higher intestinal absorption of haem iron contained in meat (20-30%). The low absorption of non-haem iron from cocoa can be noted in the presence of ascorbic acid (Colombo et al., 2011).

Manganese is an essential trace element involved in the constitution of many essential enzymes in the metabolism of amino acids, lipids, carbohydrates; participates in the production of insulin and in bone formation (Doctissimo, 2017).

Copper is involved in multiple enzymatic reactions including collagen and neurotransmitter synthesis (Arredondo et al., 2005)

A copper-deficient diet can lead to cardiovascular disease later in life. Divo "*Forastero*" cocoa is a good source of copper (Colombo et al., 2011).

Zinc is a cofactor in more than 300 biochemical reactions in our body. It is also involved in the growth of children, hair loss, liver detoxification and immunity. Zinc also plays an important role in fertility. In men it is important for sperm quality and in women it plays an important role in the implantation of the egg in the uterus (Anonymous 1, 2012).

Furthermore, according to the European Food Safety Authority EFSA (2013), the daily dietary allowances for trace elements are: Iron (adult: 9-15 mg), manganese (adult: 3 mg), copper (adult: 1.7 mg), zinc (adult: 8-13.5 mg). These nutrients can be provided by the "*Mercedes*" and "*Forastero*" varieties of cocoa beans.

These almonds can therefore be recommended to ensure a good balance and proper functioning of the body.

Conclusion

This study revealed that the cocoa bean samples analysed are rich in phenolic compounds, macro minerals (calcium, potassium, sodium, magnesium) and trace minerals (iron, copper, zinc and manganese). The profile of phenolic compounds showed the presence of flavonoids, hydroxy-benzoics and hydroxy-cinnamics. Phenolic compounds and minerals interact well to give cocoa bean kernels a strong antioxidant capacity to fight against oxidative stress and cardiovascular diseases. Cocoa bean kernels can be recommended in pharmacology and cosmetics.

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Investigation of Technical and Socio-Economic Status of Beekeeping Enterprises in Yozgat Province*

Adil Koray Yıldız¹, Merve Ayyıldız², Bekir Ayyıldız², Servet Arslan³

¹Tarım Makinaları ve Teknolojileri Mühendisliği Bölümü, Ziraat Fakültesi, Yozgat Bozok Üniversitesi, Yozgat, Turkey.

²Tarım Ekonomisi Bölümü, Ziraat Fakültesi, Yozgat Bozok Üniversitesi, Yozgat, Turkey.

³Organik Tarım Programı, Teknik Bilimler Meslek Yüksekokulu, Akdeniz Üniversitesi, Antalya, Turkey.

Abstract

Beekeeping, which can be established with little capital and can provide strong economic returns, is one of the important branches of animal husbandry. Beekeeping has an important place in Yozgat's agricultural sector with 415 enterprises. At the end of 2019, there are a total of 29,370 beehives in Yozgat. Honey production has been less than the general of Turkey according to the presence of hive. Achieving more efficient production is possible by identifying the problems in the current production. With this study, it was determined the technical and socio-cultural structures of the existing beekeeping enterprises in Yozgat city center and its districts through a survey study. For this purpose, information about the enterprises was obtained from the Yozgat Provincial Directorate of Agriculture and Forestry and the Yozgat Beekeepers' Association. A sample of 135 businesses was created by examining the data of a total of 415 businesses. The survey was conducted with these selected businesses. According to the findings, a statistically significant difference was found between beekeeping business groups in terms of experience of breeders, ownership of land and honey yield. Therefore, it can be said that the scale of the enterprise has grown in parallel with the increase in the experience of the breeders. Similarly, property land assets increase according to the scale of the enterprise. On the other hand, it is observed that honey yield decreases with the increase in scale in beekeeping enterprises. This means that the efficiency of the enterprises in Yozgat province decreases with the scale growth.

Key Words: Bee, Beekeeping, Survey, Yozgat

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Yozgat İli Arıcılık İşletmelerinin Teknik ve Sosyo-Ekonomik Durumunun İncelenmesi*

Özet

Az sermayeyle kurulabilen ve güçlü ekonomik getiri sağlayabilen arıcılık, hayvancılığın önemli dallarından biridir. Arıcılık 415 işletme ile Yozgat tarım sektörünün içinde önemli bir yer tutmaktadır. Yozgat ilinde 2019 yılı sonunda toplam 29.370 adet arı kovanı bulunmaktadır. Bal üretimi kovan varlığına göre Türkiye geneline göre daha az olmuştur. Daha Etkin üretimin sağlanabilmesi mevcut üretimdeki problemlerin belirlenmesi ile mümkün olmaktadır. Bu çalışma ile Yozgat il merkezi ve ilçelerinde mevcut arıcılık işletmelerinin teknik ve sosyo-kültürel yapılarının anket çalışması yoluyla belirlenmesi amaçlanmıştır. Bu amaçla Yozgat İl Tarım ve Orman Müdürlüğü ve Yozgat Arı Yetiştiricileri Birliği'nden işletmelerle ilgili bilgiler elde edilmiştir. Toplam 415 işletme verisi incelenerek 135 işletmeden oluşan bir örneklem oluşturulmuştur. Belirlenen bu işletmeler ile anket çalışması yapılmıştır. Elde edilen bulgulara göre, arıcılık işletme grupları arasında yetiştiricilerin tecrübesi, mülk araziye sahip olması ve bal verimi açısından istatistiksel olarak anlamlı bir farklılık bulunmuştur. Buna göre yetiştiricilerin tecrübesindeki artışa paralel olarak işletme ölçeğinin büyüdüğünden söz edilebilir. Benzer şekilde mülk arazi varlığı işletme ölçeğine göre artış göstermektedir. Diğer yandan arıcılık işletmelerinde ölçek artışıyla birlikte bal veriminin azalışı gösterdiği gözlenmektedir. Bu durum Yozgat ilindeki işletmelerin ölçek büyümesiyle birlikte etkinliğinin azaldığı anlamına gelmektedir.

Anahtar Kelimeler: Arı, Arı Yetiştiriciliği, Anket, Yozgat

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Poults Raising Criteria Affecting Economic Turkeys Production

Hasan Eleroğlu¹

¹Department of Plant and Animal Production, Sivas Vocational School, Sivas Cumhuriyet University, 58140 Sivas, Turkey

Abstract

The effect of poults growth on economic efficiency is more permanent than in other periods. Uniform body weight gain and low mortality rate in breeding and turkey fattening are very effective on economic production. Everything must be done to minimize the risk of disease in the flock and to produce healthy poults. The coops should be easy to maintain and manage, and the coops structure should allow for cleaning and hygiene measures. The entry of wild animals and rodents into the house must be prevented. The most common system for housing day-old poults is an environmentally controlled environment. The number of animals to be placed per unit area depends on the target body weight in the slaughter. The basic needs of chicks after hatching should be met for high vitality and quality chick production. These; clean air, water, suitable feed, quality litter and temperature. Lighting duration, intensity and type are much more important for breeding turkeys. Ventilation should be provided to keep carbon dioxide, dust, odor and other polluting factors in the air at a minimum. The litter must be a dry, moisture absorbent, dust-free, mold-free and chemically-treated material. Beak trimming reduces pecking in animals, preventing damage to the eyes and other organs. In order to ensure optimum development in turkeys, animals are fed according to different sexes. Uniform development of turkeys during the rearing period is important for meat production and breeding. Therefore, at different periods, undesirable ones are removed and not used as parents. In this study, turkey poults production techniques that affect economic production such as health, shelters and environmental conditions, breeding techniques, lighting, ventilation and selection are emphasized.

Key Words: Poults, Uniform, Feeding, Growth, Health

Ekonomik Hindi Üretimini Etkileyen Palaz Büyütme Kriterleri

Özet

Ekonomik verimlilik üzerine palaz büyütmenin etkisi diğer dönemlere göre daha kalıcı olmaktadır. Damızlık yetiştirme ve Hindi besisinde üniform canlı ağırlık kazanımı ve düşük ölüm oranı ekonomik üretim üzerine oldukça etkili olmaktadır. Sürüde hastalık riskini en düşük düzeye indirmek ve sağlıklı palaz üretimi için gereken her şey yapılmalıdır. Kümesin bakım ve idaresi kolay olmalı ve kümes yapısı temizlik ve hijyen önlemlerine imkan sağlamalıdır. Yabani hayvanların ve kemirgenlerin kümes içine girişinin önlenmesi gerekir. Günlük palazların barındırılmasında en yaygın sistem çevre kontrollü bir ortamdır. Birim alana konulacak hayvan sayısı kesimdeki hedef canlı ağırlığına bağlıdır. Yaşama gücünün yüksekliği ve kaliteli palaz üretimi için palazların kuluçka sonrası temel ihtiyaçları karşılanmalıdır. Bunlar; temiz hava, su, uygun yem, kaliteli altlık ve sıcaklıktır. Aydınlatma süresi, şiddeti ve tipi damızlık hindiler için çok daha önemlidir. Havadaki karbondioksit, toz, koku ve diğer kirletici etmenleri en düşük düzeyde tutacak havalandırma sağlanmalıdır. Altlık, kuru, nem çekebilen, tozsuz, küfsüz ve kimyasal işlem görmemiş bir materyal olmalıdır. Gaga kesimi hayvanlarda gagalamayı azaltarak gözlere ve diğer organlara zarar verilmesini önler. Hindilerde optimum gelişme sağlanabilmesi amacıyla hayvanlar farklı cinsiyetlere göre beslenirler. Büyütme döneminde hindilerin birörnek gelişmeleri et üretimi ve damızlık yetiştiriciliği açısından önemlidir. Bu nedenle değişik dönemlerde, istenmeyen özellikte olanlar ayıklanır ve ebeveyn olarak kullanılmazlar. Bu çalışmada sağlık, barınaklar ve çevre koşulları, yetiştirme teknikleri, aydınlatma, havalandırma ve seleksiyon gibi ekonomik üretime etki eden hindi palazı üretim teknikleri üzerinde durulmuştur.

Anahtar Kelimeler: Palaz, Uniform, Besleme, Büyütme, Sağlık

Omega-3 Fatty Acids in Fish

Semra Küçük

Adnan Menderes University, Agriculture Faculty, Department of Aquacultural Engineering, 09100 Aydın/Turkey

Abstract

Nowadays, global and Turkey aquaculture productions were 179 billions and 786 thousands tonnes in 2019. Global and Turkey fish consumption is 20.4 kg and 5.5 per capita in 2019. Fish meat is a very good food having important source of protein, vitamins and minerals. Omega-3 fatty acids (omega-3 oils or ω -3 fatty acids or n -3 fatty acids) are polyunsaturated fatty acids (PUFAs) characterized by the presence of a double bond, three atoms away from the terminal methyl group in their chemical structure. They are widely distributed in nature, being important places of animal lipid metabolism, and play an important role in the human consumption and in human physiology. The three types of omega-3 fatty acids in human physiology are linolenic acid (ALA) found in plant oils, and eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), commonly found in oils of marine fish. Marine algae and phytoplankton also are primary sources of omega-3 fatty acids (which also accumulate in fish). The evidence linking the consumption of marine omega-3 fatty acids to a lower risk of different cancers. Brain function and vision are dependent on intake of DHA to support the needs of cell membranes (particularly grey matter parts), especially structural component of the mammalian brain. Fish consumption have positive effects on development and being healthy of humans. Omega-3 fatty acids support the necessities of body and brain to develop and maintain good health. Omega-3 fatty acids also protect by lowering the inflammation markers in blood (C-reactive protein, interleukin, TNF- α). It is mentioned that the definition and importance of omega-3 fatty acids, importance of fish consumption and benefits of fish eating to protect and maintain health in this study. Fish, omega-3 fatty acids, DHA, PUFA

Key Words: Fish, Omega-3, Fatty acids, DHA, PUFA

Effect of Pre-Treatments Applied to Acacia (*Robinia Pseudoacacia*) Seeds on the Percentage of Output and Seed Development

Hakan Karadağ¹, Güzella Yılmaz¹, Kenan Yıldız¹

¹Department of Horticulture, Agriculture Faculty, Tokat Gaziosmanpasa University, Tokat, Turkey

Abstract

In the study, the effect of different applications to seeds on the germination rate of seeds of the black locust plant, which has a high landscape value, was investigated. Some of the seeds were kept in 500 ppm salicylic acid (SA) solution, some in warm water and some in 1000 ppm sodium hypochlorite (NaClO) solutions for 12 hours before sowing. For control treatment, the seeds were sown without any application. Compared with the control, SA, warm water and NaClO caused significant increases in germination rate. The germination rate, which was 22.5% in the control treatment, increased to 37.5% by the SA treatment, 44.2% by the NaClO application, and 50% by the warm water treatment. Applications made to the seeds caused significant changes in plant height and width. The applications made to the seeds before sowing caused significant changes in the germination rate. The fastest germination was determined in the treatment of warm water.

Key Words: Dormancy, sodium hypochlorite, salicylic acid

Akasya (*Robinia pseudoacacia*) Tohumlarına Uygulanan Ön İşlemlerin Çıkış Yüzdesi ve Çöğür Gelişimine Etkisi

Özet

Çalışmada peyzaj değeri yüksek olan yalancı akasya bitkisinin tohumlarının çimlenme oranı üzerine farklı uygulamaların etkisi incelenmiştir. Çalışmada kontrol grubu dışında, 500 ppm salisilik asit (SA), ılık su ve 1000 ppm sodyum hipoklorit (NaClO) çözeltilerinde 12 saat süre bekletme uygulamaları yapılmıştır. Kontrol ile kıyaslandığında hem SA, hem ılık su hem de NaClO çimlenme oranında önemli artışlara neden olmuşlardır. Kontrol uygulamasında %22.5 olan çimlenme oranı SA uygulaması ile %37.5, NaClO uygulaması ile %44.2, ılık su uygulaması ile ise % 50'ye çıkmıştır. Tohuma yapılan uygulamalar bitki boyu ve eninde de önemli değişimlere neden olmuştur. Yine uygulamalar çimlenme hızında da belirgin değişikliklere neden olmuştur. En hızlı çimlenme ılık su uygulamasında tespit edilmiştir.

Anahtar Kelimeler: Dormansi, sodyum hipoklorit, salisilik asit

Giriş

Yalancı akasya (*Robinia pseudoacacia*), *Fabaceae* familyasının *Robinia* cinsi içinde yer alan bir türdür (Aktaş, 2003). *Robinia* cinsindeki bitkiler kışın yaprak döken ağaç veya çalı formundaki türlerdir. Amerika Birleşik Devletleri'nde doğal olarak yetişen yalancı akasya ülkemizde 1916 yılında yetiştirilmeye başlanmıştır. Türkiye'de ilk defa Belgrad Ormanı'nda kurulan fidanlıkta yetiştirilmiş ve Ankara Atatürk Orman Çiftliği'nde kullanılmıştır (Aktaş, 2003).

Yalancı akasya kuru madde miktarı fazla olduğu ve hızlı büyüdüğünden enerji ormanı tesisi için ideal bitkidir. Aynı zamanda sürgün verme özelliği iyi olduğu için baltalık orman oluşturulmasında da tercih edilmektedir (Kızmaz,1998). Diğer baklagiller gibi akasya da havadaki azotu bağlayarak toprağın azot içeriğini artır. Maden atığı bulunan topraklarda, istenmeyen koku olan alanlarda, çöp depolama alanlarında, tarımdan sonra arazinin tekrar kazanımında ve fakir topraklarda ıslah amaçlı kullanımı yanında, kereste ya da yakacak elde etmek amacıyla, kıyı ağaçlandırılmasında çirkin alanların örtülmesinde, çit bitkisi, rüzgar perdesi, gölge ağacı ve arıcılıkta nektar kaynağı olarak kullanılması ile de fonksiyonel bir bitkidir (Kızmaz,1998). Bütün bunların yanında estetik görünümünden dolayı birçok yerde peyzaj tasarımlarında süs bitkisi olarak kullanılmaktadır.

Yalancı akasyanın üretimi çoğunlukla tohumla yapılmaktadır. Ancak fizyolojik ve fiziksel dormansiden dolayı çimlenme oranı düşüktür (Başbağ ve Ayzit 2010; Hazar ve ark 2020). Sert ve geçirimsiz tohum kabuğundan kaynaklanan fiziksel dormansinin etkisini azaltmak için söz konusu tohum kabuğunu aşındırmaya yönelik uygulamaların etkili olabileceğini dair çalışmalar bulunmaktadır. Bu uygulamalardan biri olan sıcak suda bekletmenin akasya tohumlarında çimlenme oranının önemli derecede artışı bildirilmiştir (Masaka ve Yamada 2009; Başbağ ve Ayzit 2010;). Bunun dışında mekanik veya kimyasal uygulamalarla tohum kabuğunun

aşındırılabilirliği ve buna bağlı olarak çimlenmenin artırılabilirliğini belirten araştırma sonuçları bulunmaktadır (Mirzaei ve ark 2013; Jastrzebowski ve ark 2017). Hazar ve ark (2020) mekanik aşındırma ve sıcak suda bekletme uygulamalarının yabancı akasya tohumlarının çimlenme oranını önemli derecede artırdığını, sülfürik asitle yaptığı aşındırmanın ise çimlenme oranında önemli bir değişime neden olmadığını tespit etmişlerdir.

Sert tohum kabuğuna sahip olan tohumlarda çimlenmenin başarılı olması için tohum kabuğunun fiziksel direncini kırma yanında, içsek bazı engelleyicilerin etkisi ile oluşan fizyolojik dinlenme etkisinin de ortadan kaldırılması gereklidir. Bu amaçla çoğunlukla gelişme düzenleyicilerden yararlanılmaktadır. Başta gibberellik asit olmak üzere gelişme düzenleyicilerin çimlenme üzerine etkisi konusunda çok sayıda çalışma yapılmış ve gibberellik asit yanında (Hartmann ve ark., 1990; Bewley, 1997; Cantliffe, 2003) brassinosteroidler ve salisilik asit gibi diğer gelişme düzenleyicilerin de çimlenme olayında etkili olabileceğini kaydedilmiştir (Kim 1991; Lee ve ark 2010).

Bu çalışmada ekim öncesi ılık suda ve sodyum hipoklorit çözeltisinde bekletme yanında salisilik asit uygulamalarının yabancı akasya tohumlarının çimlenmesi üzerine etkisini belirlemek amaçlanmıştır.

Materyal ve Yöntem

Çalışma Gaziosmanpaşa Üniversitesi Tarımsal Uygulama ve Araştırma Merkezi bünyesinde bulunan ısıtmasız serada yürütülmüştür. Çalışmada bitkisel materyal olarak olgun ve sağlıklı yabancı akasya tohumları kullanılmıştır. Tohumlar Yalova'da bulunan özel bir firmadan temin edilmiştir. Bu tohumlardan benzer büyüklükte ve renkte olanlar seçilerek kuruması için oda sıcaklığında 48 saat bekletilmiştir. Ekim zamanına kadar kapalı şişelerde serin bir yerde saklanmıştır. Deneme 22 Nisan 2021 tarihinde kurulmuştur. Bu tarihte tohumların bir kısmı hiçbir uygulama yapılmadan (kontrol), bir kısmı ılık suda, bir kısmı 500 ppm salisilik asit çözeltisinde, bir kısmı ise 1000 ppm sodyum hipoklorit (NaClO) çözeltisinde 12 saat süre bekletildikten sonra içleri torf dolu viyole ekilmiştir. Tohumlar kendi çapları kadar derinliğe (yaklaşık 1-1.5 cm) ekilmiştir. Çalışma, tesadüf parselleri deneme desenine göre 5 tekerrürlü ve her tekerrürde 24 tohum olacak şekilde kurulmuştur. Çıkan bitki sayısı ekilen tohum sayısına bölünerek çıkış oranı olarak ifade edilmiştir. İlk bitki çıkışından itibaren çıkan bitkiler günlük olarak sayılmış ve çıkış hızı belirlenmiştir. 22 Nisan'da viyole tohumları ekilen bitkiler 4 Haziran'da saksılara aktarılmıştır. Saksılara aktarmadan önce bitkilerde boy ve çap ölçümleri yapılmıştır.

Denemede elde edilen veriler tesadüf parselleri desenine uygun olarak varyans analizi ile analiz edildikten sonra uygulama ortalamaları arasındaki farklılık Duncan çoklu karşılaştırma testi ile belirlenmiştir. Hem varyans analizinde hem de çoklu karşılaştırma testlerinde önemlilik seviyesi olarak 0.05 alınmıştır.

Bulgular ve Tartışma

Ekim öncesi tohumlara yapılan bütün uygulamalar kontrole kıyasla çıkış oranında önemli artışlara neden olmuştur. Kontrol olarak ekilen tohumların %22.5'i çıkış yaparken, SA uygulanan tohumlarda bu oran % 37.5 olarak belirlenmiştir (Tablo 1). SA'nın çimlenme üzerine etkisi konusunda yapılan çalışmalarda bitki türüne, uygulanan konsantrasyona bağlı olarak farklı sonuçların alındığı kaydedilmiştir. Dadaşoğlu ve Ekinci (2013) fasulye tohumları ile yaptıkları çalışmada SA'nın yüksek dozlarının çimlenmeyi engellediğini, 0.25 mM SA'nın ise çimlenmede artışa neden olduğunu vurgulamıştır. Kormaz (2005) biberde, Özden ve Kutbay (2008) ise bir çiçek türü olan *Spergularia marina* tohumlarında SA uygulamasının çimlenmeyi artırdığını belirlemiştir. Bu sonuçlar SA'nın çimlenmeyi iyileştirmede alternatif bir uygulama olarak kullanılabileceğini ancak türe ve çeşite özgü uygun dozların belirlenmesinin gerekli olduğunu ortaya koymaktadır.

Birçok çalışmada NaClO'nun tohumlarda dormansinin kırılmasında etkili olduğu ve çimlenmeyi artırdığı bildirilmiştir (Hasiao ve Quick 1984; Hesami ve ark 2017) Benzer şekilde bu çalışmada da NaClO uygulaması çıkış oranını artırmış ve %44.2'ye çıkarmıştır. Tursun (2019) dadırak (*Salvia verticillata* L) tohumlarına sodyum hipoklorit uygulamış ve çimlenme üzerine etkisinin konsantrasyona ve tohumların çözelti içinde bekletilme süresine bağlı olarak değiştiğini tespit etmiştir. Sodyum hipokloridin çimlenme üzerine etki mekanizmasının tohum kabuğunun yapısını değiştirerek içeri daha fazla oksijen girmesine yol açması ile ilişkili olduğu ileri sürülmüştür (Hasiao ve Quick 1984).

Bu çalışmada en yüksek köklenme oranı %50.0 ile ılık su uygulamasından elde edilmiştir. Hazar ve ark (2020) farklı sıcaklıktaki suda beklettikleri yabancı akasya tohumlarından %63.3 ile % 36.7 arasında değişen çimlenme oranları elde ettiklerini bildirmişlerdir. Benzer şekilde Cabra-Rivas ve Castro-Díez (2016) da sıcak su uygulaması ile yabancı akasyada çimlenme oranının artırılabilirliğini ifade etmiştir.

Tablo 1. Farklı uygulamaların akasya tohumlarının çıkış oranı ve çöğür gelişimine etkisi

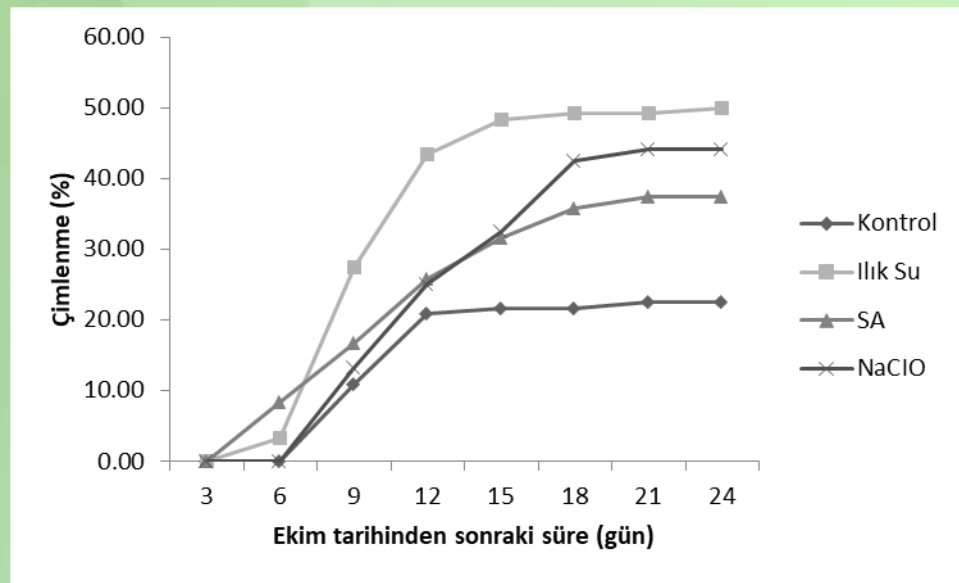
Uygulama	Çıkış oranı	Bitki boyu (cm)	Bitki eni
Kontrol	22.5 c	6.3 b	5.1 c
SA	37.5 b	8.1 a	7.3 a
Ilık su	50.0 a	7.6 a	6.3 b
NaClO	44.2 ab	6.7 b	6.2 b

Aynı sütunda farklı harfle gösterilen ortalamalar arasındaki farklar Duncan çoklu karşılaştırma testine göre önemlidir ($p < 0.05$).

Yalancı akasya tohumlarının çimlenmesini iyileştirmek amacıyla yapılan çalışmalara mekanik, termal veya farklı kimyasallarla aşındırma, gelişme düzenleyici uygulaması gibi farklı yöntemler kullanılmış ve birbirinden farklı sonuçlar alınmıştır. Çok yüksek başarı elde edildiğini bildiren araştırma sonuçları (Giuliani ve ark. 2015) yanında, düşük çimlenme oranının elde edildiğini bildiren araştırma sonuçları da bulunmaktadır (Hazar ve ark. 2020). Bu şekilde değişik sonuçların alınması, yapılan uygulamaların farklı olmasından kaynaklanmış olabileceği gibi, tohum kaynağının farklı olmasından da kaynaklanmış olabilir.

Tohumlara yapına uygulamalar çöğür bitkilerin gelişiminde de farklılıklara neden olmuştur. Tohum ekiminden yaklaşık 40 gün sonra yapılan ölçümlerde SA ve ılık su uygulaması yapılan tohumlardan çıkan bitkilerin kontrol ve NaClO uygulamasına kıyasla daha uzun oldukları tespit edilmiştir. Bitki eni açısından ise en düşük değer kontrol en yüksek değer ise SA uygulamasında ölçülmüştür (Tablo1).

Farklı uygulamalara maruz bırakıldıktan sonra ekilen akasya tohumlarında çıkış hızını belirlemek amacıyla günlük olarak çıkış yapan bitkiler sayılmıştır. Şekil 1’de de görüldüğü gibi en erken çıkış SA uygulanan tohumlarında başlamıştır. Ilık su uygulamasında ilk çıkış tohum ekiminden sonraki 6. günde görülmüş olup daha sonraki günlerde çıkış hızının belirgin şekilde arttığı tespit edilmiştir. Kontrol ve NaClO uygulamasında 9. güne kadar çıkış yapan bitki görülmemiştir. En düşük çimlenme oranına sahip olan kontrol uygulamasında çıkış 12. günde tamamlanmıştır. Diğer uygulamalarda ise 18. güne kadar devam etmiştir.



Şekil 1. Farklı ön uygulamaların yalancı akasya tohumlarının çıkış hızı üzerine etkisi

Sonuç olarak yapılan deneme sonucunda çok yüksek çimlenme oranları elde edilememekle birlikte, yapılan uygulamalarla yalancı akasya tohumlarında çimlenme oranının artırılacağı tespit edilmiştir. Bu sonuçlar ileride deneme konusu yapılacak farklı uygulamalarla yalancı akasya tohumlarında çimlenme oranlarının daha da artırılacağına işaret etmektedir.

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Assessment of Aboveground Insects Associated Within Farm Fields of Musanze District in Rwanda: Abundance and Diversity

Ismael Niyokwizigirwa^{1*}, Sylvestre Habimana¹, Saidi Rumanzi Mbaraka¹, Innocent Nyamwasa¹, Evergiste Niyonsenga¹, Erastus Dushimeyesu¹, Theophile Kanyarwanda¹, Jean Irene Museminari¹, Angelo Ndayiragije², Philippe Sibomana¹

¹School of Agriculture and Food Sciences, College of Agriculture, Animal Sciences and Veterinary Medicine, University of Rwanda, Busogo, Rwanda

²Departments of Statistics Applied to Economics, INES Ruhengeri, Musasnze, Rwanda

Natural pollination and the physical impairments on plant leaves, as well as plant diseases are indicators of the presence of aboveground insects. However, there is less evidence to describe the presence of such insects in Rwanda. Thus, the objective of this study was to assess the abundance of the aboveground insect species in Musanze district, in the Northern part of Rwanda. Insect traps were laid in agricultural fields ten sectors of Musanze district; Busogo, Cyuve, Gacaca, Gataraga, Kimonyi, Kinigi, Musanze, Muhoza, Muko and Nkotsi. The insects were caught using nets during the day and during night the traps were hung with light to attract insects. The insects were trapped and collected two consecutive seasons, during the month of April 2021 (wet season) and July 2021 (dry season). The data were analyzed using SPSS version 24 and Microsoft Excel package. The findings showed that the overall insect species abundance was as follows; Bush cricket (8.6%), Long-horned grass hoppers (15.4%), Bombardier beetles (3.4%), Stunk bug beetles (3.1%), Leaf chaffers (3.4%), Leaf beetles (3.7%), Honey bees (3.6%), Maize leaf hoppers (9.7%), swallowtail butterflies (18.9%), Wasps (2.2%), White butterflies (12.6%), White flies (9.2) and Leaf miners (6.2%). Hence, the results revealed that there is a significant difference in the mean amount between insects trapped. The swallowtails butterflies, which are beneficial insects, were highest in abundance (18.9%) whereas the stung bug beetles was recorded lowest abundance (3.1%). Since the collected insects included major beneficial insects, during insect pest control, farmers are recommended to firstly use trapping and netting methods before pesticides application. This can reduce the cost and dangers to human health and to beneficial insects as well. Besides, they can apply wide spectrum insecticides which have fewer hazards to the environment.

Keywords: *Insects, Abundance, Family, Population, Beneficial, Pest*

Introduction

Insects are distributed all over the world, with about 5 to 7 million species (Samways, 2019, Montgomery et al., 2020;). The exact number of all species is not known, but it is thought to be between 5 and 15 million. They represent the largest class of all living things and account for between 70-80% of all living things (Wilson, 2003). Therefore, many scientists are concerned with specific groups of insects. Some species are still undiscovered and few are fully described in Rwanda (Nyamwasa et al., 2017). From herbivores and pollinators to predators and parasites, this enormous insect diversity brings with it a wealth of ecological interactions (Renner, 2006, Jankielsohn, 2018;). Human life has a difficult relationship with insects (Cardoso et al., 2020). Indeed, they are small and typically hide among plants, in cracks or underground. Moreover, despite the perception of farmers, they have both positive and negative impacts (Nyamwasa et al., 2018). Some of them provide vital ecosystem services and have tremendous functional importance. Since insects are generally considered as pests or potential pests, their ecological importance is often overlooked (Belovsky and Slade, 2000). Therefore, ecosystem cycling, predation, pollination and decomposition are the most important ecological functions of insects in ecosystems (King & Buchmann, 2003).

According to Jankielsohn (2018), insect herbivores are actors in the nutrient cycle from an ecosystem perspective. In fact, they transform living plant biomass into green clippings, grass, and diarrhea. The way herbivores affect nutrient cycling in an ecosystem can be classified as either a slow or a fast cycling process (Belovsky and Slade, 2000; Hartley et al., 2008). Sometimes they also slow down nutrient cycling, resulting in a decrease in plant abundance. On the other hand, plant abundance can increase when herbivores speed up the cycle. Researchers Belovsky and Slade (2020) reported that grasshopper herbivory increases plant abundance due to higher availability of nitrogen (Ngai et al., 2008). The various insects for pollination include bees, flies, butterflies and beetles (King & Buchmann, 2003, Tolera and Ballantyne, 2021). They play an important role in agriculture because of their roles as mentioned above. Farmers perceive the splendour and glory of flowers, but the fact that they need to remember or care for pollinators is often ignored (Cardoso et al., 2020). However, insect pollinators contribute to plant diversity. Obviously, pollination is an ecological process that links plants and animals. Therefore, the diversity of creatures involved in the transfer of pollen from one plant to another is amazing (Calderone, 2012). Other insects are predators of each other (Lavandero et al., 2004). For example, beetles are

natural enemies of aphids that transmit viral diseases to plants (Hewlett et al., 2019). Moreover, according to the best theory, decomposers of organic matter are set by their mothers (Garcia-Robledo et al., 2012). For this purpose, they lay their eggs under the leaves to protect the offspring from natural enemies. The functions that some insects perform in an ecosystem contribute to the crops grown. Therefore, they are vital to humans (Cardoso et al., 2020). In Rwanda, more specifically in Musanze district in Northern Province, each cultivated crop is attacked by different species of insects called pests (Nyamwasa et al., 2017). The latter have a direct impact on agricultural food production. They do this by nibbling the leaves of plants, sucking plant sap, boring into the roots, stems or leaves and spreading plant infections. Some of them also contribute to plant production. The range of description of insect diversity is still low in Rwanda, so that each species is perplexed and perceived exclusively as a pest (Wilson, 2003). This study is vital to be carried out in Rwanda. In fact, the type of aboveground insect species perceived by field farmers is poorly described (Nyamwasa et al., 2018). Also, the extent of occurrence of each insect species has not been well explored. Therefore, this study aims to highlight the abundance of above ground insect species in the fields of Musanze district as information tool for insect diversity and presence of beneficial insects despite the use of broad spectrum insecticides.

Materials and Methods

Experimental site

The experiment was conducted in Musanze district, Northern Province Rwanda. This district is located in the volcanic highlands at coordinates of 01°14'59.7" South and 036°44'28.8" East, at an altitude of 1820 meters above sea level (masl). The average annual rainfall in this region is 1746 millimeters, the average maximum temperature is 23°C and the average minimum temperature is 12°C (RMA, 2021). Within Musanze district, ten sectors; Busogo, Cyuve, Gacaca, Gataraga, Kimonyi, Kinigi, Muhoza, Muko, Musanze, and Nkotsi were selected for insect sampling (Figure 1).

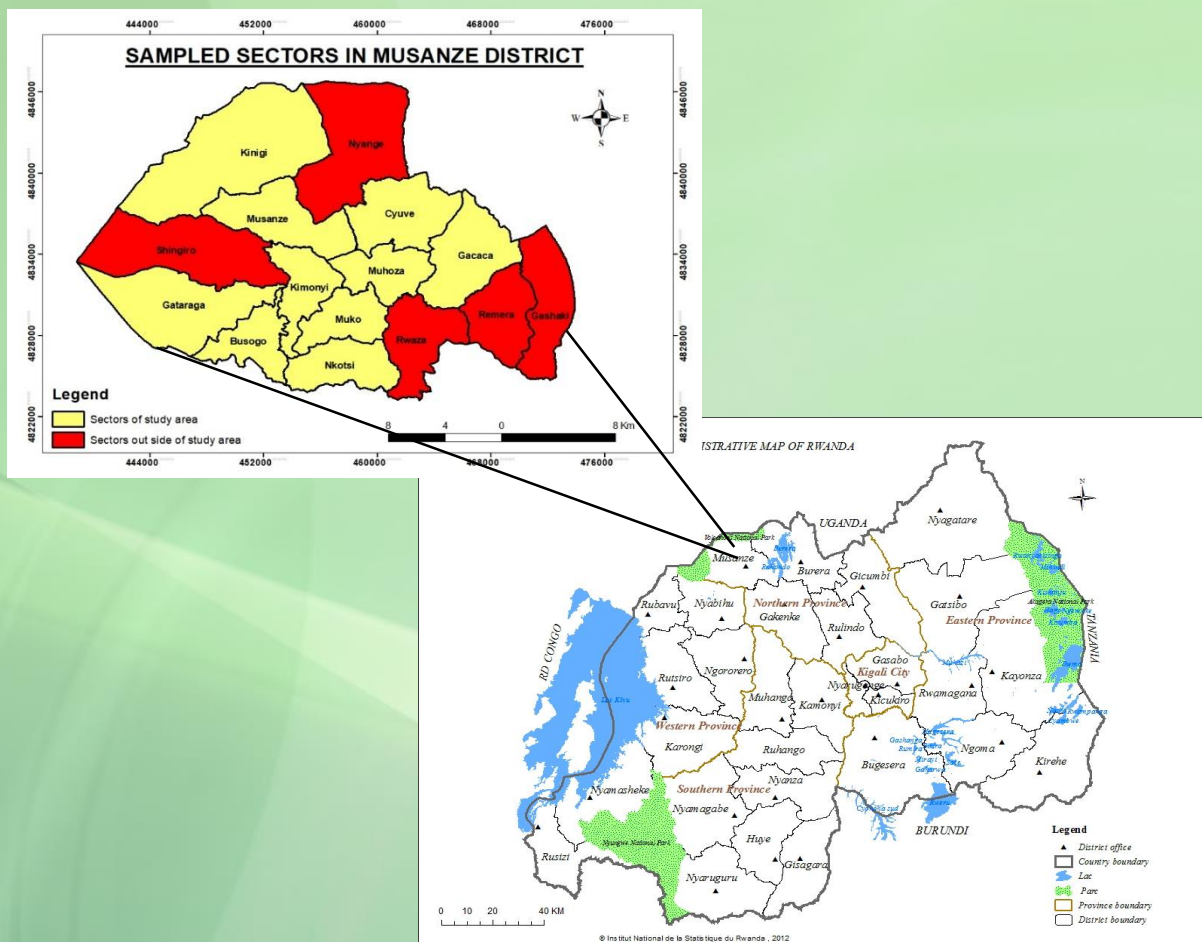


Figure 1. Map of sampling locations (sectors) in Musanze district, Rwanda

Insect collection method

To collect insects, three traps were randomly laid in selected agricultural fields in each of the ten sectors of Musanze district; Busogo, Cyuve, Gacaca, Gataraga, Kimonyi, Kinigi, Muhoza, Muko, Musanze, and Nkotsi. Insects were manually caught using nets during day and trapped at night. For the night traps, each trap consisted of a plastic container filled with water mixed with ordinary soap bubbles and the container was staked with three sticks. A portable lamp was hanged from the side of the container as a source of light to attract insects at night (Figure 2). The insects attracted by light to the trap were expected to somehow fall and get trapped in the soap in the container. The captured insect species were separated, counted and preserved in 96% ethanol and later observed under a light microscope. Images of the insect species were taken using a digital camera.



Figure 2. Insect light trap method used during insect sampling.

(a) Set-up of the light trap method. (b) Different insect species trapped in water mixed with ordinary soap. (c) Separation of insects from water prior to identification.

Data analysis

The data were entered in SPSS version 24 and excel soft wares to analyze the significant difference and abundance of insect populations respectively.

Results and Discussion

A total of 2,135 individual insects were sampled during the wet season and of these 13 insect species belonging to 12 families were identified (Table 1). Collected insects were; bush crickets (Tettigonnidae) (8.4%), long-horned grasshopper (Tettigonnidae) (17.6%), bombardier beetles (Carabidae) (2.2%), Stink bug beetles (Pentagonidae) (1.7%), Leaf chaffer (Scarabidae) (2.0%), Leaf beetle (Chrysomelidae) (2.5%), Honey bees (Apidae) (9.9%), Maize leaf hopper (Cicaderidae) (15.5%), Swallowtail butterflies (Papilionidae) (1.4%), Wasps (Vespidae) (22.0%) White butterflies (Pieridae) (9.2%) and Leaf miner (5.3%) (Table 1) (Figure 3). The same insect species were predominant during the dry season, however there was variation in their abundance. Among the 3,462 insects sampled, bush crickets were 8.7%, long-horned grasshopper (14.0%), bombardier beetles (4.2%), Stink bug beetles (3.9%), weaf chaffer (4.4%), Leaf beetle (4.4%), Honey bees (9.6%), Maize leaf hopper (10.9%), Swallowtail butterflies (2.7%), wasps (17.0%), White butterflies (9.2%) and Leaf miner (6.8%) (Table 2). The findings further showed that the overall insect species abundance was as follows; Bush cricket (8.6%), Long-horned grass hoppers (15.4%), Bombardier beetles (3.4%), Stunk bug beetles (3.1%), Leaf chaffers (3.4%), Leaf beetles (3.7%), Honey bees (3.6%), Maize leaf hoppers (9.7%), Swallowtail butterflies (18.9%), Wasps (2.2%), White butterflies (12.6%), White flies (9.2%) and Leaf miners (6.2%) (Figure 4). In both seasons, swallowtail butterflies were most abundant and wasps were least abundant (Figure 5). Of these insect species, bombardier beetles (Carabidae), Waps

(Vespidae), Honey bees (Apidae), Swallowtail butterflies (Papilionidae), and White butterflies (Pieridae) are categorized as beneficial insects while bush crickets and long-horned grasshoppers (Tettigoniidae), Whiteflies (Agromyzidae), Stink bug beetles (Pentagonidae), Leaf chaffer (Scarabidae), Leaf beetle (Chrysomelidae), Maize leaf hopper (Cicaderidae), and leaf miner (Agromyzidae) are potential crop pests. Our results showed that the swallowtail butterflies (Papilionidae) and Long-horned grasshoppers (Tettigoniidae) were most abundant across the two seasons (Table 1 and 2). However, the two insect species were more abundant in the dry season than in the wet season (Figure 5). The increase in number of swallowtail butterflies and grasshoppers in the dry season is associated with increase in temperature which stimulates their more reproduction and movement (Cormont et al., 2011; Wolesensky and Joern, 2015; Fox et al., 2019). Rain has been suggested to disrupt the reproduction cycle of different insect species thus insects tend to increase during the transition of dry season to the start of rain season (Pereira da Silva et al. (2011). In Rwanda,, similar research studies on insects were carried out in Western, Southern and Eastern parts of the country. Other reports revealed that the insect populations in Formicidae family are prevalent in Southern Province of Rwanda (Nsabimana et al., 2013). Likewise, the Western and Eastern parts the country, there are parasitoids which are beneficial (Encyrtidae) and species in Psyllidae as pestin Eucalyptus plant (Gasangwa and Ueno, 2019). Moreover, the beetles (*Anomala spp.*) are dominant in soil insect pests in higher lands of Rwanda (Nyamwasa et al., 2017).

Table 1. List of insect species collected in ten sectors of Musanze district during the month of April in 2021 (Wet season)

Insect species	Family	Number of insects collected											OA
		1	2	2	3	4	5	6	7	8	9	T	
Bush Cricket	Tettigoniidae	23	18	27	18	16	18	15	18	17	10	180	8.4
Long-horned grass hopper	Tettigoniidae	43	46	44	36	36	39	30	37	38	27	376	17.6
Bombardier beetles	Carabidae	11	11	4	1	3	9	2	1	1	3	46	2.2
Stink bug beetles	Pentatomidae	1	1	3	10	1	12	1	1	2	5	37	1.7
Leaf chaffers	Scarabidae	11	2	1	1	3	11	4	3	4	3	43	2.0
Leaf beetle	Chrysomelidae	1	3	11	9	2	10	1	10	1	6	54	2.5
Honey bees	Apidae	11	3	2	4	5	13	1	3	4	3	49	2.3
Maize leaf hopper	Cicadelidae	27	26	22	21	22	21	18	21	19	14	211	9.9
Butterflies	Papilionidae	39	41	38	30	29	36	26	33	34	24	330	15.5
Wasps	Vespidae	3	5	5	1	4	2	1	3	1	4	29	1.4
White Butterflies	Braconidae	51	43	45	43	44	50	47	46	49	51	469	22.0
Whiteflies	Aleyrobidae	7	22	22	17	21	20	33	16	19	20	197	9.2
Leaf miner	Agromyzidae	11	11	19	11	7	7	17	3	14	14	114	5.3
Total = 2135													

1: Busogo, 2: Cyuve, 3: Gacaca, 4: Gataraga, 5: Kinigi, 6: Muhoza, 7: Muko, 8: Musanze, 9: Nkotsi, T: Total, OA: Overall abundance (%)

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Insects	Between Groups	841.528	40	21.038	1.883	.007
	Within Groups	994.349	89	11.172		
	Total	1835.877	129			
Sectors	Between Groups	375.267	40	9.382	1.198	.239
	Within Groups	697.233	89	7.834		
	Total	1072.500	129			

From the results, it can be seen that the sig. = 0.007 is less than 0.05. This means that the null hypothesis is rejected and there is a significant difference between insects collected. Similarly, the sig.=0.23 is greater than 0.05 which means that the null hypothesis that there is no difference between the insect populations is accepted and it is concluded that there is no significant difference within sectors for wet season.

From the results, it can be seen that the sig. = 0.005 is less than 0.05. This means that the null hypothesis is rejected and there is a significant difference between insects collected. Similarly, the sig.=0.676 is greater than 0.05 which means that the null hypothesis that there is no difference between the insect population is accepted and it is concluded that there is no significant difference within sectors for dry season.

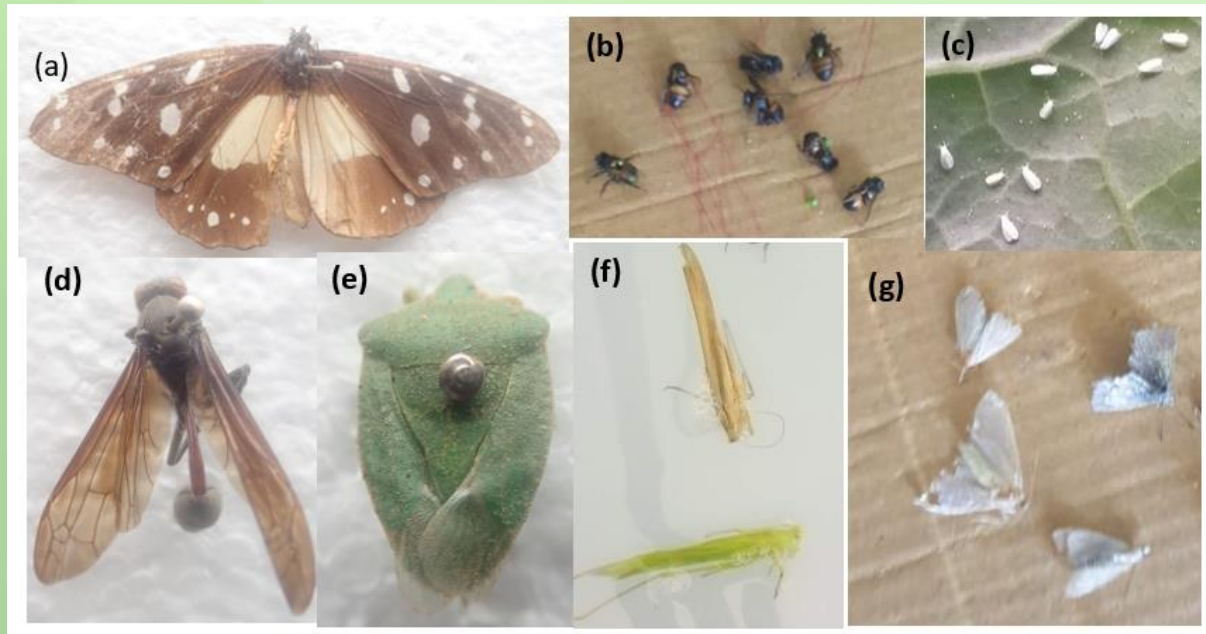


Figure 3. Some of the insect species sampled during data collection in Musanze district.
(a) Swallowtail butterflies (Papilionidae), (b) Honey bees (Apidae), (c) Whiteflies (Aleyrobidae), (d) Wasps (Vespidae), (e) Stink bug beetles (Pentatomidae) (f) Long-horned grasshopper (Tettigoniidae) and (g) White butterflies (Pieridae).

Table 2. List of insect species collected in ten sectors of Musanze district during the month of July in 2021 (Dry season)

Insect species	Family	Number of insects collected											OA
		1	2	2	3	4	5	6	7	8	9	T	
Bush cricket	Tettigoniidae	35	30	39	30	28	30	27	30	29	22	300	8.7
Long-horned grass hopper	Tettigoniidae	50	58	53	48	45	51	42	49	50	39	485	14.0
Bombardier beetles	Carabidae	23	23	8	11	15	21	14	11	11	9	146	4.2
Stink bug beetles	Pentatomidae	12	11	9	22	13	24	11	13	14	7	136	3.9
Leaf chaffers	Scarabidae	23	14	12	13	9	23	16	15	16	9	150	4.3
Leaf beetle	Chrysomelidae	11	9	23	21	14	22	12	22	13	6	153	4.4
Honey bees	Apidae	23	15	10	16	17	25	13	15	8	9	151	4.4
Maize leaf hopper	Cicadelidae	39	38	34	33	34	33	30	33	31	26	331	9.6
Butterflies	Papilionidae	49	40	45	39	25	45	35	40	25	33	376	10.9
Wasps	Vespidae	9	7	7	11	8	12	11	9	12	8	94	2.7
White Butterflies	Pieridae	63	55	57	55	56	62	59	58	61	63	589	17.0
Whiteflies	Aleyrobidae	19	34	34	29	33	32	45	28	31	32	317	9.2
Leaf Miner	Agromyzidae	23	23	31	23	19	19	29	15	26	26	234	6.8
Total =												3462	

1: Busogo, 2: Cyuve, 3: Gacaca, 4: Gataraga, 5: Kinigi, 6: Muhoza, 7: Muko, 8: Musanze, 9: Nkotsi, T: Total, OA: Overall abundance (%)

ANOVA						
Insects	Between Groups	Sum of Squares	df	Mean Square	F	Sig.
	Within Groups	946.996	46	20.587	1.922	.005
	Total	888.881	83	10.709		
Sectors	Between Groups	1835.877	129			
	Within Groups	351.836	46	7.649	.881	.676
	Total	720.664	83	8.683		
		1072.500	129			

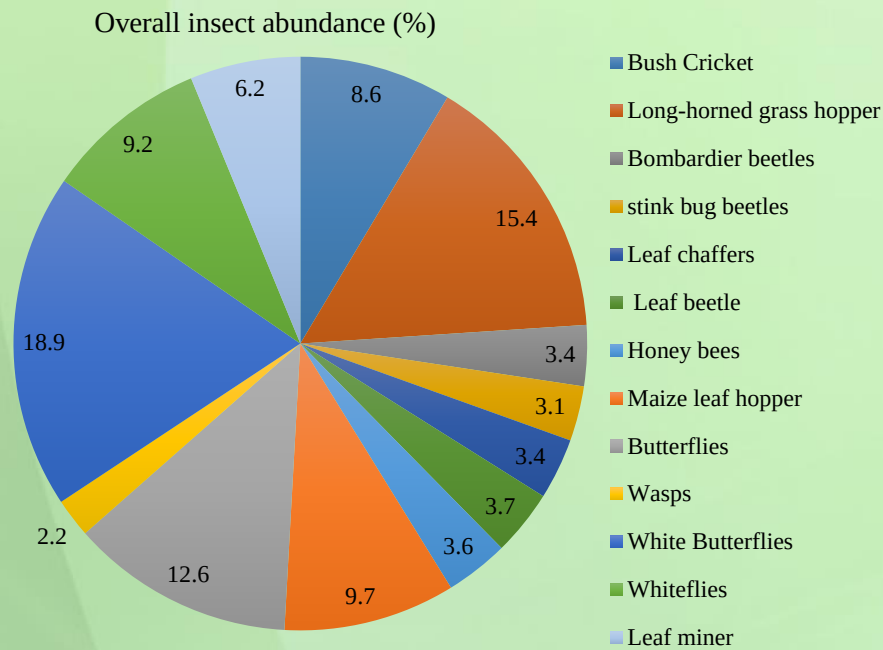


Figure 4. Overall insect species abundance in ten sectors of Musanze district.

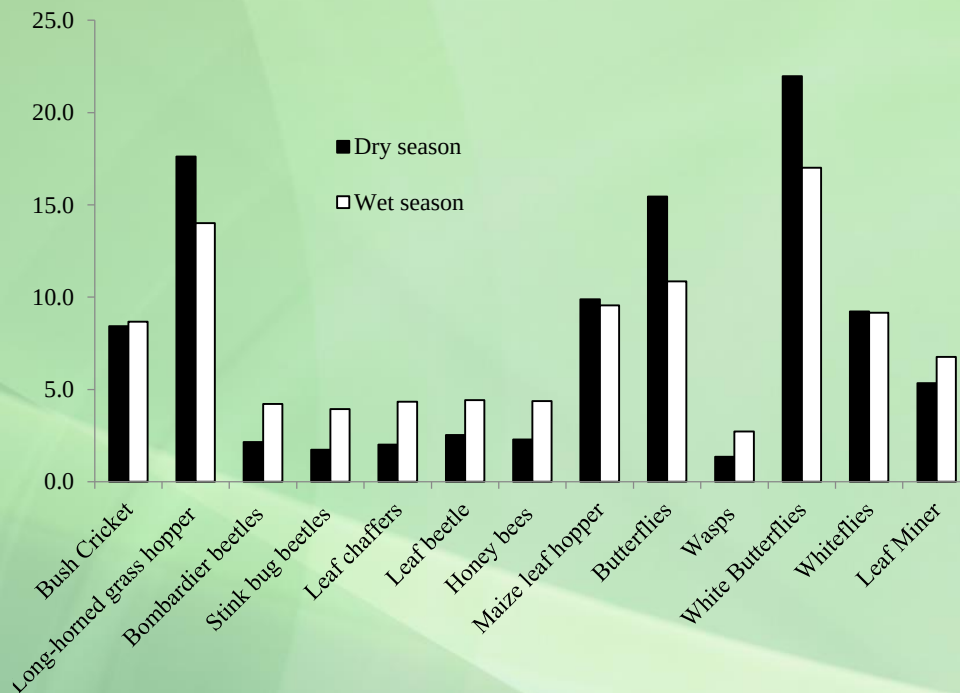


Figure 5. Insect species comparison between wet and dry seasons

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Effects of Eggplant Peel Extracts Obtained with Different Extraction Techniques on Physicochemical Properties and Oxidative Stability of Cooked Beef Meatballs During Refrigerated Storage

Azim Şimşek¹

¹Department of Food Processing, Eğirdir Vocational School, Isparta University of Applied Sciences, Isparta, Turkey

Abstract

The aims of the present study were to evaluate the effects of eggplant peel extracts (EPP; 0.5% and 1%) obtained with ethanolic (80%) extraction (EE) and ultrasound-assisted ethanolic (80%) extraction (UAEE) on physicochemical properties and oxidative stability of cooked beef meatballs during refrigerated storage (4°C; 9 d) in atmospheric conditions. The results showed that the EPP obtained with UAEE presented the higher total phenolic content (TPC) and ferric reducing antioxidant power (FRAP) value and a lower 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity value (IC₅₀) than that obtained of EE ($P<0.05$). The beef meatballs treated with EPP (except UAEE-0.5 group) had greater cooking loss values comparing with control or BHT treated group ($P<0.05$). The pH values of cooked beef meatballs decreased with the addition of EPP obtained by both extraction techniques ($P<0.05$). However, the pH values of the samples treated with EPP were higher compared to the control at the end of the storage ($P<0.05$). In addition, pH values in all beef meatball groups increased on day 3 and then decreased on day 9 ($P<0.05$). In general, the samples treated with EPP had lower L^* and a^* values compared to the BHT treated group ($P<0.05$). On the other hand, the L^* values of the samples containing 1.0% EPP obtained with EE or UAEE were lower than control ($P<0.05$). Whereas the lower a^* (except EE-0.5 group) and the higher b^* values were obtained in the groups treated with EPP than control during the first 3 days of storage ($P<0.05$), no significant differences in terms of a^* or b^* values among the control and EPP treated groups were determined during the rest of the storage. The cooked beef meatballs containing all EPP ratios had lower thiobarbituric acid reactive substances (TBARS) and lipid hydroperoxide (LPO) values than the control and BHT treated groups during refrigerated storage for 9 d ($P<0.05$). Moreover, the lower TBARS and LPO values were obtained as the EPP ratio increased ($P<0.05$). As a result of using 1% of EPP obtained with UAEE, it was observed that the oxidation levels (TBARS and LPO) were lower than the using same ratio of EPP obtained with EE ($P<0.05$). Therefore, the results of this study suggest that EPP has the potential to be used as a natural antioxidant in retarding lipid oxidation in cooked meat products. Furthermore, UAEE was more effective in extracting antioxidant compounds from eggplant peel compared to EE.

Key Words: Eggplant peel, Extract, Meatball, Lipid oxidation, Ultrasound.

Effect of Walnut Tea and Microcapsule Saturated with Lavender Oil on Vase Life of Gerbera Flowers

Güzella Yılmaz¹, Hakan Karadağ¹

¹Department of Horticulture, Agriculture Faculty, Tokat Gaziosmanpasa University, Tokat, Turkey

Abstract

In the study, it was aimed to increase the vase life of Basic, Ulaş and Terra Ozan cultivars of Gerbera sp. For this purpose, microcapsules containing lavender oil (1000 and 1500 ppm) and naturally obtained walnut tea (33% and 50%) were used. Sucrose (4%) was added to all vase solutions, including the control group solutions. The experiment was set up with 3 replications (three vases) for each treatment and one flower per replication. As a result of the experiment, it was observed that both walnut tea and lavender treatments did not cause a significant change in the vase life of the Terra Ozan cultivars. In the Basic cultivar, the vase life of the flowers in the solution containing lavender oil was longer than that in the solution containing walnut tea, but both treatments did not make a significant difference compared to the control. In Ulaş, both walnut tea and lavender oil applications caused significant increases in the vase life of the flowers. The applications made in the study caused significant changes in the water intake of the flower stems. The treatments that increase the water intake also increased the vase life.

Key Words: Postharvest, Micro Capsule, natural compound

Gerbera Çiçeklerinin Vazo Ömrü Üzerinde Ceviz Çayı ve Mikro kapsüle Emdirilmiş Lavanta Yağının Etkisi

Özet

Çalışmada, Gerbera bitkisine ait Basic, Ulaş ve Terra Ozan çeşitlerinin vazo ömrünü arttırmak amaçlanmıştır. Bu amaçla doğal yollarla elde edilen ceviz çayı (%33 ve %50) ve lavanta yağı emdirilmiş (1000 ve 1500 ppm) mikro kapsüller kullanılmıştır. Kontrol grubu solüsyonları da dahil olmak üzere vazo solüsyonlarının hepsine %4 şeker ilavesi yapılmıştır. Deneme, her solüsyon çeşidi için 3 tekerrür (üç vazo) ve her tekerrürde 1 çiçek olacak şekilde kurulmuştur. Deneme sonunda, Terra Ozan çeşidinde hem ceviz çayı hemde lavanta yağı uygulamalarının vazo ömründe önemli bir değişime neden olmadığı görülmüştür. Basic çeşidinde lavanta yağı içeren solüsyondaki çiçeklerin vazo ömrü, ceviz çayı içeren solüsyondakilere göre daha uzun olmuş ancak her iki uygulamada kontrole kıyasla önemli bir farklılık oluşturmamıştır. Ulaş çeşidinde ise hem ceviz çayı hemde lavanta yağı uygulamaları çiçeklerin vazo ömründe önemli artışlara neden olmuştur. Yapılan uygulamalar çiçek gövdelerinin su alımında da önemli değişimlere neden olmuştur. Su alımını artıran uygulamalar vazo ömrünü de artırmıştır.

Anahtar Kelimeler: Hasat sonrası, Mikro Kapsül, doğal bileşik

Determining the Effects of Laying Time and Age Differences on Calculated Egg Parameters of White Layer Pure Line

Hasan Eleroğlu¹

¹Department of Plant and Animal Production, Sivas Vocational School, Sivas Cumhuriyet University, 58140 Sivas, Turkey

Abstract

In this study, the White Layer Pure Line that housing as individual cage system at the Poultry Research Institute in Ankara was used. Eggs obtained from 24, 28, 32, 36 and 40 weeks old eggs were collected 3 times a day in the morning (10:00), noon (12:00) and evening (15:00). Egg Size and Egg Width (YBE), Shape Index and Elongation (SIE), Egg Surface Area and Volume (YAH), Shell Weight and Shell Thickness (CAS), Number of Pores and Pore Density (GSY), Yellow Ratio and Yellow Weight (SOA), Albumen Weight and Albumen Ratio (AO) were examined in 438 eggs obtained from these chickens found in these cages which are three tiers as upper, middle and bottom. The difference in cage layer did not have a significant effect on the calculated properties ($P > 0.05$). On the other hand, the effect of laying time on all traits obtained from these calculations based on egg weight was found to be significant ($P < 0.01$).

Key Words: Laying Time, Cage Layer, White Layer, Egg Characteristics, Numerical Method

Sayısal Yöntemlerle Belirlenen Yumurta Parametreleri Üzerine Yumurtalama Zamanı ve Kafes Katı Farklılığının Etkisi

Özet

Bu araştırmada, Ankara Tavukçuluk Araştırma Enstitüsünde bireysel kafes gözlerinde barındırılan beyaz yumurtacı saf hat kullanılmıştır. Yüz elli adet tavuktan 24, 28, 32, 36 ve 40. haftalık yaşlarda elde edilen yumurtalar sabah (10:00), öğlen (12:00) ve akşam (15:00) olmak üzere günde 3 kez toplanmıştır. Üst, orta ve alt olmak üzere 3 farklı katta bulunan tavuklardan elde edilen 438 adet yumurta ağırlığı üzerinden Yumurta Boyu ve Yumurta Eni (YBE), Şekil İndeksi ve Elongasyon (SIE), Yumurta Yüzey Alanı ve Hacmi (YAH), Kabuk Ağırlığı ve Kabuk Kalınlığı (KAK), Gözenek Sayısı ve Gözenek Yoğunluğu (GSY), Sarı Oranı ve Sarı Ağırlığı (SOA), Ak Ağırlığı ve Ak Oranı (AO) değerleri hesaplanmıştır. Hesaplanan özellikler üzerine kafes katı farklılığı önemli bir etkide bulunmamıştır ($P > 0,05$). Buna karşılık yumurta ağırlığına dayanan bu hesaplamalardan elde edilen bütün özellikler üzerine yumurtlama zamanının etkisi önemli bulunmuştur ($P < 0,01$).

Anahtar Kelimeler: Yumurtlama zamanı, Kafes Katı, Beyaz yumurtacı, Yumurta özellikleri, Sayısal Yöntem

Use of Essential Oils in Food Marination

Halenur Yıldız¹, Buket Er Demirhan²

¹Department of Food Analysis and Nutrition, Institute of Health Sciences, Gazi University, Ankara, Turkey

²Department of Pharmaceutical Basic Sciences, Faculty of Pharmacy, Gazi University, Ankara, Turkey

Abstract

Marinating is a method that has been used for centuries to improve the quality of foods. The main purpose of this method is to inhibit microbial growth, tenderize meat products, improve flavor and extend the shelf life of foods. The ingredients commonly used in marinating are water, salt, phosphates, and organic acids. Traditionally used marinades include vinegar, wine, yogurt, juices and oils. Apart from these marinades, essential oils are also among the substances used in food marination. Essential oils have been known and used since ancient times for their antioxidant and antimicrobial effects. Essential oils have a specific aroma, taste, and odor. It contains many bioactive components, such as terpenes, alcohols, aldehydes, ketones, carboxylic acids, lactones and sulfides. It is known that they have antimicrobial and antioxidant effects, depending on the phytochemical components it contains. Due to these properties, it is used as a natural ingredient in many pharmaceuticals and cosmetic products. There are various studies on the use of essential oils in foods. Due to their bioactive compounds, they have a reducing effect on oxidation and inhibiting microbial growth in foods. In this study, it is aimed to give general information about the use of essential oils in food marination.

Key Words: *Essential oils, Marination, Food quality*

Gıda Marinasyonunda Esansiyel Yağların Kullanımı

Özet

Marinasyon, gıdaların kalitesini artırmak için yüzyıllardır kullanılan bir yöntemdir. Bu yöntemin temel amacı mikrobiyal gelişmeyi engellemek, et ürünlerini yumuşatmak, lezzeti iyileştirmek ve gıdaların raf ömrünü uzatmaktır. Marinasyonda yaygın olarak kullanılan bileşenler su, tuz, fosfatlar ve organik asitlerdir. Geleneksel olarak kullanılan marinatlar arasında sirke, şarap, yoğurt, meyve suları ve yağlar bulunmaktadır. Bu marinatların dışında esansiyel yağlar da gıda marinasyonunda kullanılan maddeler arasındadır. Esansiyel yağların antioksidan ve antimikrobiyal etkileri nedeniyle eski çağlardan beri bilinmekte ve kullanılmaktadır. Esansiyel yağların kendine has bir aroması, tadı ve kokusu vardır. Terpenler, alkoller, aldehytler, ketonlar, karboksilik asitler, laktonlar ve sülfürler gibi birçok biyoaktif bileşen içermektedir. İçerdiği fitokimyasal bileşenlere bağlı olarak antimikrobiyal ve antioksidan etkileri olduğu bilinmektedir. Bu özelliklerinden dolayı birçok ilaç ve kozmetik üründe doğal bir bileşen olarak kullanılmaktadır. Esansiyel yağların gıdalarda kullanımı ile ilgili çeşitli çalışmalar bulunmaktadır. Biyoaktif bileşikler sayesinde gıdalarda oksidasyonu azaltıcı ve mikrobiyal büyümeyi önleyici etkiye sahiptirler. Bu çalışmada, esansiyel yağların gıda marinasyonunda kullanımı hakkında genel bilgi verilmesi amaçlanmıştır.

Anahtar Kelimeler: *Esansiyel yağlar, Marinasyon, Gıda kalitesi*

Induction of line x tester for genetic analysis of iron & zinc micronutrients in parents and their hybrids in bread wheat

Basit Imran¹, Rana Arsalan Javaid^{2*}, Ghulam Shabbir¹, Qurat ul Ain Sani³ Muhammad Ilyas¹, Munir Ahmad¹

¹ Department of Plant Breeding and Genetics, PMAS Arid Agriculture University, Rawalpindi

² Crop Sciences Institute, National Agricultural Research Centre Islamabad

³ Department of Plant Biotechnology, National University of Science and trechnology Islamabad

⁴ Department of Zoology, University of Gujrat, Rawalpindi

*Corresponding Author: ranaarsalan48@gmail.com

Abstract

Wheat is a most important staple crop in the world but genetically it is deficient in micronutrients like iron and zinc that plays key role in human growth. There is a dire need to improve the concentration of these micronutrients and there are many strategies to overcome this malnutrition. Incorporation of micronutrients into wheat varieties through genetic manipulation is one of them. Therefore, present study was designed for biofortification where three female lines, four testers and 12 hybrids were evaluated for two consecutive years. These genotypes were evaluated for morphological characters, yield and the micronutrient concentrations. Mean square values for the traits like days to maturity, number of tillers per plant, plant height and grain yield per plant, zinc and iron contents possessed highly significant differences and traits like 1000 grain weight had significant differences suggesting that the genotypes studied had genetic variation. In case of line $\times$ tester analysis highly significant differences were observed in number of tillers per plant, zinc and iron contents, whereas significant different for thousand grain weight. Specific combining ability (SCA), General combining ability (GCA), variances and their ratio showed that SCA was higher than GCA in days to maturity, grain yield/plant, number of tillers per plant, plant height and 1000 grain weight. These analysis depicted that they were under control of non-additive type of gene action. Variances due to SCA, GCA and their ratio indicated that iron and zinc contents were also under non-additive type of gene action and suggested that selection should be delayed accordingly as non-additive type of gene action prevails.

Keywords: Biofortification, Malnutrition, Combining Ability, Yield, Gene action

Sperm Parameters and Factors Affecting Fertility in Artificial Insemination in Turkeys

Hasan Eleroğlu¹

¹Department of Plant and Animal Production, Sivas Vocational School, Sivas Cumhuriyet University, 58140 Sivas, Turkey

Abstract

Since the males used in turkey breeding are heavy and broad-breasted, successful mating and sufficient fertility cannot be achieved. Therefore, obtaining fertile eggs from females requires artificial insemination. Sperm production depends on the development of the male turkey's reproductive organs. Male turkeys should be milked no more than two or three times a week. There should be absolutely no blood in the sperm. Sperm volume is low at the beginning and end of the production season. Quality sperm production process takes an average of 15 weeks. Undiluted sperm should be used within 35-40 minutes to avoid adversely affecting fertility. Insemination tubes should not be reused to reduce the risk of disease. High fertility is obtained from weekly insemination with a dose of 60-80 million spermatozoa under controlled trial conditions. The experience of the insemination team is the most influential factor on targeted fertility. The presence of a shaped egg in the uterus during insemination causes low fertility. Egg production also has an effect on fertility and hatchability. Records must be kept in order to ensure the reproductive capacity of turkeys. Artificial insemination application should be arranged to minimize stress. Between milkings, turkeys should be given a two-day rest period. In this study, artificial insemination technique, sperm parameters and factors affecting fertility in breeding turkey production were emphasized.

Key Words: *Breeding, Artificial insemination, Sperm quality, Fertility, Nutrition*

Hindilerde Sperm Parametreleri ve Yapay Tohumlamada Döllülüğü Etkileyen Etmenler

Özet

Hindi yetiştiriciliğinde kullanılan erkekler ağır ve geniş göğüslü olduklarından başarılı çiftleşme ve yeterli döllülük sağlanamamaktadır. Bu nedenle dişilerden döllu yumurta alınması yapay tohumlamayı gerektirir. Sperm üretimi erkek hindinin üreme organlarındaki gelişmeye bağlıdır. Erkek hindiler haftada en fazla iki veya üç kez sağılmalıdır. Sperm içinde kesinlikle kan bulunmamalıdır. Sperm hacmi üretim sezonu başında ve sonunda düşüktür. Kaliteli sperm üretim süreci ortalama 15 haftadır. Döllülüğün olumsuz etkilenmesini önlemek için sulandırılmamış sperm, 35-40 dakika içerisinde kullanılmalıdır. Hastalık riskini azaltmak için tohumlama tüpleri tekrar kullanılmamalıdır. Kontrollü deneme koşullarında 60-80 milyon spermatozoa içeren dozla haftalık yapılan tohumlamadan yüksek döllülük elde edilmektedir. Tohumlama ekibinin deneyimi hedeflenen döllülük üzerinde en etkili faktördür. Tohumlama sırasında uterusda şekillenmiş yumurtanın bulunması düşük döllülüğe neden olmaktadır. Hindilerin üreme kapasitesinden emin olmak için kayıtların düzenli tutulması gerekir. Yapay tohumlama uygulaması stresi en aza indirecek şekilde düzenlenmelidir. Sağimler arasında hindilere iki günlük dinlenme süresi verilmelidir. Bu çalışmada, damızlık hindi üretiminde yapay tohumlama tekniği, sperm parametreleri ve döllülüğü etkileyen etmenler üzerinde durulmuştur.

Anahtar Kelimeler: *Damızlık, Yapay tohumlama, Sperm kalitesi, Döllülük, Besleme*

Determination of Antioxidant Activity of Corn Cob That Is Agricultural Waste

Yağmur Erim Köse

Van Yuzuncu Yil University Faculty of Engineering Department of Food Engineering, Van-Turkey

Abstract

Corn cob, known as food waste, is released as a result of breaking the corn kernels and, approximately 18 kg of cob is obtained from every 100 kg of corn. A sustainable waste management system not only prevents environmental problems, but also ensures the recovery of energy and raw materials simultaneously. For this reason, in this study; the total phenolic content and antioxidant activity of the extracts of corn cobs were determined and reuse possibilities in areas such as the food, pharmaceutical, and cosmetics industries were investigated. The cob used in the study was obtained from the Tirebolu district of Giresun province, and the total phenolic content, antioxidant capacity (DPPH and ABTS•+ radical scavenging capacity assays) were investigated. DPPH antioxidant activity was determined as % inhibition and the mean value was determined as 77.27%. The antioxidant activity value of the cob extracts obtained by ABTS method was determined as 13.52 mmol trolox/g. Total phenolic content of the samples was calculated as gallic acid equivalent on dry matter and 3129.167 mgGAE / 100g DM was determined. When the results are compared with the results of different grains and grain wastes researches in the literature, it is possible to say that the antioxidant activity of corncob is quite high. This finding is very important in terms of being a pioneer in research on corn waste and will also contribute to the sustainable waste management system.

Key Words: Corn cob, Waste, Waste management, Antioxidant activity

Tarımsal Atık Olan Mısır Koçanının Antioksidan Aktivitesinin Belirlenmesi

Özet

Mısır tanelerinin koparılması sonucu açığa çıkan ve bir gıda atığı olarak bilinen mısır koçanının, her 100 kg mısırdan yaklaşık olarak 18 kg kadar elde edildiği bilinmektedir. Sürdürülebilir atık yönetimi sistemi sadece çevresel problemlerin önüne geçmekle kalmayıp, eşzamanlı olarak enerji ve hammaddenin geri kazanımını da sağlamaktadır. Bu amaç doğrultusunda çalışmada; mısır koçanlarından elde edilen ekstraktların toplam fenolik madde ve antioksidan aktivite kapasiteleri belirlenerek, gıda, eczacılık, kozmetik gibi alanlarda tekrardan kullanılabilme olasılığı araştırılmıştır. Araştırmada kullanılan mısır koçanı Giresun ilinin Tirebolu ilçesinden temin edilmiş olup, metanol ile hazırlanan koçan ekstraktlarının toplam fenolik madde içeriği belirlenerek, antioksidan kapasitelerinin değerlendirilmesinde DPPH ve ABTS•+ radikal giderme aktivitesi tayini yöntemleri kullanılmıştır. DPPH antioksidan aktivite tayini % inhibisyon olarak ifade edilmiş olup, ortalama değer % 77.27 olarak belirlenmiştir. ABTS yöntemiyle elde edilen koçan ekstraktlarına ait antioksidan aktivite değeri ise 13.52 mmol trolox/g olarak tespit edilmiştir. Örneklerin toplam fenolik madde miktarı kuru madde üzerinden gallik asit eşdeğeri olarak hesaplanmış olup, 3129.167 mgGAE/100g KM olarak tespit edilmiştir.

Elde edilen sonuçlar literatürde mevcut olan farklı tahıllara ve tahıl atıklarına ait sonuçlar ile karşılaştırıldığında, mısır koçanının antioksidan aktivitesinin oldukça yüksek olduğunu söylemek mümkündür. Bu çalışma mısır atıkları ile ilgili yapılacak olan çalışmalara ışık tutması bakımından önem arz ettiği gibi, sürdürülebilir atık yönetim sistemine de katkı sağlayacaktır.

Anahtar Kelimeler: Mısır koçanı, Atık, Atık yönetimi, Antioksidan aktivite

Effects of Acute Ammonium Nitrate Levels Caused by Agricultural Activities on Four Amphibian Species in The Eastern Black Sea Region

Handan Karaoğlu

Recep Tayyip Erdoğan University, Faculty of Agriculture, Department of Field Crops, Rize, Turkey

Abstract

The tadpoles of four amphibian species, namely the Marsh Frog (*Pelophylax ridibundus*), the Iranian Long-Legged Frog (*Rana macrocnemis*), the Caucasian Parsley Frog (*Pelodytes caucasicus*) and the Variable Green Toad (*Bufo variabilis*), were exposed to acute concentrations (0 to 500 mg/L) of ammonium nitrate to assess the lethal effects (larval growth, abnormalities, mortality and LC₅₀ values). Eggs of each species were obtained from clean and polluted habitats in the same region and the tadpoles for experiments were provided from those eggs in the laboratory conditions. Although there were some variability between different populations of same species or between different species in the observed effects, acute levels of ammonium nitrate caused decreased growth rate and increased abnormalities and mortality in general. Among the 4 amphibian species, the Variable Green Toad was the most damaged one in terms of growth reduction (on average 77-83 %), and abnormality rates and the most damaged one in terms of mortality rates was the Marsh Frog (on average 61-72 %). Additionally, the species with the lowest concentration of ammonium nitrate, which killed half of its population, was the Marsh Frog. LC₅₀ values for two populations of Marsh Frog were 37 and 59 mg/L. As a result of our research, it was determined that the acute fertilizer levels caused by agricultural activities in the region had very important harmful effects for all the species we examined. In this context, it can be said that very important environmental and biodiversity problems may occur if certain precautions are not taken regarding the use of the fertilizers and if the awareness of the farmers using these fertilizers cannot be raised.

Keywords: Acute ammonium nitrate levels, *Pelophylax ridibundus*, *Rana macrocnemis*, *Pelodytes caucasicus*, *Bufo variabilis*

Optimal Ranking of Compost Facilities that Can Be Established in Çorum with COPRAS and MAIRCA Methods

Sinan Dünder¹, Hüdaverdi Bircan², Hasan Eleroğlu³

¹ORAN Development Agency, Sivas, Turkey

²Faculty of Economics and Administrative Sciences, Cumhuriyet University, Sivas, Turkey

³Department of Plant and Animal Production Sivas Vocational School, Sivas Cumhuriyet University, 58140 Sivas, Turkey

Abstract

The compost product, which is a biologically active substance, emerges as a result of microbial decomposition of organic materials under controlled conditions. This product, which is used for the improvement of soil structure and the development of agricultural products, also offers opportunities in terms of minimizing the damage caused by organic wastes to the environment. It is important to encourage efforts for compost production, especially in terms of both disposal and economic evaluation of wastes generated in animal production farms. Determining the most suitable location of a facility for the utilization of animal wastes as compost, which will be obtained from livestock enterprises scattered in different geographical areas, will be an essential study in terms of minimizing operating costs. For such a facility, it would be an appropriate approach to use multi-criteria decision making methods to choose among predetermined facility location alternatives. In this study, a total of 17 facility location alternatives with 83,163 cattle potential in Çorum province were ranked according to the criteria determined and weighted by means of SWARA method. The optimal ranking of 17 alternatives determined by K-Means clustering analysis was carried out by COPRAS and MAIRCA methods. According to the ranking results obtained from both methods, it was determined that cluster number 6 was in the first rank, cluster number 4 was in the second rank, and cluster number 3 was in the third rank.

Key Words: SWARA, COPRAS, MAIRCA, Compost, Multi-Criteria Decision Making

COPRAS ve MAIRCA Yöntemleriyle Çorum İlinde Kurulabilecek Kompost Tesislerinin Optimallik Sıralaması

Özet

Biyolojik açıdan aktif bir madde olan kompost ürünü, organik maddelerin kontrollü koşullar altında mikrobiyal ayrışması sonucu ortaya çıkmaktadır. Toprak yapısının iyileştirilmesi ve tarımsal ürünlerin gelişimine yönelik kullanılan bu ürün, organik atıkların çevreye verdiği zararları asgariye indirme açısından da fırsatlar sunmaktadır. Özellikle hayvansal üretim yapan çiftliklerde ortaya çıkan atıkların hem bertaraf edilmesi hem de ekonomik açıdan değerlendirilmesi açısından, kompost üretimine yönelik çabaların teşvik edilmesi önemli bir husustur. Farklı coğrafi alanlara dağılmış durumdaki hayvancılık işletmelerinden temin edilecek hayvansal atıkların kompost olarak değerlendirilmesine yönelik bir tesis için en uygun konumun belirlenmesi, işletme maliyetlerinin asgariye indirilmesi açısından gerekli bir çalışma olacaktır. Bu tarz bir tesis için önceden belirlenmiş kuruluş yeri alternatifleri arasından seçim yapmaya yönelik olarak çok kriterli karar verme yöntemlerinin kullanılması uygun bir yaklaşım olacaktır. Bu çalışmada, Çorum ilinde 83.163 kriterler doğrultusunda optimallik sıralaması yapılmıştır. K-Means kümeleme analizi ile tespit edilmiş olan 17 alternatifin optimal sıralaması COPRAS ve MAIRCA yöntemiyle gerçekleştirilmiştir. Her iki yöntemden elde edilen sıralama sonuçlarına göre 6 numaralı kümenin ilk sırada, 4 numaralı kümenin ikinci sırada, 3 numaralı kümenin ise üçüncü sırada olduğu tespit edilmiştir.

Anahtar Kelimeler: SWARA, COPRAS, MAIRCA, Kompost, Çok Kriterli Karar Verme

Bilgi: Bu çalışma Prof. Dr. Hüdaverdi BİRCAN danışmanlığında hazırlanan “Kümeleme Yöntemi ile TR83 Bölgesinde Hayvansal Atıkların Değerlendirilmesinde Optimal Tesis Yerlerinin Belirlenmesi” adlı doktora tezinden türetilmiştir.

Animal Origin Compost Potential and Optimum Facility Locations in Samsun Province

Sinan Dünder¹, Hüdaverdi Bircan², Hasan Eleroğlu³

¹ORAN Development Agency, Sivas, Turkey

²Faculty of Economics and Administrative Sciences, Cumhuriyet University, Sivas, Turkey

³Department of Plant and Animal Production Sivas Vocational School, Sivas Cumhuriyet University, 58140 Sivas, Turkey

Abstract

Compared to industrial wastes, the recycling of agricultural wastes is more efficient because they are organic. The low organic matter content of Anatolian agricultural lands makes the recycling of agricultural wastes even more important. In the Samsun region, compost centers are recommended in order to help increase productivity in agricultural production, develop agricultural activities and ensure rural development. It is very important to use natural fertilizers because it is to protect and improve the organic structure of the soil. The low production costs of organic fertilizers compared to chemical fertilizers provide an advantage to farmers and prevent foreign exchange loss. In this study, it is aimed to determine the animal existence and optimum facility locations for evaluation of animal wastes as compost in Samsun. For this purpose, in line with the data obtained from Samsun Provincial Directorate according to their capacities. The coordinates of the settlements belonging to 1,284 enterprises with a cattle capacity of 40 and above in Samsun were determined as latitude and longitude. By using these coordinates, the location of the most suitable compost production centres in terms of distance and total number of animals was determined by K-Means cluster analysis method. For Samsun, the group size was taken as 2,000-10,000 cattle, and businesses with a focal length less than 15 km were included in the compost production clusters. In line with these criteria, 10 compost production clusters were determined for compost production in Samsun. The data obtained from this study were analysed using the K-Means clustering method, and were shown with a point density diagram on the map in a way that would provide the most efficient information to the investor and related institutions.

Key Words: Samsun, Animal Waste, Compost, K-Means, Organic Waste

Samsun İlinde Hayvansal Kaynaklı Kompost Potansiyeli ve Optimum Tesis Konumları

Özet

Endüstriyel atıklar ile karşılaştırıldığında, tarımsal atıkların geri dönüşümün daha verimli olması organik yapıda olmalarındandır. Anadolu tarım arazilerinin organik madde içeriğinin zayıf olması, tarımsal atıkların geri dönüşümünü daha bir önemli hale getirmektedir. Samsun bölgesinde tarımsal üretimde verimliliğin artmasına, tarımsal faaliyetlerin geliştirilmesine ve kırsal kalınımının sağlanmasına yardımcı olması bakımından kompost merkezleri önerilmektedir. Toprağın organik yapısını korumak ve geliştirmek olduğundan doğal gübrelerin kullanılması çok önemlidir. Organik gübrelerin kimyasal gübreyle oranla üretim maliyetlerinin düşük olması çiftçilere avantaj sağlamakta, döviz kaybını da önlemektedir. Bu çalışmada, Samsun ilinde mevcut hayvansal varlığın belirlenmesi ve hayvansal atıkların kompost olarak değerlendirilmesi için optimum tesis konumlarının belirlenmesi amaçlanmıştır. Bu amaçla, Samsun İl Tarım ve Orman Müdürlüğünden elde edilen veriler doğrultusunda bölgedeki hayvan sayıları hesaplanmış, işletmeler kapasitelerine göre sıralanmıştır. Samsun ilinde 40 ve üzeri büyükbaş kapasitesine sahip 1.284 işletmeye ait yerleşim yerlerinin koordinatları enlem ve boylam olarak belirlenmiştir. Bu koordinatlar kullanılarak, uzaklık ve toplam hayvan sayısı bakımından en uygun kompost üretim merkezlerinin konumu K-Means kümeleme analizi yöntemiyle belirlenmiştir. Samsun için grup büyüklüğü 2.000-10.000 büyükbaş olarak alınmış olup odak uzaklık değeri 15 km'nin aşağısında olan işletmeler kompost üretimi kümelerine dâhil edilmiştir. Bu kriterler doğrultusunda Samsun ilinde kompost üretimine yönelik 10 adet kompost üretim kümesi belirlenmiştir. Yapılan bu çalışmadan elde edilen veriler, K-Means kümeleme yöntemi kullanılarak analiz edilmiş, yatırımcıya ve ilgili kurumlara en verimli bilgileri verecek şekilde harita üzerinde nokta yoğunluk diyagramıyla gösterilmiştir.

Anahtar Kelimeler: Samsun, Hayvansal Atık, Kompost, K-Means, Organik Atık

Bilgi: Bu çalışma Prof. Dr. Hüdaverdi BİRCAN danışmanlığında hazırlanan “Kümeleme Yöntemi ile TR83 Bölgesinde Hayvansal Atıkların Değerlendirilmesinde Optimal Tesis Yerlerinin Belirlenmesi” adlı doktora tezinden türetilmiştir.

Optimal Ranking of Compost Facilities that Can Be Established in Samsun Province by COCOSO and WASPAS Methods

Sinan Dünder¹, Hüdaverdi Bircan², Hasan Eleroğlu³

¹ORAN Development Agency, Sivas, Turkey

²Faculty of Economics and Administrative Sciences, Cumhuriyet University, Sivas, Turkey

³Department of Plant and Animal Production Sivas Vocational School, Sivas Cumhuriyet University, 58140 Sivas, Turkey

Abstract

The compost product, which offers many benefits such as the evaluation of organic wastes, improvement of soil structure, neutralization of toxins and pH balance of the soil, has significant potential for the improvement of our country's lands. Considering the development of animal existence in our country, the production of compost product to be obtained from feces, which is the product of these animal beings, is an issue that needs to be emphasized. The choice of plant location, which must be determined for an investment to be made for the acquisition of this product emerges as a separate problem. For this reason, in this study, the order of optimality among the alternatives for compost plant installation is considered as a multi-criteria decision making problem. For this purpose, a total of 10 clusters with the potential of 35,829 animals that can produce compost in Samsun were ranked in accordance with the determined criteria. The optimal availability ranking of these 10 compost plant clusters was determined by COCOSO and WASPAS methods. According to the ranking results obtained from both methods, it has been determined that cluster number 27 is in the first order, cluster number 13 is in the second order, and cluster number 14 is in the third order.

Key Words: SWARA, COCOSO, WASPAS, Compost, Multi-Criteria Decision Making

Samsun İlinde Kurulabilecek Kompost Tesislerinin COCOSO ve WASPAS Yöntemiyle Optimallik Sıralaması

Özet

Organik atıkların değerlendirilmesi, toprak yapısının iyileştirilmesi, topraktaki toksinlerin etkisiz hale getirilmesi, toprağın pH dengesinin sağlanması gibi çok sayıda faydalar sunan kompost ürünü, ülkemiz topraklarının ıslah edilmesine yönelik olarak önemli potansiyel barındırmaktadır. Ülkemizdeki hayvansal varlığın gelişimi göz önüne alındığında bu hayvansal varlıkların ürünü olan dışkılarından elde edilecek kompost ürününün üretilmesi, üzerinde durulması gereken bir konudur. Bu ürünün elde edilmesine yönelik yapılacak bir yatırım için tespit edilmesi gereken kuruluş yeri seçimi ise ayrı bir problem olarak karşımıza çıkmaktadır. Bu nedenle bu çalışmada kompost tesis kurulumu için alternatifler arasında optimallik sıralaması, çok kriterli bir karar verme problemi olarak ele alınmıştır. Bu amaçla, Samsun ilinde kompost üretebilecek, 35.829 hayvan potansiyeline sahip toplam 10 kümenin belirlenen kriterler doğrultusunda optimallik sıralaması yapılmıştır. Belirlenen bu 10 kompost kümesinin optimal uygunluk sıralaması COCOSO ve WASPAS yöntemiyle belirlenmiştir. Her iki yöntemden elde edilen sıralama sonuçlarına göre 27 numaralı kümenin ilk sırada, 13 numaralı kümenin ikinci sırada, 14 numaralı kümenin ise üçüncü sırada olduğu tespit edilmiştir.

Anahtar Kelimeler: SWARA , COCOSO, WASPAS, Kompost, Çok Kriterli Karar Verme

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The Analysis of the Genetic Variation and the Assessment of Population Genetics and Diversity in Bovine Annexin A9, Insulin-like Growth Factor 1, and Beta-Lactoglobulin Genes in Turkish Native Cattle Breeds

Sena Ardicli, Ozden Cobanoglu

Department of Genetics, Faculty of Veterinary Medicine, Bursa Uludag University, Bursa, Turkey

Abstract

Annexin A9 (ANXA9) is a member of the Ca^{2+} and phospholipid-binding protein family and it is encoded by the ANXA9 gene which was mapped to bovine chromosome 3. This region is known to be an important genomic location where QTLs for milk fat content and the other milk traits have been mapped. The beta-lactoglobulin (LGB) gene (GenBank accession number: X14710) is located on bovine chromosome 11 and plays a key role in the evaluation of milk production. Moreover, this gene has been associated with other loci that have a direct influence on growth. The insulin-like growth factor (IGF1) (GenBank accession number: AF210383) has crucial influences on growth rate and meat production traits via its functional roles in the regulation of cell proliferation. It was mapped to bovine chromosome 5. Although the above-mentioned genes have very important phenotypic effects there is limited information about them in Turkish native cattle breeds. Therefore, this study aimed to assess the genetic variation of ANXA9, LGB, and IGF1 in Turkish Grey Steppe, Anatolian Black, and East Anatolian Red cattle. The analysis was conducted on a total of 238 cattle from three native breeds including 93 Turkish Grey Steppe, 83 Anatolian Black, and 62 East Anatolian Red. Genomic DNA was purified from 4 mL blood samples using the phenol-chloroform method. Genotyping of the SNPs in the selected genes was performed by the PCR-RFLP method. In this context, A/G transition in position 951 of the ANXA9 gene (GeneBank accession number: AY785287), T/C substitution in position 5261 of the LGB gene, and the C/T alteration in position 472 of the IGF1 gene were evaluated. Amplification products were applied into the 3% agarose gel and the fragments were visualized with UV transillumination. The frequency and distribution of genotypes and alleles were calculated by the standard procedure. Population genetic parameters, including effective allele numbers (N_e), gene heterozygosity (H_e), polymorphism information content (PIC), fixation index (F_{is}), and the level of possible variability realization (LPVR), were estimated based on the genotypic data. The Hardy-Weinberg equilibrium (HWE) was tested for all alleles by using the chi-square approximation of goodness-of-fit test statistics, with expected frequencies derived from allele frequencies. Moreover, Fisher's exact test was used alternatively if there was a limited number of animals per genotype. On the other hand, biodiversity indices including the Shannon-Weaver index, Simpson Index, and the Gini Coefficient were evaluated through genotypic distributions. Results revealed that the number of heterozygote animals was remarkably high in all breeds regarding ANXA9 and LGB genes. There was no animal with the AA genotype in the ANXA9 in East Anatolian Red breed. Concerning Anatolian Black cattle, the CC genotype, and the BB genotype were absent in the IGF1 and LGB genes, respectively resulting in lower C and B alleles. The G and the T alleles were predominant in ANXA9 and IGF1 genes. The chi-square test showed that there were deviations from HWE in the ANXA9 (except for Anatolian Black cattle), IGF1 (except for East Anatolian Red cattle), and the LGB (except for Turkish Greys) ($P < 0.05$). All of the markers were found to be moderately informative concerning all breeds and the total population based on the PIC evaluation ($0.25 < \text{PIC} < 0.50$). There was only one exception for this interpretation which was observed for the IGF1 marker in East Anatolian Red cattle ($\text{PIC} < 0.25$: low informative polymorphism). The low variation levels in the IGF1 resulted in relatively low levels of N_e (< 1.65). This also causes low levels of biodiversity indices including the Shannon-Weaver index, Simpson Index, and the Gini Coefficient. High numbers of heterozygous animals in the LGB caused negative values of F_{is} (< 0) indicating lower gene homozygosity and higher LPVR values compared to other selected markers in this study. Consequently, this study focuses on the genetic variation and population and diversity parameters of the ANXA9, LGB, and IGF1 genes in Turkish native cattle breeds. To the best of our knowledge, there are limited publicly available papers about the mentioned genes in Turkish native cattle breeds. Hence, the data presented in this study may be valuable for further analysis. More detailed genetic studies conducted on native breeds should be performed to achieve an adequate characterization among breeds and to conserve animal genetic resources in Turkey.

Key Words: Cattle, Genetic marker, Biodiversity, Population genetics, SNP

A Potential Threat for Blackberry, Raspberry and Rosehip Growing in Konya Province: Fire Blight Disease

Aysun Öztürk¹, Kubilay Kurtulus Bastas²

¹Konya Metropolitan Municipality, Directorate of Park and Gardens, Konya/Turkey

²Selcuk University Faculty of Agriculture Dept. of Plant Protection, Campus, Konya/Turkey

*Corresponding author e-mail: kbastas@selcuk.edu.tr

Abstract

Fire blight, caused by the bacterial pathogen *Erwinia amylovora*, infects all members including *Rubus* spp. of the family *Rosaceae*. In Turkey, *E. amylovora* was first reported on blackberry (*Rubus fruticosus*) in 2012 by Bastas and Sahin and, on rosehip (*Rosa canina*) by Bastas et al. in 2013. In the present study, totally 49 samples, which showed the symptoms of leaf and shoot blight and cankers with brown discoloration of necrotic tissues on mature branches, were collected from 22 districts of Konya Province between the years 2017 and 2019. Presence rate of *E. amylovora* in collected samples, showing symptoms of the disease, from the Konya province was determined to be 40% for blackberry and raspberry and 33% for rosehip in three years. Bacteria, isolated from the diseased tissues were consistently identified on the basis of biochemical, physiological, and molecular tests, comparing with a reference strain of *E. amylovora*, isolated from blackberry (Kbb 371). Twenty seven representative bacterial strains were gram-negative, rod-shaped, mucoid, fermentative, positive for levan formation and acetoin production, no growth at 36°C, positive for gelatin hydrolysis, and negative for esculin hydrolysis, indole, urease, catalase, oxidase, arginine dehydrolase, reduction of nitrate, acid production from lactose, and inositol. All strains induced a hypersensitive response in tobacco (*Nicotiana tabacum* cv. White Burley) 24 h after inoculation with a 10⁸ CFU ml⁻¹ bacterial suspension in sterile distilled water. The strains were identified as *E. amylovora* using the species-specific primers set A/B (1), which amplified a 1-kb DNA fragment in PCR, and the matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) method. In order to fulfill the Koch postulates, pathogenicity test was confirmed by injecting bacterial suspensions of 10⁸ CFU ml⁻¹ in sterile distilled water into the shoot tips of 3-year-old blackberry *Rubus fruticosus* cv. Chester, raspberry *R. idaeus* cv. Heritage and rosehip *R. canina*. All tests were repeated three times. The bacterium was re-isolated from inoculated plants and identified as *E. amylovora*. Phytosanitary measures are needed to prevent any further spread of the bacterium as potential inoculum sources to new blackberry, raspberry and rosehip growing areas.

Keywords: fire blight, blackberry, raspberry, rosehip, phytosanitary

Anti-Quorum Sensing Effects of Some Medicinal and Aromatic Plant Extracts on *Xanthomonas axonopodis* pv. *phaseoli*

Tibebu Belete¹, Kubilay Kurtuluş Baştaş^{2*}

¹Rwanda Institute for Conservation Agriculture, Bugesera Campus, Bugesera, Rwanda

²Selcuk University Faculty of Agriculture, Department of Plant Protection, Konya, Turkey

*Corresponding author e-mail: kbastas@selcuk.edu.tr

Abstract

Xanthomonas axonopodis pv. *phaseoli* (*Xap*), a causal agent of common bacterial blight (CBB) is known as one of the most important seedborne destructive pathogen on beans worldwide. Nowadays, *Xap* is considered to acquire resistance to antibiotics and synthetic bactericides which concerns the scientific world for its future management. This has made the use of biologically active products, such as plant extracts and essential oils, an attractive alternative in the control of microbial pathogens by inhibiting the quorum sensing mediated virulence factors. This study was designed to evaluate the antibacterial activities and the anti-QS effects of the 14 different aromatic and medicinal plants against QS mediated virulence factors of *Xap*. The results revealed that *Syzygium aromaticum* showed the largest inhibition zone diameter and strongest antibacterial effect among the tested plant extracts followed by *Thymus vulgaris* and *Coriandrum sativum*. Similarly, the lowest swarming, swimming and twitching motility values were measured from the *Syzygium aromaticum* application followed by *Coriandrum sativum*, *Thymus vulgaris*, *Brassica nigra*, *Lepidium sativum* and *Ruta chalepensis*. These results clearly indicated that *S. aromaticum*, *C. sativum*, *T. vulgaris*, *B. nigra*, *L. sativum* and *R. chalepensis* will be a potential candidate as anti-quorum sensing agents in preventing common bacterial disease of beans caused by *Xap*. Compounds derived from aromatic and medicinal plants has demonstrated successful control of diseases in crops and the use of these substances provides a valuable tool to the growers around the world for diseases management in organic production.

Keywords: Plant Extracts, QS, Swarming, Swimming, Twitching, *Xap*

Development of transgenic sugarcane to encounter red rot by overexpressing SUGARWIN genes for fungal resistance

Aqsa Parvaiz¹, Ghulam Mustafa¹, Faiz Ahmad Joyia¹, Amjad Ali², Muhammad Sarwar Khan¹

¹Centre of Agricultural Biochemistry & Biotechnology (CABB), University of Agriculture, Faisalabad, Pakistan

²Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan.

Abstract

Sugarcane is cash crop which not only fulfils 70% of world sugar need but is also main impending source of biofuel. Some biotic and abiotic stresses have devastating effects on sugarcane crop and sometimes may lead to complete crop failure. Red rot is a fungal disease caused by *colletotrichum falcatum* which severely affect yield and quality of sugarcane. To combat fungal diseases sugarcane plant is blessed with a wide variety of endogenous pathogenesis-related (PR) proteins i.e. glucanases, chitinases, chitosanases and proteases. These PR proteins hydrolyze fungal cell wall and may lead to fungal cell apoptosis. This study report the overexpression of two myco-protective genes i.e. SUGARWIN1 and SUGARWIN2 genes which have role in red rot resistance. Both genes were cloned under the constitutive promoter. Bar was used as marker gene which confer resistance against gluphosinate (Phosphinothricin) for the selection of expression cassette. Biolistic transformation approach was used for transformation of expression cassette into embryogenic calli which were propagated from leaf whorls of sugarcane. Putative transformed plants were screened on phosphinothricin (selective agent) during regeneration. The regenerated shoots were shifted on rooting media and then plants were acclimatized. Transgenic event was confirmed by molecular analysis i.e. PCR (polymerase chain reaction). Overexpression of both genes was confirmed by expression analysis carried through qRT-PCR. Fungal bioassays of transgenic and untransformed plants were also carried out under in vitro conditions. The recent study established various parameters which may open new possibilities to gene transfer in monocots for the development of fungal resistant crops.

Key Words: Biolistic transformation, Sugarcane, Young leaf whorls, SUGARWIN, Constitutive promoter, red rot, *Colletotrichum falcatum*.

Mathematical Modeling of the Growth of Specific Spoilage Micro-Organisms in Tilapia (*Oreochromis niloticus*) Fish

Odangowei I. Ogidi¹, Eruom E. Charles², Chioma C. Okore³, Beatrice Wilfred², Lilian M. O. Oguoma⁴

¹Department of Biochemistry, Federal Polytechnic, Ekowe, Bayelsa State

²Department of Microbiology, Federal polytechnic, Ekowe, Bayelsa State

³Department of Environmental Biology, Federal Polytechnic Nekede Owerri, Imo-State

⁴Department of Biotechnology, Federal University of Technology, Owerri, Imo State

Abstract

This study examined the growth rate of specific spoilage organisms (SSOs) of tilapia (*Oreochromis niloticus*) fish and the effect of varying temperature (0, -2 and -4°C) and storage time (24, 48, 72 hours). The growth of SSOs was also modeled using Gompertz function and Linear Regression Models. The results of this study demonstrated that *Pseudomonas species*, *Staphylococcus species*, *E. coli*, *Shigella species*, *Salmonella species*, *Klebsiella species*, *Penicillium species*, Yeast, *Fusarium species*, *Phytophthora species* and *Aspergillus species* were observed to be SSOs of *Oreochromis niloticus* fish. They reduce the lifespan of *O. niloticus* fish at 0, -2 and -4°C temperatures in 24, 48 and 72 hours storage times. On the number of isolated colonies of the microbial growth in tilapia fish -4°C temperature isolates such as *Salmonella* (2.2×10^8 CFU/cm²), *Pseudomonas* (2.15×10^8 CFU/cm²) and *Staphylococcus* (1.8×10^8 CFU/cm²) were observed to be the highest. The experimental data was modeled using the Gompertz modified equation for both bacteria and fungi counts with different temperatures of the isolates in cfu/ml of the samples. The derived parameters of the Gompertz model such as specific growth rate (μ) was observed to increase at temperatures of -4°C with decreasing maximum population density (MPD) and Lag phase duration (LPD) time of the specific spoilage organisms. The test organism's results in tilapia fish at 0, -2 and -4°C temperatures were modeled by the linear regression model (R^2 values were 0.8, 1.0 and 0.5 respectively), showing a strong positive linear relationship. Temperature and time has been established as the two very significant factors that affect the growth of specific spoilage organisms in foods. Hence, modeling the growth of SSO, considering temperature and time enables scientist to predict the possible growth of SSO accurately during processing and storage of tilapia fish.

Key Words: *Oreochromis niloticus* fish, Mathematical Models, specific spoilage organisms, temperature, storage time

Introduction

Oreochromis niloticus commonly called tilapia is considered as one of the most consumed fish globally with production of 4.200 million tons in 2016 (Pulido *et al.*, 2019). Tilapia fish is prevalent in Africa and Middle East countries. This provides the prospect of business and domestic protein source, due to their availability and easily cultured practices. Meanwhile wild capture fishes are in high extinction globally (Ahmed *et al.*, 2005). *O. niloticus* is omnivorous, easily growing and breeding in captivity and undemanding under different types of aquatic, climate conditions and more disease resistant than other types of fishes. It can also grow, tolerate and reproduce in saline waters, although, this ability is a bit counterbalanced at high salinity conditions. These unique characteristics make tilapia fish ideal aquaculture species which explains why it has become one of the most significant domesticated fishes all over the world (Mark *et al.*, 2010).

Lifespan or shelf life is used to classify fresh fish quality and its spoilage level which most likely is correlated to the global intensification of aquaculture (Ghaly *et al.*, 2010). The lifespan of fresh fish is commonly affected by many factors. Some direct methods such as chemical and sensory methods are used in evaluating fish quality some decades ago, but are limited by test time and sensitivity. The presence of microorganisms and their activities in fish products are correlated to its spoilage especially with specific spoilage organisms (SSO) which has been established. These SSOs can live and multiply on the fish products and their microbiological metabolic activities can make a strong and very unpleasant smell. With this increasing putrefaction by microbes, modeling of SSOs to predict the lifespan of fish and its products cannot be over emphasized (Koutsoumanis, 2009). It has been established that temperature and time are veritable factors which affect the SSO growth in foods. Therefore, modeling the growth of SSO, considering the effect of temperature and time can help in predicting possible growth of SSOs accurately during processing and storage.

Various scientist and researchers have noticed that the microbes linked with seafood directly are correlated with the following factors; storage, fishing ground, harvesting method, transportation and the environment. Moreover, the growth of microorganisms during storage will be depended on various established preservation conditions. Gram and Huss (2000) reported that the microbes responsible for spoilage were dominated by psychrotolerant gram-negative bacteria such as *Pseudomonas species* and *Shewanella species* grown on chilled fish.

Modified atmosphere packaging enhanced with carbon dioxide atmosphere slow down respiratory organisms and influences *Photobacterium phosphoreum* and lactic acid bacteria (Dalgaard, 2000). Bacteria responsible for spoilage in clement water fishes are influenced by psychrotrophic, aerobic or facultative anaerobic gram-negative bacteria commonly known as *Pseudomonas*, *Moraxella*, *Acinetobacter*, *S. putrefaciens*, *Vibrio*, *Flavobacterium*, *Photobacterium*, and *Aeromonas* (Sivertsvik *et al.* 2002). Gram-positive bacteria such as *Staphylococcus* spp., *Micrococcus*, *Bacillus*, *Clostridium*, *Cornynebacterium*, *Brochothric thermosphacta*, and *Streptococcus* can be said to be the dominant microflora in tropical marine fish (Al Bulushi *et al.*, 2010).

The study of microbial growth in tilapias by using equations that can predict fish age has been very useful, because they encapsulate information from a data series into a small set of parameters that can be transferred biologically. Microbial growth is a field of microbiology that has been known in the last two decades, and in the last ten years, hundreds of papers have been published with the keyword microbial growth (Akkermans and Van Impe, 2018; Baranyi and Roberts, 1994). This emphasizes the reasons why microorganisms response to different environments by using mathematical models. Mathematical modeling is used to represent and describes real world problems with equation and various mathematical expressions, so that an understanding problems in the real world is obtained more precisely and accurately. Related to natural phenomena, people often need a mathematical model to solve the problem encountered. Therefore, this study was aimed to determine the mathematical modeling of the growth of Specific Spoilage organisms (SSO) in Tilapia (*Oreochromis niloticus*) fish.

Materials and Methods

Sample collection

Nine (9) tilapia (*Oreochromis niloticus*) fish samples were bought from Tombia market and were taken to the microbiological laboratory of The Bayelsa Medical University, Yenagoa for analysis. The fish samples were refrigerated at 0°C, -2°C and -4°C Temperatures for 24, 48 and 72 hours respectively.

Microbiological analysis

Media used: Nutrient agar (NA), Salmonella- Shigalla Agar (SSA), Eosin Methylene blue (EMB), Sabouraud dextrose agar (SDA) and Peptone water.

Procedure

The tilapia fish samples was removed from the refrigerator and allowed to get back to room temperature. 1 g of the fish was aseptically cut with a sterile scalpel and weighed into 10ml of buffered peptone water and was left for 30 minutes. Then ten (10) fold serial dilution was carried out and at the tube 10⁻⁴ (dilution factor). 1 ml was plated out into petri dish and a molten agar cooled at 45°C was poured and mixed with the inoculum (aliquote) to evenly spread. Culture was incubated at 35-37°C in an inverted position in the incubator for 24 hours (for bacteria) and 72-168 hours (for fungi).

Enumeration of bacteria and fungi

The colony forming unit (CFU) was determined after culture incubation using the formula stated below:

$$CFU = \frac{\text{Number of colony counted}}{\text{ml of inoculum}} \times \text{Dilution factor}$$

Mathematical modeling

Modeling, mathematically enable scientist to explain the effects of the main factors affecting the growth parameters of microorganisms. One of the commonly used models in biological sciences is the Gompertz model (Zwietering *et al.*, 1990).

Original Gompertz equation:

$$y = a \exp[-\exp(b - ct)] \quad 1$$

Where,

a, b and c are Gompertz model parameters

t is time

The original Gompertz model was re-parameterized for the parameters a, b, and c to obtain biologically meaningful parameters, such as the maximum specific growth rate, μ_m the lag time λ , and the asymptotic value A.

The modified Gompertz equation:

$$y = A \exp(-\exp[\frac{\mu_m e}{A}(\lambda - t) + 1]) \quad 2$$

Where,

A is Asymptotic value

μ_m is maximum specific growth rate

e is Euler's number (2.7182)

λ is Lag phase

t is time

From this equation, the following derived parameters were obtained: specific growth rate $\mu = b/c/e$ [$\log(\text{CFU}/\text{cm}^2)$ hours⁻¹], with $e = 2.7182$; lag phase duration (LPD) = $0.5/\mu$ [hours], maximum population density (MPD) = $a + c$ [$\log(\text{CFU}/\text{cm}^2)$]. Data fits obtained from Gompertz model were analyzed. When the microbial counts in food remain constant or decrease during storage, it is possible to use the linear regression model (Coll *et al.*, 2008). The regression coefficient equation is shown below:

$$r^2 = \frac{a\sum y + b\sum xy - n\bar{y}^2}{\sum y^2 - n\bar{y}^2} \quad 3$$

Where;

a is the intercept of the linear curve

b is the slope of the linear curve

n is the number of variables

x is independent variable

y is the dependent variable

Text

Results and Discussion

Microbial growth

Tables 1, 2 and 3 shows the colony morphology of specific spoilage microorganisms of the refrigerated tilapia fish at 0°C, -2°C and -4°C in 24, 48 and 72 hours according to the different media used. Temperature of -4°C were observed to have the highest growth rate for the Isolated specific spoilage microorganisms followed by 0°C temperature as shown in Table 4.

Table 1. Colony morphology of specific spoilage microorganisms of tilapia fish at 0°C in 24, 48 and 72 hours

S/N	Media	Suspected Microorganisms			Colony morphology
		24 hours	48 hours	72 hours	
1	NA	Pseudomonas sp.	Pseudomonas sp.	Pseudomonas sp.	Light blue transparent colonies.
		Staphylococcus sp.	-	-	Yellow-orange small colonies.
2	EMB	No growth	No growth	No growth	No colony formed.
3	SSA	No growth	No growth	No growth	No colony formed.
4	SDA	No growth	Penicillium sp.	-	Blue colony with white margin.
			Yeast	-	White cream small colonies.
			Fusarium sp.	Fusarium sp.	White fluffy colony.
			Phytophthora sp.	-	White rosette with slightly cottony colonies.
			Aspergillus sp.	Aspergillus sp.	White margin colony with dark center

Legend: EMB-Eosin Methylene Blue; NA-Nutrient Agar; SSA-Salmonella- Shigella Agar; SDA-Sabouraud Dextrose Agar; S/N- Serial Number

Table 2. Colony Morphology of Specific Spoilage Microorganisms of Tilapia Fish at -2°C in 24, 48 and 72 hours

S/N	Media	Suspected microorganisms			Colony morphology
		24 hours	48 hours	72 hours	
1	NA	Pseudomonas sp.	-	-	Light blue transparent colonies.
		-	Staphylococcus sp.	Staphylococcus sp.	Yellow-orange small colonies.
2	EMB	Klebsiella sp.	No growth	-	Light pink colonies (mucoid) with or without dark pink centers.
		Pseudomonas sp.	No growth	Pseudomonas sp.	Light blue transparent colonies.
3	SSA	No growth	No growth	No growth	No colony formed.
4	SDA	No growth	Penicillium sp.	No growth	Blue colony with white margin.
			Aspergillus sp.		White margin colony with dark center.
			Fusarium sp.		White fluffy colony.

Legend: EMB-Eosin Methylene Blue; NA-Nutrient Agar; SSA-Salmonella- Shigella Agar; SDA-Sabouraud Dextrose Agar; S/N- Serial Number

Table 3. Colony Morphology of Specific Spoilage Microorganisms of Tilapia Fish at -4°C in 24, 48 and 72 hours

S/N	Media	Suspected microorganisms			Colony morphology
		24 hours	48 hours	72 hours	
1	NA	Staphylococcus sp.	No growth	No growth	Yellow-orange small colonies.
		Pseudomonas sp.			Light blue transparent colonies.
		Penicillium sp.			Blue colony with white margin.
2	EMB	E. coli	No growth	No growth	Pink colonies with colourless centers.
		Pseudomonas sp.			Light blue transparent colonies.
		E. coli			Pink colonies with colourless centers.
3	SSA	Shigella sp.	No growth	No growth	Colourless colonies.
		Salmonella sp.			Colourless colonies with dark centers.
		Fusarium sp.			White fluffy colonies.
4	SDA	Yeast (candida)	-	-	Cream milk budding colonies.
		Phytophthora sp.			White rosette with slightly cottony colonies.
		-			Brownish white mycelia at the margin.
			Penicillium crustosum	Penicillium crustosum	

Legend: EMB-Eosin Methylene Blue; NA-Nutrient Agar; SSA-Salmonella- Shigella Agar; SDA-Sabouraud Dextrose Agar; S/N- Serial Number

Table 4. Number of colonies of microbial analysis of Tilapia fish in CFU/cm² at 0, -2 and -4°C

S/N	Specific Spoilage Microorganism	Number of colonies at different refrigerated temperatures in CFU/cm ²		
		0°C	-2°C	-4°C
1	Pseudomonas sp.	1.8×10 ⁷	5.2×10 ⁷	2.15×10 ⁸
2	Klebsiella sp.	1.3×10 ⁷	2.6×10 ⁷	1.5×10 ⁸
3	Staphylococcus sp.	1.3×10 ⁸	1.7×10 ⁷	1.8×10 ⁸
4	E. coli	1.0×10 ⁸	1.2×10 ⁷	2.0×10 ⁸
5	Salmonella sp.	1.2×10 ⁸	1.4×10 ⁷	2.2×10 ⁸
6	Shigella sp.	1.3×10 ⁸	1.5×10 ⁷	1.9×10 ⁸
7	Fungi	1.0×10 ⁶	1.5×10 ⁷	2.31×10 ⁷

Legend: S/N- Serial Number

The shelf life of fresh fish is commonly affected by many factors. Some direct methods such as chemical and sensory methods are used in evaluating fish quality some decades ago, but are limited by test time and sensitivity. The presence of microorganisms and their activities in fish products are correlated to its spoilage especially with specific spoilage organisms (SSO).

In this research different types of specific spoilage organisms that are pathogenic in nature had been isolated from tilapia fish. Pathogens have been established to contribute very significant diseases globally which includes pneumonia, caused by *Streptococcus* and *Pseudomonas*, and foodborne illnesses caused by *Shigella* and *Salmonella*.

The SSO in tilapia fish at 0°C were bacteria (*Pseudomonas sp.* and *staphylococcus sp.*) and fungi (*Penicillium sp.*, *Yeast*, *Fusarium sp.*, *Phytophthora sp.* and *Aspergillus sp.*) isolates as shown in Table 4.1. At temperature -2°C the Tilapia SSO was observed to be Bacteria (*Pseudomonas sp.*, *staphylococcus sp.* and *Klebsiella sp.*) and fungi (*Penicillium sp.*, *Fusarium sp.* and *Aspergillus sp.*) strains as shown in Table 4.2. While Table 4.3 shows the tilapia fish SSO at -4°C, which was bacteria (*Pseudomonas species*, *staphylococcus species*, *E. coli*, *Shigella species* and *Salmonella species*) and fungi (*Penicillium species*, *Yeast (candida)*, *Fusarium sp.* and *Phytophthora sp.*). The specific spoilage organisms found in tilapia fish are in conformity with the studies of Xing *et al.*, (2012) and Payap, (2011).

On the number of isolated colonies of the microbial growth in tilapia fish -4°C temperature isolates such as *Salmonella* (2.2×10⁸CFU/cm²), *Pseudomonas* (2.15×10⁸CFU/cm²) and *Staphylococcus* (1.8×10⁸CFU/cm²) were observed to be highest (Table 4). The high presence of *Salmonella species* can be correlated to contaminated waters used by the retailers of the tilapia fish. *Salmonella* has been isolated often from the fish market environments and gastrointestinal tract of all farmed and wild animals (EFSA, 2007; Nørrung *et al.*, 2009). High presence of *Salmonella species* in different raw food samples in local markets had also been reported by another study which supports this study (Maharjan *et al.*, 2006). These microorganisms natural flora of their skin and mucous membranes of animals and humans causes contamination in fish (Nørrung *et al.*, 2009). The result of this study is in accord with Eddy *et al.* (2019) and Xing *et al.* (2012).

The total fungi load of the study for 0, -2 and -4°C are shown in Table 4. Temperature -4°C was also observed to be highest in total fungal count (2.31×10^7 CFU/cm²), though the count is low when compared with the various bacterial counts. This might be because of their slow growth and relatively poor ability to compete with bacteria successfully, for they are most likely to be found in the foods in which the environment is less favorable for bacterial growth, e.g. low pH, low -aw-, high salt or sugar content, low storage temperature, the presence of antibiotics, or exposure to irradiation. This finding was synonyms to the reports of Mogessie, (2007).

Mathematical modeling

Tables 5 - 7 shows the mathematical modeling of the growth of specific spoilage of microorganisms of tilapia fish at 0, -2, and -4°C temperature. The derived parameters of Gompertz models such as specific growth rate (μ) as observed to increase at temperature of -4° with decreasing Lag phase duration and maximum population density. Figures 4.1-4.3 shows the linear regression results of 0, -2 and -4°C of tilapia fish samples with R² values of 0.8, 1.0 and 0.5 respectively.

Table 5. Mathematical modeling of growth of microorganisms of Tilapia fish at 0°C

S/N	Specific spoilage microorganisms	Gompertz Parameters			Derived Parameters		
		a	b	C	μ	LPD	MPD
1	Pseudomonas sp.	4.87	1.17	0.88	2.75	0.1818	41.75
2	Klebsiella sp.	5.2	1.16	0.83	2.52	0.1984	42.87
3	Staphylococcus sp.	2.9	1.28	1.48	5.65	0.0885	35.52
4	E. coli	3.16	1.26	1.36	5.04	0.0992	36.16
5	Salmonella sp.	2.98	1.27	1.44	5.44	0.0919	35.80
6	Shigella sp.	2.9	1.28	1.48	5.65	0.0885	35.52
7	Fungi	7.76	1.11	0.55	1.35	0.3703	49.86

Legend: LPD- Lag phase duration, MPD- maximum population density, μ - specific growth rate, a: log (CFU cm⁻²), c: log (CFU cm⁻²), b: hours⁻¹, μ : log (CFU cm⁻²) hours⁻¹, MPD: (log (CFU cm⁻²), LPD: (hours), S/N- Serial Number

Table 6. Mathematical modeling of growth of microorganisms of Tilapia fish at -2°C

S/N	Specific spoilage microorganisms	Gompertz Parameters			Derived Parameters		
		a	b	C	μ	LPD	MPD
1	Pseudomonas sp.	3.82	1.21	1.12	3.85	0.129	38.14
2	Klebsiella sp.	4.51	1.18	0.95	3.05	0.164	40.46
3	Staphylococcus sp.	4.93	1.17	0.87	2.71	0.185	41.93
4	E. coli	5.28	1.15	0.81	2.43	0.206	43.24
5	Salmonella sp.	5.13	1.16	0.84	2.56	0.195	42.69
6	Shigella sp.	5.06	1.16	0.85	2.61	0.192	48.88
7	Fungi	5.06	1.16	0.85	2.60	0.192	42.43

Legend: LPD- Lag phase duration, MPD- maximum population density, μ - specific growth rate, a: log (CFU cm⁻²), c: log (CFU cm⁻²), b: hours⁻¹, μ : log (CFU cm⁻²) hours⁻¹, MPD: (log (CFU cm⁻²), LPD: (hours), S/N- Serial Number

Table 7. Mathematical modeling of growth of microorganisms of Tilapia fish at -4°C

S/N	Specific spoilage microorganisms	Gompertz Parameters			Derived Parameters		
		a	b	C	μ	LPD	MPD
1	Pseudomonas sp.	2.39	1.34	1.79	7.35	0.068	34.82
2	Klebsiella sp.	2.75	1.29	1.56	6.06	0.083	35.26
3	Staphylococcus sp.	2.58	1.32	1.66	6.66	0.075	35.02
4	E. coli	2.47	1.33	1.74	7.07	0.071	34.94
5	Salmonella sp.	2.37	1.34	1.81	7.44	0.067	34.86
6	Shigella sp.	2.52	1.32	1.70	6.82	0.073	34.86
7	Fungi	4.63	1.18	0.93	2.97	0.168	40.92

Legend: LPD- Lag phase duration, MPD- maximum population density, μ - specific growth rate, a: log (CFU cm⁻²), c: log (CFU cm⁻²), b: hours⁻¹, μ : log (CFU cm⁻²) hours⁻¹, MPD: (log (CFU cm⁻²), LPD: (hours), S/N- Serial Number

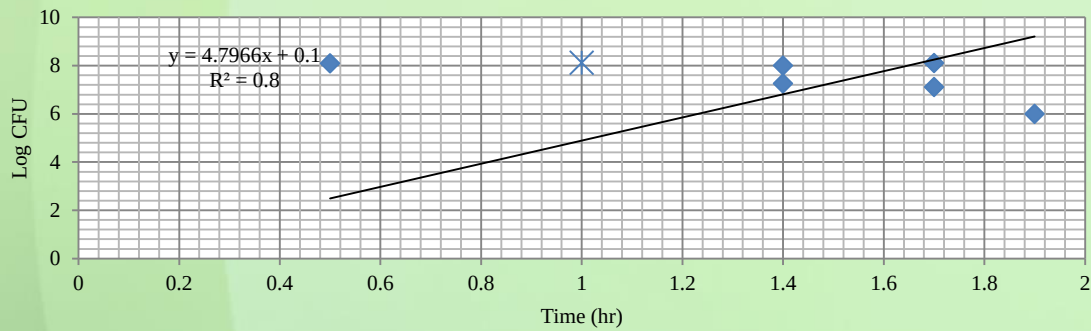


Figure 1. Linear Regression Model for 0°C temperature of tilapia fish samples

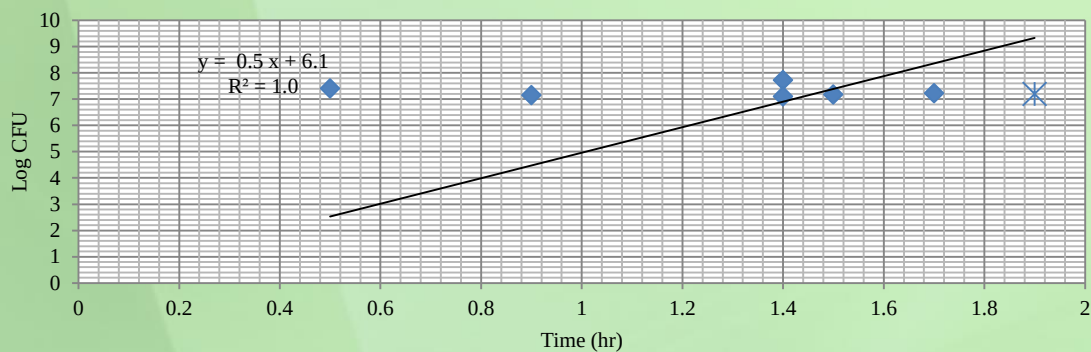


Figure 2. Linear Regression Model for -2°C temperature of tilapia fish samples

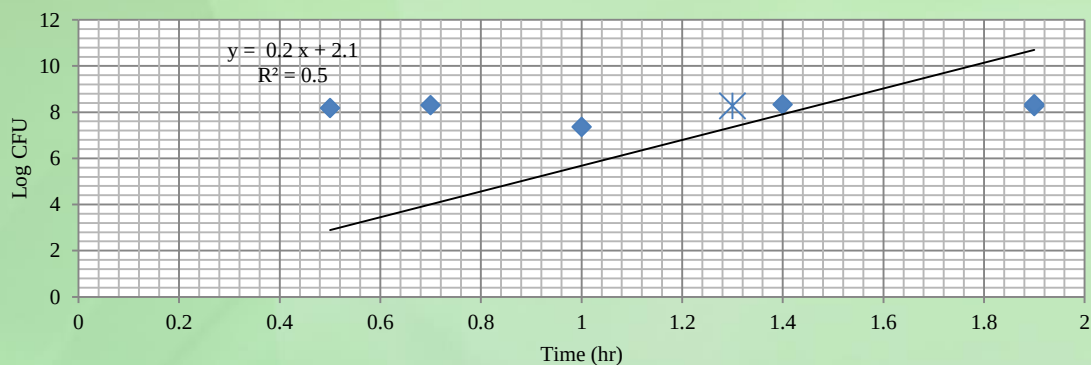


Figure 3. Linear Regression Model for -4°C temperature of tilapia fish samples

Food qualities are frequently evaluated by microbial growth. Mathematical models are used in predicting the change in food quality in respect to temperature and time which can be used in estimating the shelf life of foods. It can be used also to reduce the required amount of time and expensive challenge testing. It may also help in designing more effective methods of challenge testing, and finally can be used for distribution chain optimization. Another very significant characterization of models is the acquisition of enhanced knowledge of the components that defines food quality.

Gompertz's original and derived parameters showing the growth of specific spoilage organisms (SSOs) isolated from the surfaces of tilapia fish samples at 0, -2 and -4°C with storage time of 24, 48 and 72 hours is shown in Tables 5-7. The experimental data was modeled using the Gompertz modified equation for both bacteria and fungi counts with different temperatures of the isolates in cfu/ml of the samples. The derived parameters of the Gompertz model such as specific growth rate (μ) was observed to increase at temperatures of -4°C with decreasing maximum population density (MPD) and Lag phase duration (LPD) time of the specific spoilage organisms. These findings were in agreement with the works of Xing *et al.* (2012), Eddy *et al.*, (2019) and Odangowei *et al.* (2021).

The test organism's results in tilapia fish at 0, -2 and -4°C temperature were modeled by the linear regression model (R^2 values were 0.8, 1.0 and 0.5 respectively), showing a strong positive linear relationship (Fig. 1, 2 and 3). This linear regression model results were in accordance with the works of Pena *et al.* (2013). Temperature and

time has been established as the two very significant factors that affect the growth of specific spoilage organisms in foods. Hence, modeling the growth of SSO, considering temperature and time enables scientist to predict the possible growth of SSO accurately during processing and storage.

Conclusion

This research results demonstrated and shows that *Pseudomonas species*, *staphylococcus species*, *Escherichia coli*, *Shigella species*, *Salmonella species*, *Klebsiella species*, *Penicillium species*, Yeast, *Fusarium species*, *Phytophthora species* and *Aspergillus species* are Specific Spoilage Organisms (SSOs) of Tilapia (*Oreochromis niloticus*) fish. They reduce the lifespan of *Oreochromis niloticus* at 0, -2 and -4°C temperatures in 24, 48 and 72 hours storage times. On the number of isolated colonies of the microbial growth in tilapia fish -4°C temperature isolates such as *Salmonella* (2.2×10^8 CFU/cm²), *Pseudomonas* (2.15×10^8 CFU/cm²) and *Staphylococcus* (1.8×10^8 CFU/cm²) were observed to be highest. The intense presence of *Salmonella species* in the study can be correlated to contaminated waters used by the retailers of the tilapia fish. The experimental data was modeled using the Gompertz modified equation for both bacteria and fungi counts with different temperatures of the isolates in cfu/ml of the samples. The derived parameters of the Gompertz model such as specific growth rate (μ) was observed to increase at temperatures of -4° C with decreasing maximum population density (MPD) and Lag phase duration (LPD) time of the specific spoilage organisms. Temperature and time has been established as the two very significant factors that affect the growth of specific spoilage organisms in foods. Hence, modeling the growth of SSO, considering temperature and time enables scientist to predict the possible growth of SSO accurately during processing and storage. The test organism's results in tilapia fish at 0, -2 and -4°C temperature were modeled by the linear regression model (R^2 values were 0.8, 1.0 and 0.5 respectively), showing a strong positive linear relationship.

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Pollen Profile of Honey Samples from Middle Belt Region of Nigeria

Nchedochukwu Ikegbunam ^{1*}, Okwong Walter², Nkechinyere Nweze¹, Emmanuel Osayi¹, Reginald Njokuocha¹.

¹University of Nigeria, Faculty of Science, Department of Plant Science and Biotechnology, Nsukka, Nigeria

²University of Lagos, Faculty of Science, Department of Botany, Lagos, Nigeria

Abstract

Melissopalynological studies are useful to determine the floral contents and geographical origin of honey samples. The great diversity of plants allows bees to produce honey that is highly valuable to the Nigerian populace. This study is aimed to determine pollen types of honey samples collected from the middle belt region to provide information on botanical origin of honeys. Six honey samples were collected in Benue and Kogi states in North Central, Nigeria. According to their pollen spectra, the six of them were considered multiflora. The honey samples collected from Benue state had a total pollen count of 8, 932 belonging to 26 families and 39 pollen types. Kogi state recorded 3,859 pollen count belonging to 19 families and 29 pollen types. The major pollen types in the honey samples were *Nauclea latifolia*, *Phyllanthus* sp., *Lannea* sp., *Hymenocardia acida*, *Syzygium guineense*, *Solanum* sp., *Parkia biglobosa* and members of Anacardiaceae, Combretaceae/Melastomataceae, Euphorbiaceae and Sapindaceae in Benue state. *Hymenocardia acida*, *Elaeis guineensis*, *Solanum* sp., *Cassia* sp., *Nauclea latifolia*, members of Combretaceae/Melastomataceae and Fabaceae were dominant in Kogi state. The pollen analysis provides important information on the floral source preferences of bees and on honey contents, which can be used by traditional beekeepers and the public in general in promoting the production and consumption of high quality honey in the middle belt region of Nigeria.

Keywords: Honey; Pollen analysis; Botanical; Geographical; Kogi; Benue; Middle Belt

Genetic transformation of sugarcane for improved valuable traits

Ghulam Mustafa^{*1}, Aqsa Parvaiz¹, Faiz Ahmad Joyia¹, Sultana Anwar¹, Muhammad Saeed¹, Muhammad Sarwar Khan¹

¹Centre of Agricultural Biochemistry & Biotechnology (CABB), University of Agriculture, Faisalabad, Pakistan
Corresponding Email: drmustafa8@gmail.com

Abstract

Sugarcane, not only fulfills 70% of world sucrose needs but is also a prime potential source of bioethanol. Our entire sugar need and multibillion sugar industry is solely dependent on the fate of this crop. Further, world energy crisis have uplifted its worth to great extent being the prime source of biofuel. It had been grown in many countries as biofuel crop as well. Complex genome of modern sugarcane hybrids include sub-genomes from two progenitors *Saccharum spontaneum* and *Saccharum officinarum* with some of the chromosomes from recombination between these sub-genomes. Complexity of the genome, long breeding cycle and recalcitrancy to in vitro regeneration are the major impediments in its improvement through conventions or advanced techniques. Genetic engineering offers solution to the existing bottlenecks in the improvement of these crop plants. Recent interventions in the field of Molecular biology have led to whole genome sequencing have resolved recalcitrancy in this grass. We have worked out sugarcane regeneration and are working to engineer its genome for improved valuable traits in this sweet grass.

Key Words: *Saccharum*, In vitro regeneration, Genetic engineering, Molecular biology

Review on role of Pterostilbene in metabolic diseases through SIRT1 pathway

Rashmi Patil, Urmila Aswar

Department of Pharmacology, Poona College of Pharmacy, Bharati Vidyapeeth (Deemed to be University), Erandwane, Pune-411038, India.

Abstract

Pterostilbene (PTE) (3-5 dimethoxy-4-hydroxy-trans-stilbenes) is an analogue of resveratrol. It is extracted and isolated from a natural source of the heartwood of *Pterocarpus marsupium*, red grape skin, and blueberries (*Vaccinium spp.*). Substantial evidence suggested that PTE displayed numerous preventive and therapeutic properties in many metabolic disorders such as diabetes and obesity. Metabolic diseases result in *Insulin resistance (IR)* which advances to impaired sensitivity to insulin-mediated glucose disposal. The prominent role of SIRT (silent information regulator proteins) is now getting emphasized in metabolic disorders. SIRT1 represses Uncoupling protein 2 (UCP2) expressions which are further responsible for improving synthesis of ATP from glucose. This results in improving glucose utilization and insulin secretion, thus preventing insulin resistance. SIRT1 also exhibits prominent role in facilitating fatty acid mobilization thereby inhibiting adiposity. Metabolic disorders are therefore the consequences of SIRT1 downregulation. Pterostilbene being a SIRT1 activator, increases insulin sensitivity reduces adiposity, therefore can prove to be beneficial in diabetes as well as obesity. The review summarizes therapeutic effects portrayed by Pterostilbene via the SIRT1 pathway in metabolic diseases.

Key Words: Pterostilbene, SIRT1, Diabetes, Obesity, Inflammation, Insulin resistance

Introduction

Diabetes and Obesity are global health problems affecting various populations and is common in all age groups, gender, and ethnicity. Their prevalence is on the surge with the estimation of 25.3% (360 million) for diabetes and 44.9% for obesity in 2030 (Ampofo and Boateng, 2020). Diabetes mellitus (DM) is a disease characterized of inadequate insulin regulation which leads to disorganization of carbohydrate, protein, and fat metabolism. While obesity is body mass index above 30 kg/m² which is associated with chronic low-grade inflammation and is an important parameter to the pathogenesis of Insulin resistance (IR) (Aswar, Patil and Bodhankar, 2019). DM and obesity thereupon result in *Insulin resistance (IR)* which advances to impaired sensitivity to insulin-mediated glucose disposal. This leads to intolerance to a glucose load causing hyperglycemia, hyperinsulinemia, increased very low-density lipoprotein (VLDL), decreased very high-density lipoprotein (VHDL), and hypertension.

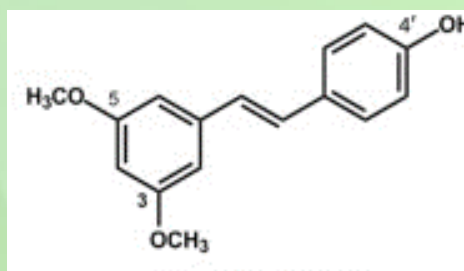
Role of SIRT1 in metabolic diseases

The prominent role of SIRT (silent information regulator proteins) is getting emphasized concerning metabolic disorders. SIRT is a group of NAD-dependent Class III histone deacetylases causing deacetylation of histone or non-histone proteins. It results in the transfer of the acetyl group from acetyl lysine residue of histone to the ADP-ribose moiety of NAD⁺, producing nicotinamide, 2'-O-acetyl ADP ribose, and deacetylated proteins (Chong *et al.*, 2012). Seven mammalian SIRT proteins have been identified as SIRT1 to SIRT7. Research has shown that SIRT-1 protein is involved in regulating cellular protection against oxidative stress in diabetes (Chong *et al.*, 2012). Increased SIRT 1 expression is stated to improve glucose utilization, insulin secretion and inhibition of IR (Cao *et al.*, 2016), regulation of inflammatory responses. This raised the interest in the use of SIRT 1 analogs in the management of a variety of diseases including diabetes (Ramadori *et al.*, 2011) and obesity (Xu *et al.*, 2016). Hence, SIRT1 becomes a newer target to overcome diabetes, obesity, IR, inflammation. SIRT1 represses uncoupling protein 2 (UCP2) expression which is responsible for inhibiting the synthesis of ATP from glucose by uncoupling mitochondrial respiration. Hence SIRT1 expression improves ATP synthesis from glucose thereby improving glucose utilization, improving insulin secretion and inhibiting insulin resistance. In obesity, expression of SIRT1 is found to be reduced, it is observed that fatty acid mobilization from white adipose tissue is compromised in SIRT1 deficient mice (Picard *et al.*, 2010). Thus it can be stated that SIRT1 expression is responsible for inhibiting adiposity (Xu *et al.*, 2016).

PTE as SIRT1 activator

PTE (3-5 dimethoxy-4-hydroxy-trans-stilbene) is an aromatic hydrocarbon belonging to one of the polyphenolic compounds called stilbenoids. PTE portrays high liposolubility and increased Blood brain barrier (BBB) permeability due to the presence of two more methoxy groups on the A-benzene ring as compared to

resveratrol(Deng *et al.*, 2015). It has a molecular weight of 256.3 hence gets rapidly absorbed and distributed in the body(Kapetanovic *et al.*, 2011). This significantly results in increased cell membrane permeability, higher bioavailability, bioactivity, stability, longer half-life, and lower toxicity which may have good prospects in the future for clinical application(Kapetanovic *et al.*, 2011). Presence of only one free hydroxyl group in Pterostilbene makes it more metabolically stable and only one group can be utilised for glucuronidation or sulphation (Dellinger *et al.*, 2014)). The major factor affecting PTE dissolution is its poor water solubility but gets easily dissolved in ethanol. Various suspending agents like Carboxy methylcellulose, β Cyclodextrin, Tween 80 can be incorporated. It gets excreted in the form of glucuronic acid and conjugates with its binding metabolites (Remsberg *et al.*, 2008). In this review, we systematically introduce the emerging role of PTE in metabolic disorders such as diabetes and obesity through the SIRT1 pathway. SIRT1 shows its beneficial effects mediated through various probable factors such as UCP2, Nrf2, NFKB, PPAR γ and PGC-1 α . The downregulation of SIRT1 in metabolic conditions hampers its ability to block UCP2, Nrf2, NFKB. Increased expression of UCP2 negatively regulates insulin secretion, resulting in IR. SIRT1 is master regulator of inflammatory responses by inhibiting Nrf2 and NF-KB which regulate the levels of proinflammatory cytokines (TNF- α , IL-1 β , IL-16, IL-8). PPAR γ and PGC-1 α play important role in mitochondrial biogenesis, lipid and glucose homeostasis and antioxidant defense mechanism, which gets affected by SIRT1 downregulation.



IUPAC name-3-5 dimethoxy-4-hydroxy-trans-stilbene

PTE displays wide variety of pharmacological roles which include potent anticancer, hypolipidemic activity, anti-diabetes, cardioprotection and neuroprotection (Remsberg *et al.*, 2008). The probable mechanisms can be correlated to its antioxidant and anti-inflammatory property (Kosuru *et al.*, 2016) (Gómez-Zorita *et al.*, 2015). PTE being SIRT1 activator it potentiates its activity and results in attenuation of metabolic disorders. The probable pathway is depicted in figure given below.

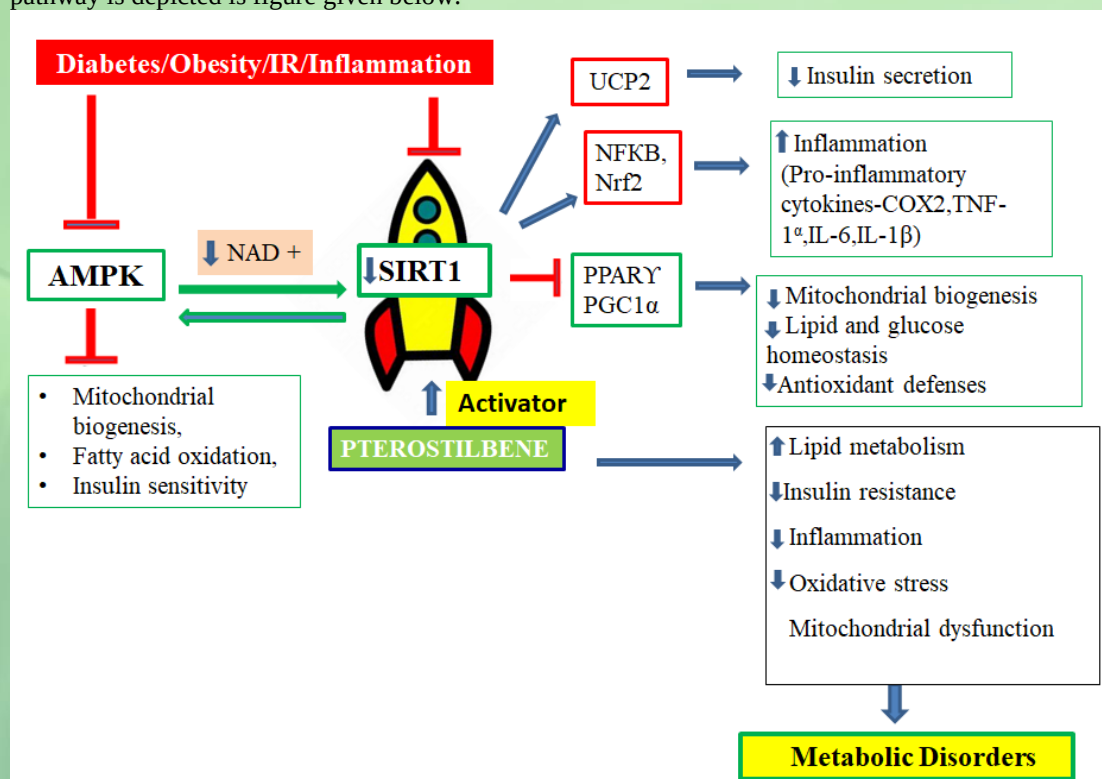


Figure 1. Schematic representation of probable factors involved in Pterostilbene associated SIRT1 pathway in metabolic disorders.

Sources of PTE

Pterostilbene was first identified and isolated from *Pterocarpus santalinus* (sandalwood) in the year, 1940 (Seshadri, 1972). Few year later many other sources were identified such as *Pterocarpus marsupium* (Indian kino) (Manickam *et al.*, 1997), *Vaccinium* berries (Rimando *et al.*, 2004), *Vitis vinifera* (grape vine) (Adrian *et al.*, 2000), and *Arachis hypogaea* (peanut) (Sobolev *et al.*, 2011).

1) *Pterocarpus marsupium* Roxb. (Fabaceae)

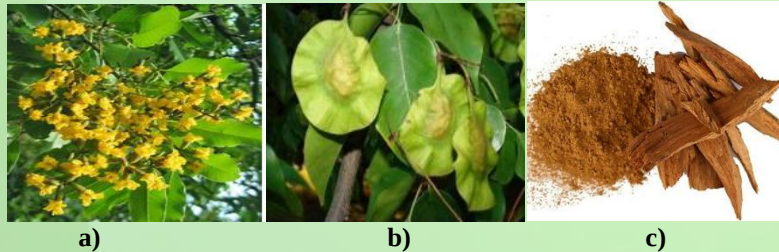


Figure: *Pterocarpus marsupium* Roxb. (Fabaceae): a) Flowers and leaves; b) Seed; c) Bark

Taxonomic position: Order –Fabales; Family- Fabaceae; Subfamily- Faboideae; Tribe -Dalbergieae ;Genus - *Pterocarpus* ;Species -*P. Marsupium*.

Pterocarpus marsupium Roxb. (Fabaceae) is well known in India and neighbouring countries for more than 2000 years. It is commonly known as Malabar kino, Indian kino, Vijayasar, or Venkai. Kino is called as “Bija or Bijasal” (Gamble JS 1935). It is a deciduous tree species with high medicinal value, found in India, in the Western Ghats in the Karnataka-Kerala region, forests of Central India, Nepal, and Sri Lanka. It can grow medium to large, up to 30 m (98 ft) tall. The tree has multipurpose uses such as for wood, fodder, fuel wood and shade tree in coffee plantations. Every part of the tree has been used for its most versatile medicinal values and a wide spectrum of biological activity. It is a valuable source of unique natural products for development of medicines against various diseases as described below.

The leaves of the tree are compound with three to seven oblong leaflets, three to five inches in length, with wavy margins. Medicinally leaves can be applied externally for boils, sores and skin diseases and for treatment of stomach ulcers. Flowers are yellow coloured, fragrant with large panicles. They are bitter in taste and improve the appetite and cause flatulence and also useful in control of fever (Kitikar *et al.*, 1999). Seed pods are flat, orbicular and winged. Gum is bitter in taste and is used as antipyretic, anthelmintic and tonic to liver. It is useful in treatment of diarrhea, dysentery, leucorrhoea, passive haemorrhages. The surface of bark rough, grey or greyish-black longitudinally fissured, scaly, exfoliated, irregular, fibrous with width of 10-15 mm. The internal colour of older tree bark is blaze pink and it exudes blood-red gum resin. Heartwood in golden yellow and sapwood is pale yellow to white in colour. The bark shows beneficial activity against stomachache, cholera, dysentery, urinary complaints, tongue diseases and toothaches. *Pterocarpus marsupium* contain pterosupin, pterostilbene, isoliquiritigenin, liquiritigenin, epicatechin, kinotannic acid, kinoin, kino-red beta-eudesmol, marsupol, carpusin and marsupinol (Badkhane *et al.*, 2010). It exhibits a unique feature of beta cell protection and regeneration along with blood glucose reduction (Dhanabal *et al.*, 2006). Many preclinical trials conducted on various species including rats, dogs, and rabbits with induced diabetes. *P. marsupium* reversed the damage to the beta cells leading to complete restoration of normal insulin secretion (Satheesh and Pari, 2010). It also exhibit PGE2- inhibitory and COX-1/2 selective inhibitory activity which attenuates inflammation (Rizvi and Mishra, 2013).

2) *Vaccinium* spp (Blueberries and Cranberries)

Taxonomic position: Order-Family *Ericaceae*, Subfamily *Vaccinoideae*, Genus *Vaccinium*,



***Vaccinium ashei* Reade (Blueberries)**

The blueberry belongs to Ericaceae family and genus *Vaccinium*. The cluster fruited blueberry species are largely confined to the eastern United States containing acidic soil and South America and particularly to Alabama (Southern and Blueberry, 1990). Two *Vaccinium* species, *Vaccinium ashei* Reade (rabbiteye blueberry) and *Vaccinium stamineum* L. (deerberry), contain pterostilbene (Rimando et al., 2004). In rabbiteye blueberry (*V. ashei* Reade), every 100 g of the dried sample contains 9.9–15.1 µg of pterostilbene and deerberry (*V. stamineum* L.) contains about 52 µg/100 g dry sample (Rimando et al., 2004). Blueberry fruit are known as “false” berries because they originate from inferior ovaries (Vicente et al., 2007) which rapidly swells after fertilization and remain green with little change in volume. The berry begins to get more purple with time and with increased sweetness and flavours. Blueberries are deep purple to black, but the bluish colour is due to the glaucous covering (Austin and Bondari, 1993).

***Vaccinium stamineum* L. (Deerberry)**



Taxonomic position: Order:Ericales, Family:Ericaceae, Genus:*Vaccinium*, Species:*Vaccinium stamineum* L. – Deerberry

Vaccinium stamineum L. (deerberry), majorly found in the United States and Canada. It is commonly known as deerberry, tall deerberry, squaw huckleberry, highbush huckleberry, buckberry, and southern gooseberry. It is a low slender shrub, growing up to 1.5 meters (60 inches or 5 feet) tall. The leaves are alternate, simple, elliptical, entire, 1 to 3 inches long, which have thin blades yellow green in colour with waxy hairy texture. Flowers are small (1/4 inch), white, bell-shaped with 5 lobes, hanging with five green sepals and bell shaped corolla five in number fused with petals. Fruits are small, purplish-black with a white bloom, edible with tart, sour, bitter, or sweet-spicy taste. Twig is slender, zigzag, green and red turning and pointed. Bark is gray-brown to reddish brown and shreddy in nature. The fruit is rich source of vitamins A, C, and E, as well as carbohydrates, protein, fiber, and fat. The chemical constituents present are polyphenolic substances including chlorogenic, citric, malic, quinic, acetic, caffeic, p-coumaric, and shikimic acids. It exhibits wide range of pharmacological properties like reduction of blood sugar, serum cholesterol, and triglyceride levels and are demonstrated to be antiallergenic, anti-viral and antiproliferative (Druice and Percival 2003). A noteworthy observation was done by Pezet R et al (1988) that a higher concentration of PTE was found to be presented in grapes infected by fungus in comparison with the healthy skin of grapes.

3) *Vitis vinifera* (Grapes)



Taxonomic position Kingdom-Plantae;Clade-Tracheophytes;Order-Vitales;Family-Vitaceae; Genus-*Vitis*;Species-*V. vinifera*

Vitis vinifera, also known as the common grape vine, is native of mediterranean region, Central Europe and Southwestern Asian. It is commonly called as kalidraksha. It is a woody, deciduous vine that climbs by branched tendrils which sprawl horizontally over low-growing shrubs. Leaves are ovate, suborbicular with long stalk. The margin of leaves are bristly and coarsely toothed. Soft pulpy grapes (botanically berries) are grown from the flower which get ripen to sweet taste in summers, which vary in size, form and color. The barks are flaky and shred in strips. Grapes are rich source of resveratrol and its analogue, the flavanol quercetin, catechins, procyanidins, and anthocyanins, etc. It acts as an antioxidant, which are essential for improving a person's appetite and metabolism (Jayaprakasha, Singh and Sakariah, 2001). *Vitis vinifera* shows pharmacological activity in treatment of cardiovascular diseases, cognition and neuronal function associated with aging and neurodegenerative disorders, tumor and microbial infection. HPLC study of Darakchasava a traditional Indian herbal medicine shows presence of PTE (Paul et al., 1999)

4) *Dracaena cochinchinensis* (Lour.)



a) *Dracaenacochinchinensis* (Lour.).



b) Dragon Blood resin

Taxonomic position: Kingdom: Plantae, Order: Asparagales, Family: Asparagaceae, Subfamily: Nolinoideae, Genus: *Dracaena*, Species: *D. cochinchinensis*

PTE is present in the dragon's blood resin derived from *Dracaena cochinchinensis* (Lour.). It is a bright red resin located at Guangxi and Yunnan provinces of China (Ding *et al.*, 2018), Asian tropical forests under the family is *Asparagaceae*. The tree is an evergreen plant which is multi-branched, 5 - 15 m tall (Fan *et al.*, 2014). The plant is reported for promotion of blood circulation, analgesic, antibacterial, anti-inflammatory, antioxidant, antiseptic, antispasmodic, antithrombotic, antitumor, astringent and haemostatic (Liu *et al.*, 2013). It also treats a diverse range of central and peripheral inflammatory diseases such as diabetes, arthritis, colitis, gynecopathy, and allergic dermatitis.

5) *Arachis hypogaea* (Peanuts)



Taxonomic position- Genus-*Arachis*; Species-*hypogaea*; Family-Fabaceae

Arachis hypogaea, or peanut, is a legume grown worldwide and is native to central Brazil. Numerous studies demonstrated that hairy root cultures of peanut which is among the divergent group of plants that contain significant amount of Pterostilbene (Medina-Bolivar *et al.*, 2007) (Sobolev *et al.*, 2011). The name *hypogaea* means "under the earth" is used since the pod containing edible seed grows below the ground. The flowers are bright yellow in colour, with 4-5 petals and 1-3 inches in size. The leaves are elliptically ovate green coloured, 1-3 inches in length with a prominent midvein. Stem is cylindrical and smooth, sturdy erect or prostrate stem which becomes angular and hairy with age. The pods, grown underground, contain one to three seeds covered with thin papery seed coat. Peanut is one of the principal oilseeds and high-quality food on a daily basis. The peanut oil has demulcent, emollient, anti-inflammatory, aphrodisiac and decoagulant action (Duke, J. A 1985)

6) *Pterocarpus santalinus* (Sandalwood)



Taxonomic position-Kingdom- Planta; Phylum- Tracheophyta; Class- Equisetopsida C. Agardh ; Order- Fabales; Family –Fabaceae; Genus- Pterocarpus; Species- *Pterocarpus santalinus* L.f.

The Pterocarpus species is distributed in majorly in peninsular India and Sri Lanka. Common names are Agar, Red sandalwood, Chandan. Sandalwood is a deciduous tree with clear trunk and rounded crown with height of about height of 10 m. The flowers are yellow, densely arranged in branches. The pods are narrowly winged obliquely orbicular, 3–4 cm in size. The leaves are alternately arranged and petiolate. The bark is blackish brown, fissured and similar to crocodile skin. When the inner part of bark is cut it oozes out red coloured ‘santolin’ dye. It is used as an astringent, analgesic, anti-inflammatory. It shows effective role in treatment of chronic dysentery, burning sensation, vomiting, skin diseases, leprosy, ulcers, fistula, and haemorrhages. It shows prominent antidiabetic activity which can be useful in lowering the blood sugar level (Kameswara Rao *et al.*, 2001).

Conclusion

PTE is found to act through SIRT1 activation and SIRT1 has been proven to be beneficial in treatment of diabetes, IR and inflammation. It is also found to mobilize fatty acids useful for avoidance of obesity. Considering the significant role of Pterostilbene in metabolic diseases and improvement in understanding of its mechanism of action at molecular level, the moiety should be further studied for its clinical use. The present review has overviewed the beneficial effects of PTE and its sources.

Acknowledgements

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Development And Characterization Of Hybrid Proteins For Plant Insect-Pest Control Using Computational Tools

Hafsa Abid¹, Arfa Tanveer¹, Sadam Munawar¹, Aqsa Parvaiz¹, Ghulam Mustafa¹, Muhammad Sarwar Khan¹, Faiz Ahmad Joyia^{1*}

¹ Centre of Agricultural Biochemistry and Biotechnology (CABB), University of Agriculture Faisalabad-PAKISTAN

*corresponding author: faizahmad1980@gmail.com

Abstract

Insect pest's cause massive damage to the commercially important crops around the world. Sucking insects are one of the important insect pests that are difficult to manage due to emerging insecticide resistance. Since, existing strategies aimed at minimizing crop losses by relying primarily on chemical pesticides. Transgenic-crops with inherent pest-resistance propose potential alternatives and are continuously developing. The phenomenon of induced plant defense has given the idea of deploying the Volatile Organic Compounds (VOCs) emission to improve crop-protection. However, the molecular basis of these defensive compound and their repellent activity is not well known. The present study was conducted *in-silico* to assess the mode of action of these volatile compounds mainly pheromones that are supposed to act as insect repellents, for tomato insects' pests. The functional domains of insecticidal protein Cry1ac, Cry2ab, Cry3bb, Cry1ab were fused with the terpene synthases responsible for the production of volatile compounds of interest. These proteins were fused to broaden the insect management activity. Initially 3-D protein structures were predicted using Swissmodel and phyre2 servers, and then evaluated using PROCHECK, ERRAT and Verify3D tools. Docking analysis for OBP-ligand was done using MOE, parent cry proteins and fusion protein docking with the receptor proteins was done with Zdock and Patchdock server. The interaction studies of fusion proteins and insect receptors showed promising results of high binding affinities for most proteins while the best interacting ones were Cry2ab-E β FS, Cry2ab-E β OS for cadherin receptor, Cry1ac-E β OS and Cry1ab-E β FS for ALP receptor and Cry3bb-E β OS and Cry1ac-E β OS for APN receptor. The best interactions are specified on the basis of number and length of hydrogen bonds. Thus, the study concluded that fusion proteins possess strong binding affinities against lepidopteran insect receptors and are not affecting the efficacy of both fused proteins thus has a probability to be competent proteins with insecticidal as well as insect repellent property. Moreover, the cross-binding affinities among OBP proteins and ligands showed that development of transgenic plants with the exploitation of E-beta farnesene and e-beta ocimene can be carried out in future as non-invasive pest- control strategies.

Key Words: *In silico* tools, Hybrid proteins, Insect-pest control, invasive and non-invasive control,

Kireçli Toprakta Börülce Çeşitlerinin Fide Gelişimi Üzerine Vermikompost ve Mikoriza Uygulamalarının Etkileri

Sezer Şahin, Seda Bice Ataklı

Tokat Gaziosmanpaşa Üniversitesi, Tokat, Türkiye

Özet

Organik madde topraktaki besin elementlerinin alımında olumlu etkisi vardır. Topraktaki mikoriza faaliyetlerinin artması rizosfer bölgesindeki faaliyetlerin artmasına neden olmaktadır. Vermikompost son yıllarda toprağa katılabilecek en faydalı organik gübreler arasındadır. Toprak mikroflorası mineral maddelerin dönüşünü gerçekleştirme özelliğindedir. Çalışmada Akkız, Karagöz ve Karnıkara börülce çeşitleri kullanılmıştır: Deneme tesadüf blokları deneme desenine göre 3 tekerrürlü olarak viyol çalışması olarak yürütülmüştür. Çalışmada fide geliştirmek için viyollere % 16 kireç içeren bir toprağa mikorizalı ve mikorizasız olacak şekilde farklı oranlarda vermikompost (% 0, 15, 30 ve 45) karıştırılarak fide gelişimi sağlanmıştır. Bitkilere gelişimleri için yeterli mineraller uygulanmıştır. Fideler 40 günlük iken hasat edilerek fide ölçüm parametreleri ve bitki yapraklarında makro besin elementlerine bakılmıştır. Vermikompost miktarı arttıkça fidelerin toprak üstü yaş ve kuru ağırlıklarında, kök yaş ve kök kuru ağırlıklarında artışlara neden olmuştur. Organik gübre karışımı arttıkça bitki yaprakların azot, fosfor, potasyum ve magnezyum konsantrasyonlarında artışa neden olmuştur. Yetiştirme ortamına mikoriza katılması incelenen özelliklerde farklı sonuçlar ortaya çıkmasına sebep olmuştur. Çalışmada artan organik gübre oranlarının katılması börülce çeşitlerinin Organik gübre ve bakteri uygulaması kireçli topraklarda bitkilerin gelişimlerinde artırmada etkili olmuştur.

Anahtar Kelimeler:

Soya bitkisinin gelişiminde gübre, kompost, mikoriza ve bakteri uygulamalarının etkileri

Seda Bice Ataklı, Sezer Sahin, Sabriye Belgüzar

Özet

Tarımsal üretimde yetiştiricilikte yetiştirme ortamına organik gübreler, bakteri aşılama, mikoriza uygulamaları ve ideal kimyasal gübreler ile besleme bitkisel gelişimde en etkili faktörler arasındadır. Bu faktörler toprak organik maddesinin zenginleştirilmesinde, toprak ve yetiştirme canlılığını artırmada ve mineral maddelerin bitkiler için dönüştürülmesinde etkilidir. Çalışmada Yemsoy soya fasülyesi çeşidi kullanılmıştır, tesadüf blokları deneme desenine göre 3 tekerrürlü olarak saksı çalışması olarak yürütülmüştür. Çalışmada torf ve perlit karışımı ortamına üç farklı gübre dozu (EC 0, 0,5 ve 1), üç farklı üzüm posası kompostu (% 0, 20 ve 40) ve bu ortamlara mikoriza ve bakteri aşılama şeklinde gerçekleştirilmiştir. Bitkiler 60 günlük bir yetiştirme süresi sonunda saksı üstü kısmından hasat edilerek ölçümler yapılmıştır. Çalışmada artan gübre oranlarında yetiştirilen soya bitkisinin toprak üstü yaş ve kuru ağırlıklarında, kök yaş ve kök kuru ağırlıklarında artışlar yaşanmıştır. Bu artış bitki yaprakların azot, fosfor, potasyum ve magnezyum konsantrasyonlarında artışa neden olmuştur. Yetiştirme ortamına kompost katılması, mikoriza ve bakteri katılması incelenen özelliklerde farklı sonuçlar ortaya çıkmasına sebep olmuştur. Bakteri ilavesi ortamın canlılığını artırmıştır. Kompost ve birki besleme dozlarının artışı bitki gelişimini artırmada etkili olmuştur.

Anahtar Kelimeler:

Humik asit uygulamalarının zambak bitkisinin gelişimi, bitkideki fenolojik ve pomolojik gözlemler üzerine etkisi

Seda Bice Ataklı, Sezer Şahin, Onur Sefa Alkaç

Tokat Gaziosmanpaşa University, Tokat, Turkey

Özet

Bu çalışma torf perlit ortamında yetiştirilen Zambak bitkisinin gelişimi ve bitki kalite özellikleri üzerine temel gübrelemeye ek olarak humik asitin yetiştirme ortamına direk ve yapraktan uygulamalarının etkilerini ortaya koymak için bir saksı çalışması yürütülmüştür. Deneme ısıtmasız serada yaz döneminde üzerine gölge tülü çekilmiş sera ortamında gerçekleştirilmiştir. Denemede humik asit dozları kontrole ek olarak topraktan 3,5 lt/da, toprak 7,5 lt/da, yapraktan 1,75 lt/da, yapraktan 3,75 lt/da ve toprak + yapraktan 3,5lt/da + 1,75 lt/da olarak 3 kere uygulama yapılmıştır. Tesadüf parselleri deneme desenine göre üç tekerrürlü olarak kurulan saksı denemesinde her saksıda 10 adet zambak soğanı dikimi yapılmış ve bitki çıkışını takiben humik asit uygulamaları iki hafta arayla yapılmıştır. Bitki hasada geldiğinde uygulamaların etkisini görebilmek için bitkinin çiçek sapı uzunluğu (mm), çiçek sapı kalınlığı (mm), dal yaş ağırlığı (mm), kandil sayısı (adet), kandil (gonca) uzunluğu (cm), yaprak sayısı (adet), tam açmış çiçek sapı (mm) ve vazo ömrüne (gün) bakılmıştır. Humik asitin dozları arttıkça zambak bitkisinin vegetatif ağırlığı artarken uygulamaların etkisi incelenen özelliklere etkisi farklı olmuştur. Humik asit içerisindeki mineral elementler, hormonlar ve bitki büyüme düzenleyicileri ile bitkide biomasın artışı teşvik etme niteliği taşımaktadır.

Anahtar Kelimeler

Impacts of Climate Changes on Plant-Beneficial Microorganism Interactions

Kubilay Kurtuluş Bastas

Selcuk University Faculty of Agriculture Dept. of Plant Protection, Campus/Konya/Turkey
Author e-mail: kbastas@selcuk.edu.tr

Abstract

Global climate is estimated to change drastically over the next century and the ecosystems will be affected in this changing environment. Plant-associated beneficial microorganisms can stimulate plant growth and increase resistance to biotic and abiotic stresses. Nowadays, the effects of climate change factors such as increased carbon dioxide (CO₂), drought and warming on plant-beneficial microorganism interactions are increasingly being investigated in the scope of plant growth and health. Recent studies have shown that high CO₂ level has a positive effect on the abundance of mycorrhizal fungi, whereas the effects on plant growth promoting bacteria and endophytic fungi are more variable. Elevated CO₂ conditions lead to increased colonization of beneficial fungi. Additionally, the results of increasing CO₂ levels, warming and drought, depend upon the plant and the microbial genotype. Also, plant growth promoting microorganisms, especially bacteria, positively affect plants exposed to drought stress. Altered communities of beneficial microorganisms depending on climate changes, might have to compete with different microbial communities and, therefore microbial activities may also get affected. This work presents that climate change is an important factor affecting microorganism and plant interactions, needs to take into consideration the adaptation processes in plants and microorganisms and might require the selection of adapted plant cultivars.

Keywords: *plant, bacteria, fungi, climate change*

Physicochemical evaluation of unripe banana and broken rice flour enriched cornflakes

Saman Mubashar, Tayyaba Gull, Aqsa Nazir, Maira Anam and Allah Rakha Rehman

National Institute of Food Science and Technology, University of Agriculture Faisalabad

Abstract

Breakfast is unique among meals, taken after prolonged period of fasting. Skipping breakfast is one of current dietary habit that have deleterious consequences on health, well-being, and cognitive activities of individuals. Weight gain and higher body mass index are the most noticed consequences in individuals who continuously skip their breakfast. There is need to develop such recipes that are more attractive, require less processing and fulfill body energy needs. Ready to eat cereals specially flakes are important in this context. Flakes are energy dense, easy to serve, and attractive for children. Preparation of consistent and good quality flakes is still a challenge for manufacturer despite of various advancement and improvements. This study was designed to improve flavor and nutritional profile of flakes by using unripe banana flour (UBF) and broken rice flour (BRF) as composite flour. The prepared flakes were subjected to different physicochemical analysis including proximate, texture, color, water solubility index (WSI) and water absorptivity index (WAI) followed by sensory evaluation. The results of proximate analysis concluded that moisture, protein and fat content for the different treatments were ranged from 8.44% to 9.12%, 7.13±0.13% to 8.06±0.07% and 0.70±0.06% to 0.82±0.02% that decreased as the concentration of UBF increased in formulation. Crude fiber and ash percentage in all treatments were 0.79±0.07%, 0.92±0.02%, 0.95±0.03%, 1.11±0.08%, 1.23±0.07% and 1.10±0.11%, 1.16±0.04%, 1.99±0.10%, 2.07±0.10%, 2.16±0.06% that revealed increasing trend by increasing the percentage of UBF. A considerable increase in Total Dietary Fiber (TDF) content of flakes was observed by increasing the concentration of UBF. TDF values ranged from 6.12 to 8.49%. For physical analysis of flakes, the mean value for texture decreased by adding UBF. Texture value decreased from 210.67g to 167.33g. For color, the L* and b* value decreased by increasing UBF and a* value increased. Rheological analysis of flakes showed that UBF increased the WAI of flakes while WSI decreased. Sensory analysis showed that product was overall acceptable in terms of color, flavor, texture and taste etc. The present research thus concluded that UBF has significant potential to increase nutritional and sensory qualities of flakes.

Keywords:

The Effect Of Olive Maturity On Some Quality Parameters Of Saurani Olive Oil

Dilşat Bozdoğan Konuşkan¹

¹Gıda Mühendisliği Bölümü, Ziraat Fakültesi, Hatay Mustafa Kemal Üniversitesi, Hatay, Türkiye

Abstract

The aim of this study is to investigate the effect of olive maturity on quality parameters such as free fatty acids, peroxide value and fatty acid composition of the oil obtained from the Saurani olive variety grown in Hatay. For this purpose, olive oil was obtained by mechanical method from olives collected from Saurani variety in 3 different maturity periods of the 2020 production season. In Saurani olive oil, free fatty acids and peroxide numbers were found in the range of 0.62-0.91 % (oleic acid) and 3.68-5.26 meq O₂/kg respectively. The amount of free fatty acids increased with maturity. In Saurani olive oil were determined oleic acid in the range of 66.32%-68.79%, palmitic acid in the range of 12.47-13.75%, linoleic acid in the range of 11.43-13.84%, stearic acid in the range of 3.16-3.42%, palmitoleic acid 1.12%-1.34%, linolenic acid 0.88-1.01% and arachidic acid 0.41-0.52. It was determined that decrease in oleic acid content and an increase in linoleic acid content with maturity. It has been determined that Saurani olive oil is within the limits specified in the Turkish Food Codex on Olive Oil and Pirina Olive Oil (2017) in terms of the examined properties.

Keywords: Saurani, olive oil, maturity, quality, fatty acid

Saurani Zeytinyağının Bazı Kalite Parametreleri Üzerine Zeytin Olgunluğunun Etkisi

Özet

Bu çalışmanın amacı Hatay’da yetiştirilen Saurani zeytin çeşidinden elde edilen yağın serbest yağ asitleri, peroksit sayısı ve yağ asitleri kompozisyonu gibi kalite parametreleri üzerinde zeytin olgunluğunun etkisinin araştırılmasıdır. Bu amaçla 2020 üretim sezonunun 3 farklı olgunluk döneminde Saurani çeşidinden toplanan zeytinlerden mekanik yöntemle zeytinyağı elde edilmiştir. Saurani zeytinyağında serbest yağ asitleri %0.62-0.91 (oleik asit), peroksit sayısı 3.68-5.26 meq O₂/kg olarak belirlenmiştir. Olgunlukla birlikte serbest yağ asitleri miktarı artmıştır. Saurani zeytinyağında oleik asit %66.32-68.79, palmitik asit %12.47-13.75, linoleik asit %11.43-13.84, stearik asit %3.16-3.42, palmitoleik asit %1.12-1.34, linolenik asit %0.88-1.01 ve arasidik asit %0.41-0.52 aralıklarında belirlenmiştir. Olgunlukla birlikte oleik asit içeriğinde azalma, linoleik asit içeriğinde ise artış kaydedilmiştir. Saurani zeytinyağının incelenen özellikler bakımından Türk Gıda Kodeksi Zeytinyağı ve Pirina Zeytinyağı Tebliği’nde (2017) belirtilen sınırlar içerisinde olduğu belirlenmiştir.

Anahtar Kelimeler: Saurani, zeytinyağı, olgunluk, kalite, yağ asidi

Giriş

Dünya zeytin üretimi 19.464.495 milyon ton olarak belirlenmiş, Türkiye bu üretimde İspanya, İtalya, Fas’tan sonra 1.500.467 ton ve %7.12’lik pay ile 4. sırada (FAO, 2021) yer almıştır. TÜİK (2021) verilerine göre Türkiye toplam 182.076.130 adet zeytin ağaç varlığına sahiptir. Ülkemizde tescilli yapılan yerli zeytin çeşitlerinin sayısı 97 olup (Anonim, 2021), yeni çeşitlerin tescillenmesi ile ilgili çalışmalar devam etmektedir. Akdeniz Bölgesi zeytin üretiminde (180 bin ton) 1.sırada gelen Hatay ili (110 bin ton), zeytin yetiştiriciliği için oldukça uygun ekolojik koşullara sahiptir. Türkiye zeytin üretiminin yaklaşık %7’sini, zeytinyağı üretiminin ise %10’unu gerçekleştiren ildeki yetiştirilen başlıca zeytin çeşitleri Gemlik, Halhalı, Saurani, Sarı Hasebi çeşitleridir (Gündüz, 2020). İlde üretilen zeytinlerin büyük bir kısmı (%90) zeytinyağı olarak değerlendirilmektedir (Ayanoğlu ve ark., 2000). Zeytin meyvesinin olgunluğu, zeytinyağı kalitesine doğrudan veya dolaylı olarak etki eder. Olgunluğa bağlı olarak zeytinin fizyolojisinde meydana gelen değişimler yağın kalitesini doğrudan etkilemektedir (Garcia ve ark., 1996). Bu çalışmanın amacı Hatay’da yetiştirilen yerli zeytin çeşitlerinden Saurani’den elde edilen zeytinyağının serbest yağ asitleri, peroksit sayısı ve yağ asitleri kompozisyonu gibi kalite parametreleri üzerinde zeytin olgunluğunun etkisinin araştırılmasıdır.

Materyal ve Yöntem

Materyal

Çalışmada materyal olarak, Hatay ili Altınözü ilçesinde kurulmuş ticari zeytin bahçesinden 2020 yılında 20 Eylül, 20 Ekim, 20 Kasım olmak üzere üç farklı olgunluk zamanında önceden belirlenen 3 ağaçtan hasat edilen Saurani zeytin çeşidi kullanılmıştır.

Yöntem

Hasat edilen zeytin örnekleri Hatay Mustafa Kemal Üniversitesi Gıda Mühendisliği Bölümü Yağ Laboratuvarında bulunan kırıcı, malaksör ve seperatörden oluşan mini zeytinyağı sıkma makinesinde (Hakkı Ustaogulları) soğuk sıkım (28°C) yapılarak zeytinyağına işlenmiştir. Zeytinyağı örneklerinde serbest yağ asitleri ve peroksit sayısı analizleri sırasıyla AOCS Official Method Ca 5a-40'ye göre ve AOCS Official Method Cd 8-53'deki yöntemlere göre yapılmıştır (AOCS. 2003).

İstatistik Analiz

Araştırma sonucu elde edilen veriler SPSS 17.0 paket programı (SPSS Inc., Chicago, USA) kullanılarak varyans analizine (ANOVA) göre değerlendirilmiştir. Önemli çıkan değerler ise Duncan çoklu karşılaştırma testine tabi tutularak elde edilen sonuçlar yorumlanmıştır ($p<0.01$) (Özdamar, 1999).

Bulgular ve Tartışma

Saurani zeytinyağının olgunluğa göre serbest yağ asitleri ve peroksit sayısı değerleri Tablo 1.de verilmiştir. Tablo 1'de görüldüğü gibi zeytinyağının serbest yağ asidi içerikleri % oleik asit cinsinden %0.62 ile %0.91 arasında değişmiştir. Olgunlukla birlikte serbest yağ asitleri içeriğinin arttığı belirlenmiştir. Elde edilen bulgular Gündüz (2020)'ün bulgularıyla uyum içerisindedir. Türk Gıda Kodeksi Zeytinyağı ve Pirina Yağı Tebliği (2017)'ne göre serbest yağ asitliği esas alınarak yapılan sınıflandırmada natürel sızma zeytinyağı için belirlenen üst sınır %0.8, natürel birinci zeytinyağı için ise %2.0 olarak belirtilmiştir. %2.0 ve üstü değerler ise rafinajlık zeytinyağı sınıfa dahil olmaktadır. İncelenen zeytinyağı örneklerinde Eylül ve Ekim aylarında alınan zeytinlerden elde edilen zeytinyağları natürel sızma zeytinyağı sınıfında; Kasım ayında elde edilen zeytinyağı örneği ise natürel birinci zeytinyağı sınıfında olduğu belirlenmiştir. Zeytinyağlarına ait peroksit sayısı değerleri 3.68-5.26 meq O₂/kg olarak tespit edilmiştir. Türk Gıda Kodeksi (TGK, 2017)'ne göre natürel zeytinyağlarına ait peroksit sayısı değeri en fazla 20 meqO₂/kg yağ olup zeytinyağı örnekleri standartlarda belirtilen sınırlar içerisinde yer almıştır. Bu çalışmada elde edilen peroksit sayısı değerlerinin Gündüz (2020)'ün bulgularından yüksek olduğu, Munğan (2015)'in çalışmasıyla da benzerlik gösterdiği belirlenmiştir.

Tablo 1. Saurani zeytinyağının serbest yağ asidi ve peroksit sayısı değerlerinin olgunluğa göre değişimleri

Olgunluk	Eylül	Ekim	Kasım
S.Y.A (%Oleik)	0.62 ^c	0.74 ^b	0.91 ^a
Peroksit Değeri (meq/O ₂ kg)	3.68 ^b	3.87 ^b	5.26 ^a

Tablo 2'de Saurani zeytinyağının olgunluğa göre yağ asidi kompozisyonları verilmiştir. Tablo 2'nin de incelenmesiyle de görülebileceği gibi oleik asit, palmitik asit, linoleik asit, stearik asit, palmitoleik asit, linolenik asit ve araşidik asit zeytinyağlarındaki başlıca yağ asitleri olarak belirlenmiştir. Saurani zeytinyağında oleik asit içerikleri %66.32 ile %68.79 arasında belirlenmiş olup bu oranlar TGK (2017)'nin bildirdiği değerler (%55-83) arasındadır. Zeytinyağlarının oleik asit içerikleri olgunlaşmaya bağlı olarak azalma göstermiştir. Palmitik asit içerikleri %12.47 ile %13.75 arasında tespit edilmiş olup bu oranlar TGK'nın bildirdiği değerler (%7.5-20) arasında belirlenmiştir.

Tablo 2. Saurani zeytinyağının yağ asidi kompozisyonlarının olgunluğa göre değişimleri

Yağ asitleri (%)	Eylül	Ekim	Kasım
Palmitik asit	13.75 ^a	13.26 ^a	12.47 ^b
Palmitoleik asit	1.34 ^a	1.21 ^b	1.12 ^c
Stearik asit	3.16 ^b	3.08 ^{bc}	3.42 ^a
Oleik asit	68.79 ^a	66.84 ^b	66.32 ^{bc}
Linoleik asit	11.43 ^c	13.02 ^b	13.84 ^a
Linolenik asit	0.88 ^c	1.01 ^a	0.96 ^b
Araşidik asit	0.42 ^c	0.48 ^b	0.52 ^a

İlgili özellik bakımından elde edilen bulgular Dıraman (2010) ve Yorulmaz (2014)'ın bulgularıyla benzerlik gösterirken, Gündüz (2020)'ün sonuçlarından daha düşük bulunmuştur. Stearik asit içerikleri %3.16 ile %3.42 arasında belirlenmiş olup bu oranlar TGK'nın bildirdiği değerler (%0.5-5.0) arasındadır. Linoleik asit içerikleri %11.43 ile %13.84 aralığında değişmiş olup, TGK'nın bildirdiği sınırlar (%3.5-21) içerisinde. Linolenik ve araşidik asitler ise sırasıyla %0.88-%1.01 ve %0.42-%0.52 aralığında belirlenmiştir. Yağ asitlerinin yüzde dağılımı, olgunluğa göre farklılık göstermiştir. Yağ asidi kompozisyonu, çeşit, olgunluk, yetiştirilen bölge ve çevresel faktörlere bağlı olarak değişebilmektedir (O'Brien, 1998).

Sonuç

Bu çalışmada Hatay'da yetiştirilen Saurani zeytin çeşidinden 3 farklı olgunluk döneminde elde edilen zeytinyağlarının serbest yağ asitleri, peroksit sayısı ve yağ asitleri kompozisyonu gibi bazı önemli kalite parametreleri belirlenmiştir. Saurani zeytinyağında serbest yağ asitleri, peroksit sayısı ve yağ asitleri kompozisyonlarının ilgili standartlarda belirtilen yasal limitler içerisinde yer aldığı belirlenmiştir. Zeytin olgunluğuyla birlikte zeytinyağlarının serbest yağ asitleri ve peroksit sayılarının arttığı tespit edilmiştir. Zeytinyağındaki başlıca yağ asitlerinden olan oleik ve palmitik asit içeriklerinin olgunlukla birlikte azaldığı, linoleik asit içeriklerinin de arttığı belirlenmiştir.

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Neurotrophin (Vitamin B₁₂) in Eating Fish

Semra Küçük

Adnan Menderes University, Agriculture Faculty, Department of Aquacultural Engineering, 09100 Aydın/Turkey

Abstract

Currently, global captive and aquaculture productions have reached 179 billions and global fish consumption is 20.4 kg per a capita in 2019. Fish is an important source of protein, and a lot of vitamins and minerals, as well. The entire vitamins essential for human health is present in fish in high amounts, but amount can change by depending of the fish species. Fish are the major source of n-3 fatty acids (PUFA), and have also a well-balanced amino acid compositions containing high proportions of taurine and choline, and the vitamin D₃, B₃, B₆, B₁₂ and the minerals calcium, phosphorus, iodine, and selenium. Deficiencies of vitamin B₁₂ and n-3 fatty acids adversely affect brain function and cause corruption on mental health and cognition. B₁₂ is important co-factor in formulation S-adenosyl methionine (SAM) for DNA metilation reactions. Additinally, B₁₂ is used in many biochemical reactions such as neurotransmitters and phospholipids mechanism in body. B₁₂ and DHA, type n-3 fatty acids deficiency cause increase of homocysteine levels in plasma and decrease of DHA mobilization from liver. Thus cerebrovascular and neurodegenerative alteration occur. It is studied that the definition and importance of cobalamin (vitamin B₁₂), and benefits of fish eating can provide the young and adults health and protective effects from cognitive impairment in this research.

Key Words: *Fish, B₁₂, Cobalamin, Deficiency, Benefits*

Prediction The Growth Rate Of *Listeria monocytogenes* Based On Fuzzy Logic

İsmail Yüksel Genç¹

¹Fishing and Processing Technology Department, Eğirdir Fisheries Faculty, Isparta University of Applied Sciences, Isparta, Turkey

Abstract

Seafoods are perishable products due to their pH and nutritional value, weak connective tissue and high water activity. After harvesting and/or fishing, seafoods are exposed to the environmental contamination. Besides their natural microflora, additional microorganism which are present in the surrounding area, could contaminate seafoods very easily. Quality loss in seafood could occurs either by spoilage or by safety loss in which pathogenic microorganisms play an important role. From the point of pathogenic microorganisms *L.monocytogenes* is a pathogenic microorganism which causes safety loss in seafood. Determining the presence or absence of *L.monocytogenes* is time consuming and labor intensive method. Instead there are several mathematical models that could be used for the prediction of the growth rate of this pathogenic microorganism. In this context, the growth rate of *L.monocytogenes* was modelled by using fuzzy logic. The growth rates of the bacteria has been compiled from the literature. At total 41 growth rate values has been used for the development and validation of the fuzzy logic. For the development, 24 of the growth rates were used and the rest was conducted for the validation purposes. Temperature values ranged between 0-37°C which are used as input values. For the fuzzy inference system mamdani method was used. At the total 13 rules were produced and deployed. Centroid method was used for defuzzification. In accordance with the results of the study regression coefficient was found to be 0.70 while the correlation coefficient was 0.84. However, the predictions from the developed model is relatively higher than those of observed values. Statistical results were showed that Mean Absolute Deviation (MAD) and Residual Means of Squared Errors (RMSE) were 0.69 and 0.52. Overall conclusion is that the model could predict the growth of *L.monocytogenes* based on the rules that were created in this study and the model should be categorized in the fail-safe model due to its prediction rate which is higher than the observations.

Key Words: *Listeria monocytogenes*, growth rate prediction, fuzzy logic, mathematical modeling, seafood

The Microsatellite DNA Variation in the Honey Bee (*Apis mellifera* L.) Stocks of Breeder Farms in Turkey

Yasin Kahya¹, H. Vasfi Genç¹, E. Doruk Engin²

¹Department of Animal Science, Faculty of Agriculture, Ankara University, Ankara, Turkey

²Biotechnology Institute, Ankara University, Ankara, Turkey

Abstract

The characterization of the native populations is of great importance for conserving genetic resources and sustaining breeding programs. Camili and Posof ecotypes of Caucasian (*A. m. caucasica*) and Aegean ecotypes of Anatolian (*A. m. anatoliaca*) honey bee are preserved in some queen rearing farms, which were officially approved breeder stations by the government in Turkey. In this study, the genetic structure of honey bee stocks of nine breeder farms was studied using microsatellite markers. For molecular analysis, 737 worker bees were sampled from nine breeder queen rearing farms located in Camili (2 farms), Ardahan (1 farm), Posof (3 farms), Ankara (1 farm), Izmir (1 farm), and Muğla (1 farm). The genetic diversity of these breeder farms was assessed using 25 microsatellite loci. The microsatellite data were analysed by population admixture analysis, discriminant analysis of principal components, and UPMGA tree. The results showed that Camili and Posof ecotypes of the Caucasian honey bee and Aegean ecotype of Anatolian honey bee could be discriminated from each other by their different microsatellite patterns.

Key Words: honey bee queen, *Apis mellifera*, microsatellite, Caucasian honey bee, Anatolian honey bee

Insecticidal Potential of Nonyl Acetate against *Sitophilus granarius* (Linnaeus, 1875) and *Sitophilus oryzae* (Linnaeus, 1763) (Coleoptera: Curculionidae)

Mustafa Alkan¹, Turgut Atay^{2*}

¹Plant Protection Central Research Institute, Ankara, Turkey

^{2*}Department of Plant Protection, Faculty of Agriculture, Tokat Gaziosmanpasa University, Tokat, Turkey

Abstract

This study was conducted to determine the insecticidal effect of Nonyl Acetate, essential oil component, against two different stored product pests: *Sitophilus granarius* (Linnaeus, 1875) and *Sitophilus oryzae* (Linnaeus, 1763) (Coleoptera: Curculionidae), under laboratory conditions. Three different doses of Nonyl Acetate (1000, 2000 and 4000 $\mu\text{l kg}^{-1}$) were used in the experiment and the applications were carried out in the form of application to food (wheat for *S. granarius* and paddy for *S. oryzae*). The nutrients needed for each dose of Nonyl Acetate were placed in two-liter plastic bags, then Nonyl Acetate was added and shaken for 5 minutes to ensure a homogeneous mixture. After mixing, 10g of food was placed in 100ml plastic containers. After the containers were covered with tulle, they were left for incubation. The experiment was carried out according to completely randomized design with three replications. In each replicate 10 mixed sexed adult insects were used and the whole experiment was repeated three different times. Dead and live insects were recorded at 3, 5, 7, 14 and 21 days after application. As a result of the study, effect was determined at varying rates depending on the application dose and the applied insect. At the end of the 5th day, an effect of 5.2% was observed against *S. oryzae* at a dose of 1000 $\mu\text{l kg}^{-1}$, while a mortality rate of 27.5% was determined at a dose of 4000 $\mu\text{l kg}^{-1}$. At the end of the 21st day, a 78.8% mortality rate was determined against *S. oryzae* at an application dose of 4000 $\mu\text{l kg}^{-1}$. The applied essential oil component did not show any significant activity against *S. granarius*. These results show that Nonyl Acetate could be a useful toll in the control of *S. oryzae*.

Key Words: Essential oil, Nonyl Acetate, Insecticidal Effect, Stored Product Pests

Nonil Asetat'ın *Sitophilus granarius* (Linnaeus, 1875) ve *Sitophilus oryzae* (Linnaeus, 1763) (Coleoptera: Curculionidae)' ya Karşı İnsektisidal Potansiyeli

Özet

Bu çalışma uçucu bir bileşen olan Nonil Asetat'ın iki önemli depolanmış ürün zararlısı *Sitophilus granarius* (Linnaeus, 1875) ve *Sitophilus oryzae* (Linnaeus, 1763) (Coleoptera: Curculionidae)'ye karşı insektisidal etkisini belirlemek için laboratuvar koşullarında yürütülmüştür. Denemede Nonil Asetat'ın üç farklı dozu (1000, 2000 ve 4000 $\mu\text{l kg}^{-1}$) kullanılmış ve uygulamalar besine (*S. granarius* için buğday ve *S. oryzae* için çeltik) uygulama şeklinde gerçekleştirilmiştir. Nonil Asetat'ın her bir dozu için gerekli olan besin miktarı iki litre hacimli plastik torbalara konulmuş ve daha sonra Nonil Asetat ilave edilerek homojen bir karışımın sağlanması için 5 dakika süre ile çalkalanmıştır. Karışım sağlandıktan sonra 100ml hacimli plastik kaplara 10g besin konulmuş, kaplar tül ile kapatıldıktan sonra inkübasyona bırakılmıştır. Deneme tesadüf parselleri deneme desenine göre üç tekerrürlü olarak kurulmuştur. Her bir tekerrürde karışık cinsiyette 10 ergin kullanılmış ve deneme 3 kez tekrar edilmiştir. Uygulamadan 3, 5, 7, 14 ve 21 gün sonra ölü ve canlı böcekler kaydedilmiştir. Çalışma sonucunda uygulama dozu ve uygulama yapılan böceğe bağlı olarak değişen oranlarda etki belirlenmiştir. Beşinci günün sonunda *S. oryzae*'ye karşı 1000 $\mu\text{l kg}^{-1}$ dozunda %5.2'lik bir etki gözlemlenirken 4000 $\mu\text{l kg}^{-1}$ dozunda ise %27.5'luk bir ölüm oranı belirlenmiştir. Yirmibirinci gün sonunda 4000 $\mu\text{l kg}^{-1}$ dozunda *S. oryzae*'ye karşı %78.8'lik bir ölüm oranı belirlenmiştir. Uygulama yapılan uçucu yağ bileşeni *S. granarius*'a karşı kayda değer bir aktivite göstermemiştir. Bu sonuçlar, Nonil Asetat'ın *S. oryzae*'nin mücadelesinde önemli bir potansiyele sahip olabileceğini göstermektedir.

Anahtar Kelimeler: Uçucu yağ, Nonil Asetat, İnsektisidal Etki, Depolanmış Ürün Zararlıları

Effect of the storage period on the nutritional quality of different watermelon cvs grown in Tunisia

Imen Tlili, Riadh Ilahy and Thouraya R'him

University of Carthage, INRAT Tunisia

Abstract

Watermelon is one of the most important fruits produced and consumed in Tunisia and the Mediterranean basin. In addition to the vitamins, minerals and some atypical amino acids (citrulline), watermelon can provides a wide variety of dietary antioxidants, such as carotenoids, ascorbic acid, flavonoids and other phenols. Despite their importance, few studies have focused on the quality of watermelon fruits in Tunisia. The objective of this work was to determine the content of major bioactive compounds in different watermelon genotypes at four different storage periods. The result obtained in this study confirmed the important role of genotype in the determination of antioxidant compounds and antioxidant activity of fresh watermelon. Furthermore, the nutritional quality is strongly influenced by the storage period. Cv Giza, showed the highest levels of lycopene while Mahdia variety showed the highest antioxidant activity and phenol content. The cv Mahdia was the most suitable for extended storage periods.

Key-words: (Watermelon, *Citrullus Lanatus*, storage, antioxidant activity)

The importance of genetic resources for the sustainability of tomato processing sector in Tunisia

Yosr Laayouni, Riadh Ilahy, Imen Tlili, Thouraya R'him

Department of Biology, Faculty of Science Bizerte, Tunisia

Abstract

Processing tomato is an important agricultural crop worldwide suffering from genetic erosion due to a severe genetic diversity reduction and domestication hindrance. In Tunisia, some old underutilized tomato cultivars are increasingly being considered as genetic resources and are marginally used by small farmers constituting a real safety valve for the sustainability of the processing tomato value chain. Therefore, there is an increasing interest to examine their agricultural and processing traits for processing and fresh market tomato quality improvement. Recently, there was also a particular focus on improving the quality of fresh fruit quality via the introgression of high-pigment genes in processing tomato in order to obtain a high quality processed products. The results are also promising. This suggest that the valorization of the existing genetic pools among cultivated tomato is as important as creating novel hybrids

Keywords:

Determination of Total Phenolics, Antioxidant and Antimicrobial Activities of *Suillus collinitus* Collected from Niğde

Şükrü Canpolat¹, Ilgaz Akata², Yasemin İşlek³, Elif Canpolat⁴, Cemil İşlek⁴

¹Central Laboratory Research Center, Niğde Ömer Halisdemir University, Niğde

²Department of Biology, Faculty of Science, Ankara University, Ankara

³Department of Electronics and Automation, Vocational School of Technical Sciences, Niğde Ömer Halisdemir University, Niğde

⁴Department of Biotechnology, Faculty of Arts and Science, Niğde Ömer Halisdemir University, Niğde

Abstract

Macrofungi have long been used for food and medicinal purposes since early ages by human. They are used as research material with an increasing attraction due to their content of low carbohydrate, high protein, vitamins, essential fatty acids and bioactive compounds that have antioxidant, antimicrobial, antitumoral, antiallergic, antidiabetic properties. In this study it was aimed to determine the total phenolic compounds, antioxidant and antimicrobial activities of *Suillus collinitus* (Fr.) Kuntze (1898) collected from Niğde, Turkey. Macrofungi samples collected from the field were identified due to their morphological characteristics and by molecular methods. For this purpose, Internal Transcribed Spacer (ITS) regions of the rDNA, which are widely used for discriminating fungal species, were amplified with suitable primers by Polymerase Chain Reaction (PCR) following DNA extraction and sequenced. Identification of the macrofungi samples were performed by comparing the data obtained from sequence analysis with the GenBank databases. The DPPH scavenging effect and the amount of total phenolic compounds of the *S. collinitus* samples were investigated. The amount of total phenolic compounds of the methanol extracts of samples was determined as 1567, 32±3,45 µg GAE/mL. When the DPPH radical scavenging activities are taken into account, the activity is increased depending on the concentration. The highest DPPH scavenging activity was found in the extract of *S. collinitus* with 94,04%. Disc diffusion method was used and diameters of the inhibition zones of ethanol and methanol extracts against tested microorganisms were measured for determining the antimicrobial activity of the macrofungi samples. The largest inhibition zones were observed with a diameter of 26±0,6 mm against *Escherichia coli* and *Pseudomonas aeruginosa* test microorganisms by ethanol extracts of *S. collinitus* samples.

Key Words: ITS, DPPH, Antioxidant, Total Phenolics, Antimicrobial Activity, *Suillus collinitus*

Niğde'den Toplanan *Suillus collinitus* Mantarının Toplam Fenolik, Antioksidan ve Antimikrobiyal Özelliklerinin Belirlenmesi

Özet

Makromantarlar eski çağlardan bu yana insanlar tarafından gıda ve terapötik amaçlarla kullanılan organizmalardır. Düşük karbonhidrat, yüksek protein, vitamin, esansiyel yağ asitleri ve antioksidan, antimikrobiyal, antitümoral, antialerjik ve antidiyabetik özelliklere sahip aktif bileşikler içermelerinden dolayı artan bir ilgiyle araştırma materyali olarak kullanılmaktadırlar. Bu çalışmada Niğde'den toplanan *Suillus collinitus* (Fr.) Kuntze (1898) mantarının toplam fenolik madde miktarı, antioksidan ve antimikrobiyal özelliklerinin belirlenmesi amaçlanmıştır. Araziden toplanan makromantar örnekleri morfolojik ve moleküler yöntemlerle tanımlanmıştır. Bu amaçla fungal türlerin tanımlanmasında sıklıkla kullanılan ITS bölgesi genomik DNA izolasyonunu takiben uygun primerlerle PZR tekniği kullanılarak çoğaltıldıktan sonra sekans analizi gerçekleştirilmiş, elde edilen veriler GenBank veritabanıyla karşılaştırılarak tür tayini yapılmıştır. Mantar numunesinin DPPH radikalini süpürme etkisi ve toplam fenolik madde içeriği tespit edilmiştir. Buna göre *S. collinitus* mantar numunesinin metanolik ekstraktındaki toplam fenolik madde miktarı 1567, 32±3,45 µg GAE/mL olarak bulunmuştur. *S. collinitus* mantarının DPPH radikalini süpürme etkisi göz önüne alındığında ekstrakt yoğunluğu ile süpürme etkisinin doğru orantılı olarak artış gösterdiği ve en fazla %94,04 süpürme etkisine sahip olduğu gözlemlenmiştir. Antimikrobiyal etkiyi belirlemek amacı ile disk difüzyon yöntemi kullanılmış ve mantar örneklerinin metanol ve etanol ekstraktlarının test mikroorganizmalarına karşı oluşturdıkları zon çapları ölçülmüştür. En geniş zon çapı 26±0,6 mm ile *S. collinitus* mantar numunesinin etanolik ekstraktının *Escherichia coli* ve *Pseudomonas aeruginosa* test mikroorganizmalarına karşı oluşturduğu gözlemlenmiştir.

Anahtar Kelimeler: ITS, DPPH, Antioksidan, Toplam Fenolikler, Antimikrobiyal Etki, *Suillus collinitus*



China's Energy Needs Resources, Challenges, and Issues

Najib Altawell

Coventry University, Greenwich campus 6 Mitre Passage, Greenwich, SE10 0ER, UK

Abstract

China's energy outlook from fossil fuels, such as oil and gas, is pointing to a high import dependency in the next thirty years. On the other hand, the present prospect of obtaining energy from renewable energy sources has a positive outlook due to their abundant availability in various parts of China, as well as the volume of investments, supportive policy and incentives. Solar, wind and biomass energy are some of the sustainable sources that have already witnessed major development. China is also investing heavily in other energy sources, such as natural gas and nuclear, mainly for a higher electricity output. This paper examines energy requirement and energy policy in China and their impact on the world energy market. The paper also discusses sustainable sources of energy, financial support for renewable energy schemes and internal energy policy, as well as electrification approach in rural areas.

Keywords: *Energy, Electrification, Fossil Fuels, Development, Renewable Energy*

Lactose and Lactose Derivatives

Seval Andıç¹, Şehriban Oğuz²

¹Department of Food Engineering, University of Van Yüzüncü Yıl, Van, Turkey

²Department of Food Engineering, University of Van Yüzüncü Yıl, Van, Turkey

Abstract

Milk is an important food substance and has a complex polydisperse system. The main components of milk consist of lactose, protein and lipids. Mineral substances and vitamins are also present in milk as minor nutrients. Lactose known as milk sugar is the only carbohydrate in milk and it consists of glucose and galactose. The content of lactose in milk has varied according to milk types. Moreover, it is the most important energy source during the first year of human life, providing almost half of the total energy needed by newborns. Lactose is obtained industrially from the residues of cheese and casein production processes. Lactulose, lactitol, lactobionic acid, galactooligosaccharide, lactosucrose, epilactose and tagatose are commonly known lactose derivatives. These derivatives are produced from lactose using various methods such as epimerization, oxidation and reduction. In this article, information is given about lactose and its derivatives.

Key Words: Lactose, lactose derivatives, lactulose, milk, GOS

Laktoz ve Laktoz Türevleri

Özet

Süt, önemli bir besin maddesidir ve karmaşık bir polidisper sisteme sahiptir. Sütün ana bileşenlerini laktoz, protein ve lipitler oluşturmaktadır. Mineral maddeler ve vitaminler ise sütte minör besin maddeleri olarak bulunur. Süt şekeri olarak da bilinen laktoz sütte bulunan tek karbonhidrat olup glukoz ve galaktozdan oluşmaktadır. Sütün laktoz içeriği süt türlerine göre değişiklik göstermektedir. Ayrıca yeni doğanların ihtiyaç duyduğu toplam enerjinin neredeyse yarısını sağlayan laktoz, insan yaşamının ilk yılında en önemli enerji kaynağıdır. Laktoz, peynir ve kazein üretim proseslerinin kalıntılarından endüstriyel olarak elde edilir. Laktuloz, laktitol, laktobiyonik asit, galaktooligosakkarit, laktosükroz, epilaktoz ve tagatoz yaygın olarak bilinen laktoz türevleridir. Bu türevler, epimerizasyon, oksidasyon ve indirgeme gibi çeşitli yöntemler kullanılarak laktozdan üretilmektedir. Bu makalede laktoz ve türevleri hakkında bilgi verilmektedir.

Anahtar Kelimeler: Laktoz, laktoz türevleri, laktuloz, süt, GOS

Serological Detection of Viruses in Tomatoes Grown in Open Field and Greenhouse Areas of Eskişehir Province

Faruk Öncü^{1*}, Serkan Yeşil¹

¹Department of Plant Protection, Faculty of Agriculture, Selçuk University, Konya, Turkey

*Corresponding author: ffarukoncu@gmail.com

Abstract

Eskişehir, where microclimate conditions are observed in some of its districts, is among the provinces with significant vegetable production potential both in greenhouse and open areas. In this study, it was aimed to serologically detect *Tomato spotted wilt virus* (TSWV), *Cucumber mosaic virus* (CMV), *Potato virus Y* (PVY), *Tomato mosaic virus* (ToMV), *Tobacco mosaic virus* (TMV), *Pepino mosaic virus* (PepMV), *Tomato chlorosis virus* (ToCV) and *Tobacco necrosis virus* (TNV) in areas where tomatoes (*Solanum lycopersicum* L.) are grown in greenhouse and open field in Eskişehir. For this purpose, field surveys were carried out in Mihalgaži, Sarıcakaya, Odunpazarı, Seyitgazi and Tepebaşı districts in 2019 and samples were taken from plants showing virus disease symptoms. When the 107 samples collected were tested with the serological-based DAS-ELISA method, it was determined that 60.7% (65 samples) were infected with at least one of the viruses such as TSWV (30.8%), CMV (%16.8%), PVY (8.4%), ToMV (2.8%) and TMV (1.9%). The relative incidences of greenhouse samples (68) were calculated as 42.6%, 8.8%, 5.9%, 2.9%, and 1.5% for TSWV, CMV, PVY, TMV and ToMV, respectively. On the other hand, infections of CMV (30.8%), PVY (12.8%), TSWV (10.3%) and ToMV (5.1%) were detected in open field samples (39). PepMV, ToCV and TNV viruses could not be detected both in the open field and greenhouse. As assessed the relative incidences according to the districts, which were determined as 74.3%, 64.7%, 42.1%, 33.3%, and 33.3% for Mihalgaži, Sarıcakaya, Odunpazarı, Tepebaşı and Seyitgazi, respectively. In this study, virus species were detected for the first time in tomato production areas in Eskişehir. According to the results of the study, it can be said that the detected viruses are similar to the viruses commonly infect to tomatoes in our country and all over the world.

Key Words: CMV, DAS-ELISA, Eskişehir, Plant viruses, Tomato, TSWV

Eskişehir İlinin Açık Alan ve Örtü Altı Alanlarında Yetiştirilen Domatesten Enfeksiyon Oluşturan Virüslerin Serolojik Olarak Tespiti

Özet

Eskişehir ili, bazı ilçelerinde mikroklima özelliği görülmesi nedeniyle hem örtü altında hem de açık alanda sebze üretim potansiyeli barındıran illerimiz arasındadır. Bu çalışmada Eskişehir ilinde açıkta ve örtü altında domates (*Solanum lycopersicum* L.) yetiştirilen alanlarda *Tomato spotted wilt virus* (TSWV), *Cucumber mosaic virus* (CMV), *Potato virus Y* (PVY), *Tomato mosaic virus* (ToMV), *Tobacco mosaic virus* (TMV), *Pepino mosaic virus* (PepMV), *Tomato chlorosis virus* (ToCV) ve *Tobacco necrosis virus* (TNV) virüslerinin serolojik olarak tespiti amaçlanmıştır. Bu amaç doğrultusunda 2019 yılında Mihalgaži, Sarıcakaya, Odunpazarı, Seyitgazi ve Tepebaşı ilçelerinde arazi incelemeleri yapılmış ve virüs hastalığı belirtisi gösteren bitkilerden örnekler alınmıştır. Toplanan 107 örnek serolojik temelli DAS-ELISA yöntemi ile testlendiğinde %60,7'sinin (65 adet) TSWV (%30,8), CMV (%16,8), PVY (%8,4), ToMV (%2,8) ve TMV (%1,9) virüslerinden en az biri ile enfekteli olduğu saptanmıştır. Örtü altı domates örneklerinde (68), enfeksiyon oranına göre sırasıyla TSWV (%42,6), CMV (%8,8), PVY (%5,9), TMV (%2,9) ve ToMV (%1,5) enfeksiyonlarının yaygın olduğu bulunurken; açık alan örneklerinde (39) ise CMV (%30,8), PVY (%12,8), TSWV (%10,3) ve ToMV (%5,1) enfeksiyonlarının yaygın olduğu bulunmuştur. Hem açık alanda hem de örtü altında PepMV, ToCV ve TNV virüsleri tespit edilememiştir. Alan farketmeksizin ilçe geneli enfeksiyon oranı sıralaması Mihalgaži (%74,3), Sarıcakaya (%64,7), Odunpazarı (%42,1), Tepebaşı (%33,3) ve Seyitgazi (%33,3) olarak belirlenmiştir. Bu çalışmada sayesinde Eskişehir ilinde domates üretim alanlarındaki virüslerin varlığı ilk kez tespit edilmiştir. Çalışmanın sonucunda varlığı tespit edilen virüslerin, ülkemiz ve tüm dünya genelinde domates üretim alanlarında yaygın olarak görülen ve bildirilen virüs türleri ile benzer türler olduğu ortaya çıkmıştır.

Anahtar Kelimeler: Bitki virüsleri, CMV, DAS-ELISA, Domates, Eskişehir, TSWV

Assesment Of Aboveground Insects Associated Within Farm Fields Of Musanze District: Classification And Abundance

Ismael Niyokwizigirwa, Sylvestre Habimana, Saidi Rumanzi Mbaraka, Innocent Nyamwasa, Ivan Gasangwa, Florence Uwamahoro, Evergiste Niyonsenga, Erastus Dushimeyesu, Theophile Kanyarwanda, Angelo Ndayiragije, Jean Irene Museminari, Charles Ntigurirwa, Philippe Sibomana

University of Rwanda, College of Agriculture, Animal Sciences and Veterinary Medicine, Rwanda

Abstract

Natural pollination and the physical impairments on plant leaves, as well as plant diseases, indicate the presence of above-ground insects in Musanze District in Rwanda. For this, there is less evidence to describe the presence of insects in the area. Thus, the objective of the study was to determine the above-ground insect families and their abundance in the studied area. The insects were caught at night and netted during the day. The traps hung with light were set randomly in Busogo, Cyuve, Gacaca, Gataraga, Kimonyi, Kinigi, and Muhoza sectors. The replicate was carried out for two consecutive seasons such as wet season and dry season in 2020. The data were analyzed using SPSS version 24. The findings showed that the insects trapped were: Agromyzidae (14.05 %), Apidae(3.26%), Braconidae(17.25%), Carabidae(3.13%), Chrysomelidae(6.52%), Cicadellidae(8.23%), Elateridae(2.74%), Noctuidae(10.45%), Papilionidae(12.65%), Tettigoniidae (21.86%), and Vespidae(2.0%). Hence, the results revealed that there is a difference in the mean amount between insects trapped. In our findings, apart from Tettigoniidae which were higher in insect pests, Braconidae were higher, luckily in beneficial insects whereas the Vespidae family was recorded lower abundance. Looking at this abundance of beneficial insects, farmers are recommended to firstly use trapping and netting to bring the insect pest population below an economic threshold level. This can reduce the cost and dangers to human health and to beneficial insects. Besides, they can apply wide spectrum insecticides which have fewer hazards to the environment.

Keywords:

An Alternative Method for Preparing Mycorrhizal Root Samples for Scanning Electron Microscopy

Şükrü Canpolat¹, Cemil İşlek¹

¹Department of Biotechnology, Faculty of Arts and Science, Niğde Ömer Halisdemir University, Niğde

Abstract

Scanning Electron Microscopy (SEM) is one of the powerful tools for imaging structures that cannot be determined by bare eyes or light microscopy techniques. The efficient preparation has great importance for getting correct images of biological samples by SEM, which has a wide application area in science. Sample preparation for SEM includes four basic steps namely; fixation, dehydration, drying and coating. In widely used methods glutaraldehyde included sodium cacodylate buffer for initial fixation, sodium cacodylate buffer for washing, osmium tetroxide solution for secondary fixation, serial ethanol dilution for dehydration, critical point drying (CPD) with CO₂ for drying and sputter coating with AuPd are used for a reliable preparation of samples for SEM imaging. More attention and safety equipment are required while handling the harmful chemicals used, along with the price of the chemicals are considerably higher than routinely used ones and these may be defined as the main constraints of the process. In this study, SEM imaging of the root samples of pepper plants (*Capsicum annuum* L. cv Samandağı) which have mycorrhizal partners (*Funneliformis mosseae* (T.H. Nicolson & Gerd.) C. Walker & A. Schüßler and *Rhizophagus intraradices* (N.C. Schenck & G.S. Sm.) C. Walker & A. Schüßler) are performed. According to the method tested sodium phosphate buffer was substituted with sodium cacodylate buffer which has the carcinogenic effect, formaldehyde was substituted with glutaraldehyde which has a much higher price and freeze-drying was applied instead of CPD with CO₂. Dehydration step was performed with serial ethanol dilution and secondary fixation with osmium tetroxide which has deadly effects on a human was omitted. The results showed that the mycorrhizal root samples prepared by the above-mentioned method, which was performed by the routine laboratory chemicals and equipment, were successfully imaged by SEM.

Key Words: SEM, Sample Preparation, *Capsicum annuum*, *Funneliformis mosseae*, *Rhizophagus intraradices*.

Taramalı Elektron Mikroskobu Görüntülemeye Mikorizal Kök Numunelerinin Hazırlanması için Alternatif Bir Yöntem

Özet

Taramalı elektron mikroskobu (SEM) ile görüntüleme çıplak gözle veya ışık mikroskopisi ile tespit edilemeyen yapıları görüntülemeye kullanılan güçlü yöntemlerden biridir. Birçok farklı bilim dalında kullanımı olan SEM’de biyolojik materyallerden doğru görüntü alabilmek için örneklerin etkin bir şekilde hazırlanması büyük önem arz etmektedir. Temel olarak fiksasyon, dehidrasyon, kurutma ve kaplama basamaklarından oluşan numune hazırlık aşamasında öne çıkan zorluklardan bir tanesi bu basamaklarda kullanılan kimyasalların nispeten pahalı olması ve sağlığa zararlı etkilere sahip olmasından dolayı fazlaca dikkat ve koruyucu ekipman gerektirmesidir. Yaygın olarak kullanılan yöntemlerde fiksasyon için glutaraldehit içeren sodyum kakodilat tampon çözeltisi, yıkama için sodyum kakodilat tampon çözeltisi, ikincil fiksasyon için osmiyum tetraoksit çözeltisi, dehidrasyon için seri etil alkol dilüsyonu, kurutma için karbon dioksit ile kritik nokta kurutma yöntemi ve kaplama için AuPd ile kaplama uygulanmaktadır. Bu çalışmada, biber bitkisi (*Capsicum annuum* L. cv Samandağı) ile mikorizal mantarların (*Funneliformis mosseae* (T.H. Nicolson & Gerd.) C. Walker & A. Schüßler ve *Rhizophagus intraradices* (N.C. Schenck & G.S. Sm.) C. Walker & A. Schüßler) ilişki kurması sağlanarak alınan kök örneklerinin SEM’de görüntülenmesi sağlanmıştır. Geliştirilen yöntem doğrultusunda kanserojen etkiye sahip sodyum kakodilat tamponu yerine sodyum fosfat tamponu; nispeten pahalı olan glutaraldehit yerine formaldehit kullanılmış, karbondioksit ile kritik nokta kurutma yerine örnekler liyofilize edilmiştir. Bununla birlikte yüksek toksik etkiye sahip osmiyum tetraoksit ile ikincil fiksasyon işlemi uygulanmamıştır. Elde edilen bulgular laboratuvarlarda sıklıkla kullanılan kimyasallar ve ekipmanla daha güvenli bir şekilde gerçekleştirilen bu yöntem ile hazırlanan mikorizal kök örneklerinin SEM’de başarılı bir şekilde görüntülenebildiğini ortaya koymaktadır.

Anahtar Kelimeler: SEM, Numune hazırlama, *Capsicum annuum*, *Funneliformis mosseae*, *Rhizophagus intraradices*.

Preservation Of Aromatic Plants Used As Food By Brine Technique

Emine Aksan Aldanmaz, Samyeli Demirbilek

Hatay Mustafa Kemal University, Faculty of Agriculture, Department of Food Engineering, Antakya Hatay

Abstract

Aromatic plants have been used since the beginning of humanity both for medicinal purposes and to improve the taste and aroma of various foods. In recent years, aromatic plants have gained importance due to their antimicrobial and antioxidant effects and have been used for various purposes in many industries. Aromatic plants are often used to add flavor to foods. In recent years, aromatic plants have been especially involved in the production of functional foods due to their antimicrobial and antioxidant effects. Aromatic plants show antimicrobial activity due to the acid, alcohol, terpene and ester components in their composition. They also have antioxidant effects due to their phenolic hydroxyl groups. Preservation methods are important because the activity of these valuable components in the composition of aromatic plants. In unsuitable methods, the activity of these compounds decreases. Most of the aromatic plants are preserved by drying. In addition, in some regions, aromatic plants are made into brine and stored fresh for a long time. The preservation of aromatic plants in brine is not yet commercially applied in our country, and it is limited to local products. Çakşır (*Giant Fennel*) (*Ferula communis*) produced in Erzurum region, Borage (hodan) (*Borago officinalis*) in Kastamonu region and thyme (zahter) (*Thymbra spicata* L.) in Hatay region are aromatic plants preserved by brine technique. In this study, the purpose of use of aromatic plants consumed as food, preservation methods, aromatic plant varieties preserved by brine method and production methods have been compiled.

Keywords: Aromatic Plants, Preservation, Brine

Gıda Olarak Kullanılan Aromatik Bitkilerin Salamura Yöntemiyle Muhafazası

Özet

Aromatik bitkiler, insanlığın başlangıcından itibaren hem tıbbi amaçlı tedavide hem de çeşitli gıdaların tad ve aromasını iyileştirmek amacıyla kullanılmaktadır. Son yıllarda aromatik bitkiler, antimikrobiyel ve antioksidan etkileri nedeniyle önem kazanmış ve bir çok endüstride kullanılmaya başlanmıştır. Aromatik bitkiler, genel olarak gıdaya lezzet kazandırmak amacıyla kullanılmaktadır. Ancak son yıllarda, aromatik bitkilerin antimikrobiyel ve antioksidan etkilerinin ortaya çıkarılması nedeniyle de fonksiyonel gıdaların üretiminde yer almaktadırlar. Aromatik bitkiler, bileşimlerinde yer alan asit, alkol, terpen, ester vs. bileşenler nedeniyle antimikrobiyal aktiviteye göstermekte, fenolik hidroksil gurupları nedeniyle de antioksidan etkiye sahiptirler. Aromatik bitkilerin bileşiminde yer alan bu değerli bileşenlerin zamanla aktivitesinin kaybolmaması nedeniyle muhafaza yöntemleri önem taşımaktadır. Aromatik bitkilerin büyük bir bölümü kurutularak muhafaza edilmektedir. Bunun yanı sıra bazı bölgelerde aromatik bitkiler salamura edilerek uzun süre taze formlarıyla saklanmaktadır. Aromatik bitkiler salamura ile muhafazası ülkemizde henüz ticari olarak uygulanmamakta yöresel ürünlerle sınırlı kalmaktadır. Erzurum bölgesinde üretilen çakşır (*Ferula communis*) Kastamonu bölgesinde Borage (hodan) (*Borago officinalis*) ve Hatay bölgesinde kekik (*Thymbra spicata* L.(zahter) salamura yöntemiyle muhafaza edilen aromatik bitkilerdir. Bu çalışmada, gıda olarak tüketilen aromatik bitkilerinin kullanım amaçları, muhafaza yöntemleri, salamura yöntemiyle muhafaza edilen aromatik bitki çeşitleri ve üretim yöntemleri konusu derlenmiştir.

Anahtar Kelimeler: Aromatik Bitkiler, Muhafaza, Salamura

Effect Of Different Plasticizers On Physical, Chemical And Biological Properties Of Edible Films

Nurcennet Ertürk, Suzan Biran AY*

Department of Chemical Engineering, Faculty of Engineering, Eskişehir Technical University, 26555, Eskişehir, Turkey.
Corresponding author email: suzanba@eskisehir.edu.tr

Abstract

To minimize oil-based plastic consumption in packaging, a significant effort has been directed towards formulation and production of environmentally friendly edible films for food applications. These materials are mostly protein, polysaccharides and lipids in nature and by particular modifications, they acquire properties desired by consumers. Well-designed alterations or specific formulations are developed to obtain packaging materials with functional properties. Present day understanding of a packaging material is not limited to protection from external influences, the demand is focused on the design of functional and compatible container, which will protect, enrich and fortify the properties of the food it wraps up. Accordingly, many natural antimicrobial, antioxidant, prebiotic ingredients are screened as additives to enhance the functionality of the edible package materials and preserve the taste of food. In this study, films were produced by mixing the same raw material (rye flour) with different plasticizers (sorbitol, citric acid, glycerol and ethylene glycol) at various ratios. The quality properties of formed films such as mechanical (percent elongation and tensile strength), structural (TGA, FTIR, SEM), physical (water vapor permeability and water solubility), chemical (total phenolic content and antioxidant activity) and biological (antimicrobial effect) characteristics were investigated. Considering the common properties of the films produced with different plasticizers, it was seen that increasing the amount of added plasticizer increased the water solubility and thickness of the films, while decreasing the Young's modulus. Apart from sorbitol-containing films, antioxidant properties were observed in all of the films, where the increase added plasticizer enhanced the antioxidant activity. Antibacterial studies showed that films were more effective against *Bacillus subtilis*, Gram (+), than *Escherichia coli*, Gram (-) bacteria.

Key Words: edible film, rye flour, sorbitol, citric acid, glycerol, ethylene glycol, antibacterial

Title: Exploring the Anti-Diabetic Potential of Variable Sized

Aqsa Nazir, Dr. Allah Rakha, Faiza Khalid, Saman Mubashar

National Institute of Food Science and Technology, University of Agriculture

Abstract

Diabetes is one of the most predominant non-communicable disease, whose prevalence is increasing day by day. In dietary intervention, the foremost concern is the consumption of fiber-rich diets including whole grains. The fiber and nutritional profile of grains are dependent upon grain size, variety, climatic conditions and processing variables. Purposely, this study was planned to evaluate the whole wheat grains of variable sizes for their anti-diabetic potential. In this research, three different-sized wheat grains were selected, milled and whole wheat flour (WWF) was analyzed for their proximate, dietary fiber, polyphenol, functional and rheological properties. The crude protein, fiber and ash were highest and available carbohydrates were lowest in small-sized WWF as compared to other two types. The dietary fiber in small-sized WWF was $13.6 \pm 0.11\%$ and in large-sized WWF was $9.87 \pm 0.10\%$. The functional and rheological properties were almost high in small-sized grains flour because the resistance of dough increased with more fiber content for mixing. Thereafter, bread were prepared and analyzed for their texture, color and sensory parameters. The texture of bread was hard and color was slightly more brownish with more fiber content. The overall-acceptability of all types of breads were >6.5 . All types of breads were evaluated for the glycemic and satiety response on healthy individuals. The highest concentration of glucose was attained at 30 min by the consumption of all types of breads but the peak value of glucose was reduced by WWF breads. The decreasing trend for all types of breads was same but it was high for small-sized WWF bread. The satiety score showed the same trend which indicates that the high fiber content increase satiety level for a long time period. It prevents the hyperglycemic spikes and therefore reduce the risk and complications of diabetes.

Keywords:

Determination of Water-Yield Relationship in Growth Periods of Sunflower in Semi-Arid Conditions

Erhan Göçmen¹

¹Department of Biosystem Engineering, Faculty of Agriculture, Tekirdağ Namık Kemal University, Tekirdağ, Turkey

Abstract

The research was carried out in Tekirdağ province in 2019. In the study, yield responses of sunflower to irrigation water applied in different growth periods were measured. In the experiment, the available soil moisture was increased to field capacity during the 3 development periods (late vegetative development, flowering and grain formation) of the sunflower. Considering these periods, different irrigation treatments were created. Irrigation was carried out by drip irrigation method. According to the results obtained, the water yield factor (ky) was obtained as 0.58 for the late vegetative development period, 1.04 for the flowering period and 0.89 for the grain formation period. According to the obtained ky values, the most sensitive sunflower growth period to moisture deficiency in the soil is the flowering period.

Key Words: Sunflower (*Helianthus annuus* L.), Drip irrigation, Evapotranspiration, Growth periods, Yield response factor (ky)

Yarı Kurak Koşullarda Ayçiçeğinin Büyüme Periyotlarında Su-Verim İlişkisinin Belirlenmesi

Özet

Araştırma 2019 yılında Tekirdağ ilinde yürütülmüştür. Çalışmada ayçiçeğinin farklı gelişme dönemlerinde uygulanan sulama suyuna verim tepkileri ölçülmüştür. Denemede ayçiçeğinin 3 gelişme (geç vejetatif gelişme, çiçeklenme ve dane oluşumu) periyodu sırasında mevcut toprak nemi tarla kapasitesine çıkarılmıştır. Bu dönemler göz önüne alınarak farklı sulama konuları oluşturulmuştur. Sulamalar damla sulama yöntemi ile gerçekleştirilmiştir. Elde edilen sonuçlara göre su verim faktörü (ky) geç vejetatif gelişme periyodu için 0.58, çiçeklenme periyodu için 1.04, dane oluşum periyodu için 0.89 olarak elde edilmiştir. Elde edilen ky değerlerine göre, topraktaki nem eksikliğine en duyarlı ayçiçeği büyüme periyodu çiçeklenme periyodudur.

Anahtar Kelimeler: Ayçiçeği (*Helianthus annuus* L.), Damla sulama, Bitki su tüketimi Büyüme periyotları, Verim tepki faktörü

Giriş

Dünya genelinde yetiştiriciliği yapılan çok önemli bir yağ bitkisi olan ayçiçeği (*Helianthus annuus* L.) dünyada yağlık olarak yetiştirilen tek yıllık bitkiler sınıfında soya, kanola ve pamuktan sonra yaklaşık 52 milyon ton ile dördüncü, Türkiye’de 2 milyon ton ile pamuktan sonra gelmektedir (FAO, 2018).

Bitkisel sıvı yağ tüketiminin büyük bir bölümünün ayçiçeği yağı ile sağlandığı ülkemizde, tüketilen 900 bin ton Ayçiçek yağının yaklaşık 400 bin tonunun dışarıdan ithal edildiği belirtilmektedir (Anonim 2018).

Ayçiçeği yağı gıda ve sağlık alanında kullanılmasının yanı sıra, hayvan yemi, kimya, kozmetik, boya, motor yağı, biyodizel, hidrolik yağ, sabun, cila ve plastik sanayinde de önemli bir hammadde olduğu açıklanmıştır (Meral, 2019).

Sektörlerin ihtiyaçlarına karşılık birim alandan elde edilen ürün miktarını arttırmak gerekmektedir. Tüm modern tarımsal işlemlerin yanında sulama, ayçiçeğinde verim artışı için en önemli tarımsal uygulamadır. Ancak sulama suyunun nasıl, ne zaman ve hangi miktarda verileceğinin belirlenmesi gerekmektedir.

Son yıllarda su kaynaklarının hızla azalması ve kirlenmesi neticesinde suyun daha ekonomik kullanıldığı yöntemler tercih edilmelidir. Ayrıca bitkinin yetiştirme periyotları dikkate alınarak oluşturulacak sulama programı ile suyu daha etkin bir şekilde kullanmak mümkündür. Ayçiçeği kurağa dayanıklı bir bitkidir ancak sulama ile verim artmaktadır (Erdem ve Delibaş, 2003). Ayçiçeğinin tüm gelişme dönemlerinde oluşacak bir kuraklık stresinin, bitkinin büyümesini ve verimini etkileyebileceği açıklanmıştır. (Flagella ve ark., 2002; Esmailian ve ark., 2012; Tabatabaei ve ark., 2012).

Bu çalışmada su kaynaklarının yetersiz olduğu durumlarda ayçiçeğinin gelişme dönemlerinde yapılacak sulama uygulamaları ile bitkinin su ihtiyacı tam ada eksik karşılanmış ve tüm dönemlerde sulanan konuya göre su eksikliği yaratılan dönemlerde bitkide meydana gelen verim azalması belirlenmiş ve verim tepki faktörleri elde edilmiştir.

Materyal ve Yöntem

Araştırma Tekirdağ ili Süleymanpaşa ilçe merkezine 2.5 km uzaklıkta olan Tekirdağ Bağcılık Araştırma Enstitüsü Müdürlüğü arazisinde gerçekleştirilmiştir. Deneme topraklarının fiziksel özelliklerini belirlemek için farklı derinliklerden alınan toprak numunelerden Blake (1965) ile Benami ve Diskin (1965)'de verilen esaslara göre tarla kapasitesi, solma noktası, hacim ağırlığı, kullanılabilir su tutma kapasitesi değerleri ve bünnye sınıfı tayin edilmiş ve Çizelge 1'de verilmiştir.

Çizelge 1. Araştırma alanı topraklarının fiziksel özellikleri

Profil derinliği (cm)	Bünnye sınıfı	TK		SN		Hacim ağırlığı (g cm ⁻³)	Kullanılabilir su tutma kapasitesi (mm)
		%	mm	%	mm		
0-30	Kil	23.01	102.86	15.91	71.12	1.49	31,74
30-60	Kil	27.05	128.22	17.71	83.95	1.58	44,27
60-90	Kil	31.76	153.40	20.96	101.24	1.61	52,16
0-90			384.48		256.31		128.17

Çalışmanın gerçekleştirildiği alanda çift silindirli infiltrometre testleri yapılmış ve toprağın infiltrasyon hızı 12 mm h⁻¹ olarak tespit edilmiştir. Sulama suyunun kalite sınıfı T₂S₁ olarak belirlenmiştir. Sulamalar damla sulama yöntemi ile gerçekleştirilmiştir. Toprak bünnye sınıfı infiltrasyon hızına göre damlatıcı debisi 4 L h⁻¹, damlatıcı aralığı ise 0.50 m olarak hesaplanmış ve ıslatılan alan oranı 0.714 olarak belirlenmiştir.

Deneme, tesadüf blokları deseninde üç tekerrürlü olarak gerçekleştirilmiş ve konular rastgele dağıtılmıştır (Yurtsever, 1984). Konular bitkinin gelişme dönemleri olan geç vejetatif dönem (tabla oluşum dönemi), çiçeklenme dönemi ve tane oluşum dönemi (süt olum dönemi) olarak 3 dönemde farklı şekillerde uygulanacak şekilde oluşturulmuştur. Sulamalar yaklaşık olarak her gelişme dönemi ortasında ve tek bir seferde gerçekleştirilmiştir. Uygulanan sulama suyu miktarı 90 cm etkili kök derinliğinde bitkinin gelişme dönemlerinde sulama öncesi S₁ konusundan ölçülen nem miktarının deneme öncesi elde edilen tarla kapasitesi değerine çıkarılmasıyla hesaplanmıştır.

Deneme konuları,

S₁: Geç vejetatif dönem, çiçeklenme dönemi, tane oluşum dönemi (Her dönem sulama)

S₂: Çiçeklenme dönemi, tane oluşum dönemi (geç vejetatif dönemde sulama olmayan konu)

S₃: Geç vejetatif dönem, tane oluşum dönemi (çiçeklenme döneminde sulama olmayan konu)

S₄: Geç vejetatif dönem, çiçeklenme dönemi (Tane oluşum döneminde sulama olmayan konu)

Deneme parselleri için 3×2.8m olacak şekilde 8.4 m² alan oluşturulmuştur. Ayçiçeği 30 Nisan 2019 tarihinde havalı ekim mibzeri ile 0.3 m sıra üzeri, 0.7 m sıra arası olacak şekilde ekilmiştir.

Bitki su tüketimi, 90 cm toprak derinliği esas alınarak su bütçesi eşitliği (Eşitlik 1) ile belirlenmiştir (James, 1988). Bu amaçla, sulama uygulaması öncesi her bir deneme konusunda 90 cm toprak derinliğinde her 30 cm'lik toprak katmanından olmak üzere örnek alınarak gravimetrik yöntem ile toprak nemi değerleri belirlenmiştir.

$$ET = I + P + C_p - D_p \pm R_f \pm \Delta S$$

(Eş. 1)

Eşitlikte; ET: bitki su tüketimi (mm), I: dönem boyunca verilen sulama suyu miktarı (mm), P: dönem boyunca meydana gelen yağış (mm), C_p: kılcal yükselişle kök bölgesine giren su miktarı (mm), D_p: derine sızma kayıpları (mm), R_f: deneme parsellerine giren ve çıkan yüzey akış miktarı (mm), ΔS: kök bölgesi nem değişimleri (mm) belirtilmektedir.

Deneme parselleri 5 Eylül 2019 tarihinde hasat edilmiştir. Koulara göre verim değerleri ve bitki su tüketimi değerleri belirlenmiştir. Tohum verimi ile evapotranspirasyon arasındaki ilişki Stewart denklemine göre (Eşitlik 2) değerlendirilmiştir (Doorenbos ve Kassam, 1988).

$$\left[1 - \left(\frac{Y_a}{Y_m}\right)\right] = ky \left[1 - \left(\frac{ET_a}{ET_m}\right)\right]$$

(Eş. 2)

Eşitlikte; Y_a = gerçek verim, kg/da, Y_m = maksimum verim, kg/da, (Y_a / Y_m) = oransal verim, (1 - Y_a / Y_m) = oransal verim azalması, ky = su-verim ilişkisi faktörü, ET_a = gerçek bitki su tüketimi, mm, ET_m = maksimum bitki su tüketimi, mm, (ET_a / ET_m) = oransal bitki su tüketimi ve (1 - ET_a / ET_m) = oransal bitki su tüketimi açığıdır.

Bulgular ve Tartışma

Çalışmada bireysel büyüme dönemlerinde oransal bitki su tüketimi azalışına karşılık oransal verim azalması değerleri Çizelge 2’de verilmiştir.

Çizelge 2. Bireysel bitki büyüme dönemlerindeki oransal bitki su tüketimi azalışına karşılık oransal verim azalması

Sulama Konusu	Ya	Ym	(1-(Ya/Ym))	Eta (mm)	Etm (mm)	(1-(Eta/Etm))	ky
S ₂	463.5	520.6	0.11	174	215	0.19	0.58
S ₃	419.0	520.6	0.20	105	130	0.19	1.04
S ₄	454.5	520.6	0.13	153	178	0.14	0.89

S₁ sulama konusunda maksimum verim 520 kg/da olarak elde edilmiştir. Makimum verimin elde edildiği sulama konusunda geç vejetatif gelişme döneminde 100 mm, çiçeklenme döneminde 105 mm ve tane oluşum döneminde 90 mm olmak üzere toplam 295 mm sulama suyu uygulanmıştır. Deneme süresince 57.5 mm yağış kaydedilmiştir. Maksimum bitki su tüketimi 541,9 mm olarak yine bu konudan elde edilmiştir. S₁ konusunda geç vejetatif gelişme döneminde 215 mm, çiçeklenme döneminde 130 mm ve tane oluşum döneminde 178 mm bitki su tüketimi ölçülmüştür.

Çizelge 2’den izleneceği üzere su eksikliği yaratılan tüm dönemlerde S₁ konusuna göre bitki su tüketimindeki azalışa karşılık verimde de azalmalar meydana gelmiştir. Bu üç dönem için oransal veri azalması ve oransal bitki su tüketimi azalması hesaplanmıştır. Elde edilen sonuçlardan ky (verim tepki faktörü) değerleri belirlenmiştir. Buna göre geç vejetatif gelişme periyodu için 0.58, çiçeklenme periyodu için 1.04, tane oluşum periyodu için 0.89 olarak elde edilmiştir. Sonuçlara göre ayçiçeği en fazla çiçeklenme periyodundaki su eksikliğinden etkilenmiştir. Doorenbos ve Kassam (1988)’da ayçiçeğinin gelişme dönemleri için verdiği ky değerleri erken vejetatif gelişme periyodunda 0.25, geç vejetatif gelişme periyodunda 0.50, çiçeklenme periyodunda 1.00 ve dane oluşumu periyodunda 0.80 olmuştur. Elde edilen sonuçlar verilen bu değerlere yakın olmuştur.

Tüm sonuçlar değerlendirildiğinde ayçiçeğinin gelişme dönemlerinde su eksikliğinin verimde önemli derecede azalmalara neden olduğu belirlenmiştir. Su kaynağı temininde bir sorun yoksa tüm dönemlerde su uygulamasının yapılması, eğer su kısıtı yapılacaksa vejetatif dönemde yapılması önerilebilir. Özellikle çiçeklenme döneminde su eksikliğinden kaçınılması gerekmektedir.

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Antioxidant activity of *Pinus* resin essential oils

Nasri Meriem , Abed Hanane

Laboratory of Health and Environment, Faculty SNV-TU, University Bordj Bou Arreridj 34000, Algeria

Abstract

Pinus is medicinal plants used in traditional herbal medicine. Essential oils are mixtures of substances aromatics present in the form of tiny droplets in the leaves, the barks of the fruits, resin, branches and wood. These oils represent a very interesting group, which are endowed with antioxidant properties. This work aims is to evaluate the antioxidant activity of essential oils of *Pinus* resins and determined their chemical composition; the extraction of oils was carried out by distillation and hydrodistillation in a Clevenger-type apparatus, the chemical composition of the essential oils isolated from *Pinus* pinea, *P. brutia*, *P. caribaea*, *P. patula* and *P. radiata* was studied by GC/FID. The antioxidant activity of essential oils of *P. pinea*, *P. brutia*, *P. insularis*, *P. oocarpa* and *P. merkusii* was evaluated by two methods, the first one is the DPPH method in comparison with synthetic antioxidants α -tocopherol and ascorbic acid, the second method is the reducing power. The results showed the presence of several components including d-limonene (6.5%) β -phellandrène(10.2%) of *Pinus patula*, While *Pinus caribaea* oil contains α -pinène (50.7%) β -pinène and the major component of *Pinus radiata* (44.5%), the chemical profile of essential oils of *P. pinea* and *P. brutia* mainly included α -pinene (21.39% and 25.40%) and β -pinene (9.68% and 9.69%). *P. brutia* and *P. insularis* have a very high antioxidant activity. The essential oils of *Pinus brutia* has the higher reducing power compared to *P. pinea*. The study of antioxidant activity allows us to conclude that pine resin is a good source of natural antioxidants. Medicinal plants are still the reliable source of bioactive molecules, known for their therapeutic properties.

Key Words: Bioactive molecules, Resin, Pine, Antioxidant activity, Essential oils.

Effects of Environmentally Relevant Ammonium Nitrate Levels Caused by Agricultural Activities on Four Amphibian Species in The Eastern Black Sea Region

Handan Karaoğlu

RTE University, Faculty of Agriculture, Department of Field Crops, Rize, Turkey

Abstract

Within the scope of this research, the chronic effects of ammonium nitrate, which is most widely used fertilizer worldwide, on the tadpoles of Marsh Frog (*Pelophylax ridibundus*), the Iranian Long-Legged Frog (*Rana macrocnemis*), the Caucasian Parsley Frog (*Pelodytes caucasicus*) and the Variable Green Toad (*Bufotes variabilis*) were examined. To assess the chronic effects of the fertilizer, the tadpoles of all the species were exposure to 0, 5, 10, 15, 20, 25 mg/L concentrations in same conditions. The chronic concentrations were applied from 25th developmental stage to 42nd developmental stage. Eggs of each species were obtained from clean and polluted habitats in the same region and the tadpoles for experiments were provided from those eggs in the laboratory conditions. Each fertilizer concentration was applied to 30 tadpoles in total as repeated five times and as including six tadpoles each repetition. The tadpoles were fed with boiled lettuce throughout the experiments and the abnormalities and mortalities that occur were observed daily. The experiment solutions were prepared and renewed once a week. It was defined at the end of the experiments that although there were some variability between different populations of same species or between different species in the observed effects, chronic levels of ammonium nitrate caused decreased growth rate, prolonging in time to complete metamorphose, and increased abnormalities and mortality in general. Among the 4 amphibian species, the Variable Green Toad was the most damaged one in terms of growth reduction (on average 31-41 %), abnormality rates (on average 50-75 %), prolonged time to complete metamorphose (14-21 day on average) and mortality rates (%54-100). The most adaptive species and the least damaged one was Iranian long legged frog for growth reduction (on average 0-15 %), prolonged time to complete metamorphose (7-9 day on average) and mortality rates (%9-15). All the harmful effects of chronic fertilizer levels caused by agricultural activities in the region had very important for examined species in our researches and it can be said that important environmental and biodiversity problems may occur if certain precautions are not taken regarding the use of the fertilizers and if the attitudes of the farmers on this issue cannot be changed.

Keywords: Chronic ammonium nitrate levels, *Pelophylax ridibundus*, *Rana macrocnemis*, *Pelodytes caucasicus*, *Bufotes variabilis*

Effect of Bio fertilizer on Growth and Yield of Two Broad bean Cultivars (*Vicia faba*) Under New Halfa Environment, New Halfa ,Kassala State, Sudan

Abd Elraim Ibrahim Naiem Ahmed And Abd Elfadeil Khalaf Allah Abu Elgasim

Faculty of Agriculture and Natural Resources , University of Kassala
New Halfa , Kassala State, Sudan

Abstract

A field experiment was conducted at Faculty of Agriculture and Natural Resources Demonstration Farm in New Halfa during 2016/2017 season to perform the effect of bio fertilizer on growth and yield of two cultivars of broad bean. The experiment was carried out under New Halfa environmental condition. A randomized complete block design (RCBD) with three replications. Three levels of bio fertilizer (0, 500 and 700 g/ fed) were used. The two cultivars (Basaber and Damir) were sown in this experiment. The results showed that there were highly significant differences in plant height, stem diameter, number of nodules, dry weight, number of pods per plant, 100-seed weight and grain yield and no significant differences in leaf number per plant and seed number per pods among the three levels of bio fertilizer. Also the results showed no significant differences in all measured characters between the two cultivars and the interaction of bio fertilizer and the cultivars.

Keywords:

Introduction

Also known as the fava bean, it is a delicious and abundant food crop, but is also extremely useful as a soil improver, capturing the elusive nitrogen from the atmosphere with its specialized root nodules. The broad bean is most likely native to Mediterranean Africa. It is one of the most ancient of beans, with a history dating back to the Bronze Age and the ruins of Troy. By the Iron Age broad beans had spread to Europe. With their slightly earthy flavour you can taste the history in every bite. In traditional temperate and cold climate agricultural societies it was spring, rather than winter, when food stores were in danger of running low and famine threatened. This is precisely when broad beans deliver their protein rich crop. Broad beans are good sources of protein, fiber, vitamins A and C, potassium and iron. They also contain L-dopa, a chemical the body uses to produce dopamine, an important neurotransmitter involved in learning, mood control and motivation. Some also use fava beans as a natural alternative to drugs like Viagra, citing a link between L-dopa production and the human libido. Why not try incorporating the grey-green broad bean mash into your next romantic rendezvous.

Warning: Raw broad beans should be avoided by people with the rare hereditary condition known as G6PD, for whom ingestion can cause 'favism', a type of anemia which is sometimes fatal. For the rest of us it still makes sense to eat raw broad beans only in small doses until our body builds up the required enzymes to digest them well. Or you might do a fart. Aphids, caterpillars, and nematodes are the most common pests. A fungal disease chocolate spot is the main disease they suffer from. We use natural sprays and biologically rich soil improvers to ward off these problems. The young growth tips of the plant are edible and quite tender when cooked. The bean itself can be used fresh or dried. Broad beans are the most common fast food in Egypt and surrounding areas, where they are commonly eaten for breakfast cooked with an onion and tomato sauce. We like them wok fried to make the tough outer hull crunchy. They are delicious boiled, then blended into a spicy dip with lemon, garlic, chili and yogurt. Immature pods can be steamed and served whole. Dried beans are ground and spiced as the basis for falafel mix.

It is a rigid, erect plant 0.5–1.8 m tall, with stout stems with a square cross-section. The leaves are 10–25 cm long, pinnate with 2–7 leaflets, and of a distinct glaucous grey-green color; unlike most other vetches, the leaves do not have tendrils for climbing over other vegetation. The flowers are 1–2.5 cm long, with five petals, the standard petal white, the wing petals white with a black spot (true black, not deep purple or blue as is the case in many "black" colorings, and the keel petals are white. Crimson-flowered broad beans also exist, which were recently saved from extinction. The fruit is a broad, leathery pod, green maturing to blackish-brown, with a densely downy surface; in the wild species, the pods are 5–10 cm long and 1 cm diameter, but many modern cultivars developed for food use have pods 15–25 cm long and 2–3 cm thick. Each pod contains 3–8 seeds; round to oval and 5–10 mm diameter in the wild plant, usually flattened and up to 20–25 mm long, 15 mm broad and 5–10 mm thick in food cultivars. *Vicia faba* has a diploid (2n) chromosome number of 12 (six homologous pairs). Five pairs are acrocentric chromosomes and one pair is metacentric.

Broad beans have a long tradition of cultivation in Old World agriculture, being among the most ancient plants in cultivation and also among the easiest to grow. Along with lentils, peas, and chickpeas, they are believed to have become part of the eastern Mediterranean diet around 6000 BC or earlier. They are still often grown as a cover crop to prevent erosion, because they can overwinter and because as a legume, they fix nitrogen in the soil.

The broad bean has high plant hardiness; it can withstand rough climates, and in this case, cold ones. Unlike most legumes, the broad bean can be grown in soils with high salinity, as well as in clay soil. However, it does prefer to grow in rich loams. Broad beans are rich in tyramine, and thus should be avoided by those taking monoamine oxidase inhibitors. Raw broad beans contain the alkaloids vicine, isouramil and convicine, which can induce hemolytic anemia in patients with the hereditary condition glucose-6-phosphate dehydrogenase deficiency. This potentially fatal condition is called favism after the fava bean. Areas of origin of the bean correspond to malarial areas. Some epidemiological and *in vitro* studies suggest the hemolysis resulting from favism acts as protection from malaria, because certain species of malarial protozoa, such as *Plasmodium falciparum*, are very sensitive to oxidative damage due to deficiency of the glucose 6-phosphate dehydrogenase enzyme, which would otherwise protect from oxidative damage via production of glutathione reductases.

Some researchers reported that Bio fertilizer, which contains bacteria (*Rhizopium* sp.) when it is inoculated with leguminous crops, its increases inoculation and then increases plant growth and yield (E.A.E and Osman, A.G.1995, Hago, 2005 and Hamoda, 2010). High levels of bio fertilizer increase protein content and digestibility in broad bean (Babiker *et al*, 1995, Goh and Kee, 1978). Broad bean cultivation in Sudan traces back to an era B.C., but until the 1940^s the production was confined to the Northern State. The scarcity of land and high cost of production in the Northern State coupled with increasing demand for broad bean consumption, led to expansion of broad bean growing area through irrigation schemes in central and eastern Sudan (Hago, 2005).

Material And Methods

Experimental Site

A field experiment was conducted for one season (2016/2017, at Demonstration Farm of the Faculty of Agriculture and Natural Resources, University of Kassala, Halfa al gadidah, Sudan (Latitude 15° 19' N. Longitude 35° 36' E and Altitude 450 m asl). The soil of the experimental site belongs to Khashm ElGirba Series, classified as sodic Haplusterts, very fine smectitic, isohyperthermic with a clay percentage around 60 % and pH in the range of 4.8 to 8.8. The climate of the locality is semi-arid (rainy season during June to September) with mean day temperature around 23°C and 15.7°C during summer and winter, respectively (Ali, 2001).

Seeds of the two broad bean cultivars (basaber and damir) were obtained from Elhodaiba Agricultural Research Station. The bio fertilizer was obtained from the National Center of Researches, Khartoum, Sudan. The experimental site was ploughed in July and September using wide level disc, harrowed and ridged. The cultivars were sown on ridges with 80cm apart. Seeds were sown manually. The aim of this experiment is to study the effect of bio fertilizer on growth and yield of two broad bean cultivars namely basaber and damir. Seeds were inoculated by bio fertilizer after soaked in sugar solution and sown immediately after inoculation.

Experimental Design and layout

The experiment was arranged in a randomized complete block design (RCBD) with three replications. The experimental factors were combinations: The gross plot size was 6x6.5 m² and sowing date was 15 November. Two to three times hand weeding was used by traditional tools as Tanya and hand picking, plants were irrigated every 14 days.

Data collection

The following data were obtained from 10 plants randomly selected from each plot.

Growth attributes

Ten plants were randomly selected and tagged in each plot to determine the following growth parameters:

Plant height (cm)

Mean Plant height (cm) was determined by measuring the distance from soil surface up to the tip points using meter tape.

Number of leaves plant⁻¹

Leaves in the tagged plants in each plot were counted to determine the average number of leaves per plant.

Stem diameter (cm)

Stem diameter of the tagged plants in each plot were measured using a caliber to determine the average diameter

Days to 50% flowering

Calculated by counting the number of days from sowing up to the time when 50% of the plants in the plot were starting flowering.

Number of Nodules plant⁻¹

Five plants from each plot were up rooted carefully and cleaned from the soil, the nodules were counted for each plant and the average was taken

Yield attributes

The two inner rows in each plot were used for the determination of the following yield components.

Number of pods plant⁻¹

At maturity, number of pods per plant in unit area of the tagged plants in each plot were collected and counted.

Number of seeds plant⁻¹

Ten plants from each plot were randomly selected then the pods were collected and threshed and the seeds were counted and the average was determined.

Number of seeds per pod

From the ten pods seeds were threshed and counted and expressed as a mean from ten pods

100-grain weight (g)

From each plot, 100 grains were randomly selected and weighted using sensitive balance.

Grains yield (kg ha⁻¹)

Determined according to the following formula:

$$\text{Grain yield (kg/ha)} = \frac{\text{grain weight (g/plot)} \times 10000\text{m}^2}{\text{Plot area (m}^2\text{)} \times 1000}$$

Statistical Analysis

All data were statistically analyzed according to the procedure described by Gomez and Gomez (1984). Using M stat-C computer software package (Nelsen, 1992). Analysis of variance for all studied traits was determined. Mean comparison were worked out by Duncan's Multiple Range Test (DMRT) at 5% probability level.

Results and Discussion

Growth parameters

Plant height (cm)

The results showed that there were highly significant differences among the different levels of bio fertilizer in plant height at 30, 45 and 90 days after sowing (d a s) and no significant differences between cultivars and the interaction of bio fertilizer and cultivars (appendix 1) . The bio fertilizer level (700g/ fed)gave tallest plants (38.25, 48.17 and 76.71cm) , the bio fertilizer (500g/fed) gave plant height (36.57, 47.06 and 73.98cm and the zero bio fertilizer level (control) gave shortest plants (31.50, 41.97 and 71.17 cm) at 30,45 and 90 days after sowing respectively (table 1). The tallest plants at the high level of bio fertilizer (700g/fed) was attributed to the responsibility of the crop to high level of bio fertilizer.

Number of leaves per plant

The results showed no significant differences among the different levels of bio fertilizer at 30 and 45 days after sowing but there were highly significant differences ($p<0.01$) at 90 days after sowing and no significant differences between the two cultivars and the interaction of bio fertilizer and cultivars in number of leaves per plant (appendix 1). The treatment of high level of bio fertilizer (700g/fed) gave (63.27, 62.98 and 77.92 leaves /plant) , the treatment of bio fertilizer (500g/fed) showed 36.15 , 59.38 and 77.92 leaves /plant) and the control showed (35.47, 60.03 and 67.58 leaves / plant) at 30,45and 90 days after sowing respectively. The results gave 73.5 and 71.6 leaves per plant for the cultivars basaber and damir respectively (table 2). Number of leaves per plant is a genetic factor and not affected by different levels of bio fertilizer.

Stem diameter (cm)

The results showed highly significant differences ($p<0.01$) among the different levels of bio fertilizer in stem diameter and no significant differences between the cultivars and the interaction of bio fertilizers and cultivars (appendix 1). A high level of bio fertilizer (700g/fed) showed a thicker diameter (1.3cm), while the (500g/fed) level resulted stem diameter (1.2 cm) and the control gave a thinner stem (0.73 cm) (table 4). These results indicated that broad bean was responded to the high level of bio fertilizer which increased the vegetative growth of the plant.

Number of nodules per plant:

The experiment showed highly significant differences among the different levels of bio fertilizer in number of nodules/plant and no difference between cultivars and the interaction of bio fertilizers and cultivars (appendix 1). High level of bio fertilizer resulted 46.3 and 119.3 nodules , the second level resulted 43.17 and 114.7 nodules and the control resulted 36 and 86 nodules at 30 and 90 days after sowing respectively. The cultivars showed 112.8 and 100.2 nodules for basaber and damir respectively. The dose of bio fertilizer with rhizobium bacteria increased nodulation.

Dry weight / plant:

The results showed that there were highly significant differences in dry weight of plant among the different levels of bio fertilizer and different cultivars and no differences in the interaction of bio fertilizer and cultivars (appendix 1). A high level of bio fertilizer gave heavy dry weight (73.2g /plant), the second level gave dry weight (69.7g/ plant) and the control gave lightest dry weight (58.8g/plant). The cultivars showed dry weights (65.3 and 61.8g/plant) for damir and basaber cultivars respectively (table 4). Increase in bio fertilizer increased vegetative growth and then increased dry weight of plant.

Table 1. Mean plant height (cm) of two broad bean cultivars at three levels of bio fertilizer

Fertilizer cultivars	F0	30days F1	F2	45days F0	F1	F2	F0	90days F1	F2
V1	31.43	37.20	38.27	42.60	46.80	48.50	71.73	74.73	76.53
V2	31.57	35.93	38.03	41.33	47.33	47.73	70.60	73.23	76.90
means	31.50	36.60	38.30	41.97	47.07	48.12	71.17	73.98	76.72

F₀=control F₁= 500g/fed F₂= 700g/fed, V₁= cultivar basaber V₂= cultivar damir

Table 2. Mean number of leaves of two broad bean cultivars at three levels of bio fertilizer

fertilizer cultivars	F0	F1	F2	F0	F1	F2	F0	F1	F2
V1	33.47	35.87	36.67	63.67	62.90	60.00	68.63	73.00	78.97
V2	37.47	36.43	35.87	56.40	55.87	65.97	66.53	71.40	76.87
means	35.47	36.15	36.27	60.03	59.39	62.99	67.58	72.20	77.92

F₀=control F₁= 500g/fed F₂= 700g/fed, V₁= cultivar basaber V₂= cultivar damir

Table 3. Mean number of nodules/plant of two broad bean cultivars at three levels of bio fertilizer

fertilizer cultivars	F0	F1	F2	F0	F1	F2
V1	36.67	43.67	46.67	89.33	122.00	127.00
V2	35.33	42.67	46.00	82.67	106.33	111.67
means	36.00	43.17	46.34	86.00	114.17	119.34

F₀=control F₁= 500g/fed F₂= 700g/fed, V₁= cultivar basaber V₂= cultivar damir

Table 4. Mean stem diameter (cm) and dry weight (g) of two broad bean cultivars at three levels of bio fertilizer

fertilizer cultivars	F0	Stem F1	diameter F2	F0	Dry F1	weight F2
V1	0.73	1.17	1.33	49.77	67.48	73.80
V2	0.75	1.13	1.30	51.80	71.53	72.53
means	0.74	1.15	1.32	50.79	69.69	73.17

F₀=control F₁= 500g/fed F₂= 700g/fed, V₁= cultivar basaber V₂= cultivar damir

Yield parameters

Number of pods /plant:

The results showed highly significant differences ($p<0.01$) among the different levels of bio fertilizer in number of pods/plant and no significant differences between the cultivars and the interaction of bio fertilizers and cultivars (appendix 2). A high level of bio fertilizer (700g/fed) showed (34.2 pods), while the (500g/fed) level resulted 33.5 pods and the control gave 25.3 pods/plant. The cultivars gave 31.2 and 30.8 pods for basaber and damir respectively (table 4). Increasing in vegetative growth due to the high level of fertilizer increased flowering and grain setting.

Seed weight /plant (gm)

The results showed that there were highly significant differences in seed weight/ plant among the different levels of bio fertilizer and different cultivars and no differences in the interaction of bio fertilizer and cultivars (appendix 2). A high level of bio fertilizer gave heavy seed weight (33g /plant), the second level gave seed weight (29.2g/ plant) and the control gave lightest seed weight (25.2g/plant). The cultivars showed seed weights (30.3 and 27.9g/plant) for basaber and damir cultivars respectively (table 6). These results indicated that broad bean was responded to the high level of bio fertilizer which increased the vegetative growth and grain filling in pods.

100-seed weight (gm):

The results showed that there were highly significant differences in seed weight/ plant among the different levels of bio fertilizer and different cultivars and no differences in the interaction of bio fertilizer and cultivars (appendix 2). A high level of bio fertilizer gave heavy 100- seed weight (51.2g /plant), the second level gave 100- seed weight (49.7g/ plant) and the control gave lightest 100- seed weight (43.7g/plant). The cultivars showed 100-seed weights

(50 and 46.3g/plant) for damir and basaber cultivars respectively (table 6). These results indicated that broad bean was responded to the high level of bio fertilizer which increased the vegetative growth and grain filling in pods.

Grain yield (kg/ha):

The results showed that there were highly significant differences in seed weight/ plant among the different levels of bio fertilizer and different cultivars and no differences in the interaction of bio fertilizer and cultivars (appendix 2). A high level of bio fertilizer gave high yield (4620 kg), the second level gave yield (4084kg) and the control gave lightest yield (3523kg). The cultivars showed yield (4246 and 3904 kg) for basaber and damir cultivars respectively (table 7). These results indicated that broad bean was responded to the high level of bio fertilizer which increased the vegetative growth and grain filling in pods which finally increased the total grain yield.

Table 5. Mean number of pods/plant and number of seeds /pod of two broad bean cultivars at three levels of bio fertilizer

Fertilizer cultivars	F0	No of F1	pods/plant F2	F0	No of F1	seeds/pod F2
V1	25.00	34.33	34.33	3.67	4.67	4.33
V2	25.67	32.67	34.00	3.33	4.33	4.33
means	25.34	33.50	34.17	3.50	4.50	4.30

F₀ =control F₁ = 500g/fed F₂ = 700g/fed, V₁= cultivar basaber V₂= cultivar damir

Table 6. Mean seed weight and 100- seed weight (g) of two broad bean cultivars at three levels of bio fertilizer

fertilizer	Wt of F0	seeds/pla F1	F2	100-seed F0	Wt F1	F2
cultivars						
V1	25.67	30.00	35.33	34.00	47.67	48.33
V2	24.67	28.33	30.67	44.33	51.67	54.00
means	25.17	29.17	33.00	43.67	49.67	51.17

F₀ =control F₁ = 500g/fed F₂ = 700g/fed, V₁= cultivar basaber V₂= cultivar damir

Table 7. Mean grain yield (kg/ha) of two broad bean cultivars at three levels of bio fertilizer

fertilizer	F0	F1	F2
cultivars			
V1	3593	4200	4947
V2	3453	3967	4293
means	3523	4048	4620

F₀ =control F₁ = 500g/fed F₂ = 700g/fed, V₁= cultivar basaber V₂= cultivar damir

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Determination of Expression Level of Genes Associated with Anthocyanin Biosynthesis in Some Myrtle (*Myrtus communis* L) Genotypes

Emine Açar¹ Yıldız Aka Kaçar^{1,2}

¹Çukurova University Institute of Natural And Applied Sciences Biotechnology Department, Adana

²Çukurova University, Agriculture Faculty, Horticulture Department, Adana

Abstrac

The Myrtle plant (*Myrtus communis* L.) is a plant species of the Myrtaceae family, a member of the maquis community, which naturally spreads in Mediterranean regions. Being resistant to arid conditions, the ecological distribution areas of the myrtle plant have been allowed to expand. Being in the group of medicinal and aromatic plants, having interesting and beautiful flowers, and rich nutrient content of the fruit in terms of valuable phytochemicals, the myrtle plant has been used in many different areas. In particular, the nutritional content of its fruits and valuable metabolites have allowed the myrtle plant to be among the healthier foods. Antioxidant activity, which neutralizes reactive oxygen species (ROS), which causes many medical problems, is one of the most important features of the myrtle plant. Investigation of the biosynthesis of anthocyanin, which leads to antioxidant activity, and determination of the biosynthesis in different tissues and genotypes is important, especially in the development of production activities. Furthermore, this study aimed to investigate the anthocyanin biosynthesis in different genotypes with white and black fruits and various tissues of genotypes. For this purpose, the expression levels of CHS, CHI, F3H and PAL genes, which are involved in the anthocyanin biosynthesis pathway, were determined by qRT-PCR. In the study, it was determined that there was an increase in the level of genes related to the biosynthesis of anthocyanin in the leaf and fruit tissues of the genotype with white fruits. It was determined that the expression level of genes related to the biosynthesis of anthocyanin was observed higher in the leaf and fruit tissues of the genotype with black fruits, and the highest gene expression level was found in black fruits.

Keywords: Anthocyanin Biosynthesis Pathway, Antioxidant, Gene expression, *Myrtus communis* L.

Determination of Fruit Cracking Rates in Some Pomegranate (*Punica granatum* L.) Genotypes Grown Non-Irrigated Conditions

Emine Açar¹, Melike Cengiz^{2*}, Yıldız Aka Kaçar^{1,2}, Ahsen Işık Özgüven³

¹Department of Biotechnology, Institute of Natural and Applied Science, Çukurova University, Adana, Turkey

²Department of Horticulture, Institute of Natural and Applied Science, Çukurova University, Adana, Turkey

³Faculty of Agricultural Sciences and Technologies, Department of Plant Production and Technologies, Cyprus International University, North Cyprus

Abstract

Pomegranate (*Punica granatum* L.) is a tropical and subtropical climate plant with high economic value and nutritional content. Having valuable phytochemicals in terms of health caused an increase in demand for pomegranate consumption and this situation accelerated pomegranate production. However, global warming and climate changes are among the factors limiting the production of pomegranate. Especially abiotic stress factors caused by adverse ecological conditions cause significant economic losses in pomegranate production. Drought stress, which is one of these negativities, causes fruit cracking problem, which is one of the important problems in pomegranate production. Minimizing the fruit cracking problem, which causes economic losses, is possible by breeding varieties that are resistant to under non-irrigated conditions. Determining the resistance of the cultivars to be used in breeding programs against fruit cracking will allow the development of elite cultivars. For this purpose, it was aimed to determine the fruit cracking rates of 30 different pomegranate genotypes in the Pomegranate Genetic Collection of Çukurova University, Faculty of Agriculture, Department of Horticulture, under non-irrigated conditions. A correlation was made between the cracking rates of the genotypes and the amount of soluble solids content (SSC). According to the correlation analysis between the cultivars, there is no statistically significant difference between the SSC and the cracking rate. However, a weak negative correlation was determined between SSC-cracking rate (-0,1132). In the light of the pomological data obtained, it was determined that 8 pomegranate genotypes grown under non-irrigated conditions had a fruit cracking rate of 40 % - 85 %, cracking rates were below 10 % in 8 pomegranate genotypes and no fruit cracking was observed in 6 genotypes. As a result of the analysis, it was observed that drought stress was effective on the fruit cracking rate or the exacerbation of the fruit cracking rate, but the resistance level of some genotypes against the fruit cracking problem was high.

Keywords: Fruit Cracking, Non-irrigated conditions, Pomegranate, SSC

In Vitro Regeneration Of Tea (*Camellia Sinensis* (L). O. Kuntze) By Somatic Embryogenesis From Immature Cotyledon Tissues

Emine Yurteri*, MÜcahit Salih Can, Fatih Seyis, Haydar Küplemez

Recep Tayyip Erdogan University, Faculty of Agriculture, Field Crops Department, Rize/Pazar, Turkey.

Abstract

Tea (*Camellia sinensis*) is the world's most popular beverage plant, as well as an important plantation crop with high commercial value. It has been maintained for centuries through conventional vegetative propagation. Tea clonal propagation in vitro has the advantage of producing a large number of elite plants. If an efficient in vitro regeneration technology was available, it would be possible to choose plants or plant lines with desirable somaclonal features. In vitro regeneration of plants using cotyledon induced somatic embryos is considered to be a strategy for rapid propagation with a high plant regeneration frequency among the reported protocols for the genus *Camellia*. In this study, reproduction possibilities of tea (*Camellia sinensis* (L). O. Kuntze) by somatic embryogenesis from immature cotyledon tissues were investigated. In order to induce shoot regeneration, different concentrations of phenylboronic acid with benzyladenine and phenylboronic acid with kinetin were tested in MS medium with 30 g/L sucrose and 8 g/L agar. MS medium without any plant growth regulators was used as control group. Considering the embryo survival rate, 1,5 mg/lt phenylboronic acid + 1 mg/lt kinetin produced highest result as 87,3% while lowest was in control group as 36,7%. The highest plant regeneration rate was found in 1,5 mg/lt phenylboronic acid + 1 mg/lt kinetin and 1,5 mg/lt phenylboronic acid + 1 mg/lt benzyladenine medium respectively as 58,3% and 55,6%. Kinetin treatment with increasing phenylboronic acid concentrations gave better results in terms of embryo survival rates and plant regeneration rates. Also, kinetin treatment produced better when compared with benzyladenine concentrations.

Key Words: *Camellia sinensis*, Tissue Culture, Somatic Embryogenesis, Immature Cotyledon

The Essential Oil Components Of *Helichrysum Pallasii* Flowers

Emine Yurteri*, Fatih Seyis, Haydar Küplemez

Recep Tayyip Erdoğan University, Faculty of Agriculture, Field Crops Department

Abstract

The genus of *Helichrysum* comprises many species which have therapeutical effects and used in folk medicine. *H. pallasii* is one of these species, used in the region for traditional medicine and ornamental purposes. Plants have been used in the treatment in folk medicines since the earliest times of human history. Chemical composition of plants, antimicrobial and other medicinal properties of plants are being investigated in laboratories throughout the world. The extracts and essential oils derived from medicinal plants. Essential oils are usually complex mixtures of natural compounds of both polar and apolar structure. Essential oils consist mainly of terpenoids and their oxygenated derivatives. Essential oils, which have antioxidant and antimicrobial activities, have therapeutic properties and are the raw materials of cosmetics, as well as acting as natural additives in foods and food products. In this study, the volatile components of the *Helichrysum pallasii* plants were investigated which collected from its natural habitat in the Armutlu district of Bayburt province (Turkey) at the time of flowering. The proportion of essential oils of the plant harvested during the full flowering period and the aromatic components in the essential oil of the plant were determined using the SPME (Solid Phase Microextraction) method in a Gas Chromatography (GC-MS) device. Almost 37 different components were found as a result of the analysis. The main components were found as α -Springene (34.89%), (-)-Isolodene (7.11%), δ -Selinene (5.79%) and Aristolen (5.09).

Keywords: *H. pallasii*, Essential oils, Aromatic Compounds, GC-MS

Higher adherence to Mediterranean diet rich in bioactive compounds is associated with a better inflammatory status and antioxidant defenses

Antoni Sureda¹, Margalida Monserrat-Mesquida¹, Maria Magdalena Quetglas-Llabrés¹, Silvia Tejada²,
Antoni Pons¹, Josep Antoni Tur¹

¹ Research Group on Community Nutrition and Oxidative Stress, University of Balearic Islands-IUNICS and Health Research Institute of Balearic Islands (IdISBa), E-07122 Palma de Mallorca, Spain. CIBER Physiopathology of Obesity and Nutrition (CIBEROBN), Institute of Health Carlos III (ISCIII), E-28029 Madrid, Spain.

² Laboratory of Neurophysiology, Biology Department, University of Balearic Islands-IUNICS and Health Research Institute of Balearic Islands (IdISBa), E-07122 Palma de Mallorca, Spain. CIBER Physiopathology of Obesity and Nutrition (CIBEROBN), Institute of Health Carlos III (ISCIII), E-28029 Madrid, Spain.

Abstract

The Mediterranean Diet (MD) is considered a healthy prudent dietary pattern, rich in bioactive compounds with anti-inflammatory and antioxidant properties. A high adherence to MD has been associated with a better health status, and a reduced prevalence of various chronic diseases including cardiovascular disease and several cancers. In addition, growing body of evidence suggests that the protective effects of the MD may result, at least in part, from its antioxidant and anti-inflammatory properties. A random sample of the adult population of the Balearic Islands (18–65 years; 73 males and 161 females) was anthropometrically measured and provided a blood sample to determine biomarkers of inflammation and antioxidant enzyme activities. Dietary habits were assessed and the adherence to the Mediterranean dietary pattern calculated. The mean adherence to the MP was 45.1±6.8%. The activities of the antioxidant enzymes glutathione peroxidase and glutathione reductase were significantly higher in erythrocytes from the group above the median value (≥50%) for the adherence to MD. Higher plasma levels of adiponectin were associated with higher adherence to the MDP, whereas leptin, tumor necrosis factor alpha (TNF-α), plasminogen activator inhibitor 1 (PAI-1) and high-sensitivity C-reactive protein (hs-CRP) evidenced lower levels among subjects with higher adherence to the MDP. Higher adherence to the MDP is directly related to a better profile of inflammatory mediators in plasma and enhanced antioxidant defenses in erythrocytes. Since overweight contribute to systemic inflammation and oxidative stress, it raises the possibility that lifestyle interventions may provide effective means of reducing risk factors for cardiovascular disease.

Key Words: Mediterranean diet, cardiovascular disease, aging, oxidative stress, inflammation

Obtaining antibacterial composite materials of polypropylene

Niyazi Sh. Rasulzade, Namiq Sh. Rasulov, Kamala K. Badalova

Azerbaijan Medical University, General and toxicological chemistry department, AZ 1022 Baku, A.Gasimzade, 14, Baku, Azerbaijan

Abstract

It is important that the polymeric materials used in various fields are harmless to the human body, as well as resistant to the effects of widespread bacteria and micro-fungi. The development of technology for the production of such antimicrobial polymeric materials (APM) is carried out in several directions, one of which is the inclusion of natural and synthetic antimicrobial additives (APA) in the processing of polymeric materials. From this point of view, salicylic acid and its derivatives, as well as oligomers containing the salicylic group, are of great interest. In previous studies, as a result of co-polymerization reactions of vinyl- and allyl salicylates containing the biologically active salicylic group with methylmethacrylate, co-polymers of different compositions were obtained, their physical-mechanical and antimicrobial properties were studied. The main goal of this work is to obtain isotactic composite materials PP based on copolymers containing a salicylic group, synthesized as a continuation of previous studies, to study their physicochemical and antibacterial properties. For the production of PP composite materials, PP-CM containing 30% $Mg(OH)_2$ was used, and MMA copolymers containing a salicylic group in various compositions and proportions were added to the biocide during extrusion (molding). Antibacterial composites were prepared in a laboratory single-screw extruder from a mixture of 90-95% PP-CM and 5-10% MMA-Vasp polymers (90:10) in a PP alloy at high pressure and high shear stress. Physical and mechanical properties of modified PP-CM were studied, such as elongation, ultimate strength, alloy flow rate, heat resistance. With the addition of biologically active polymers, partial changes in the physical and mechanical properties of PP-CM were observed within the normal range. Tests have been carried out for resistance against the bacterial and micro-fungal effects of the new CM.

Key Words: phenylhydrozone, antimicrobial, *Candida*, gramm-positive

Impact of Age on Postpartum Reproductive Efficiency of Cross-bred (Friesian X Kenana) Dairy cows

Faisal Omer Ahmed¹, Mohamed Syed Mohamed Nour², Imadeldin Elfaki^{3,4}, Shema Isamedin Mohammed⁵, Yassin Elamin Ahmed Adam⁶

^{1,2}Department of Reproduction and Obstetrics, Faculty of Veterinary Medicine University of Khartoum.

³Department of biochemistry, faculty of Veterinary Medicine University of Khartoum, Sudan

⁴Department of biochemistry, faculty of science, university of Tabuk, Kingdom Saudi Arabia

⁵Department of Biochemistry, Faculty of Veterinary Medicine, Sudan University of Science and Technology. Khartoum, Sudan.

⁶Faculty of Animal Production Science and Technology, Kassala University, Suda.

Abstract

Proper management of postpartum period (PPP) in dairy cows improves the reproductive efficiency and dramatically reduces economic losses. This study was carried out during the period between March – May 2021 to assess postpartum period (PPP), number of services per-conception (NSPC), day open (DO), and inter-calving interval (ICI) in cross-bred dairy cows. A questionnaire was designed for data collection (age, parity, body condition score, PPP, NSPC, DO and ICI) from the record of the University of Khartoum teaching dairy farm. Thirty (30) apparently healthy multiparous (3 – 7 progenies) crossbred (Friesian X Kenana) dairy cows were selected from the herd (140 cows). Their age between (6 - 17) years and body condition score (BCS) 2.30 – 3.00. The cows were allocated according to their age into two equal groups A and B (15 cows each). Group A included cows of middle age (6 - 8 years). Group B included cows of old age (13 – 17 years). The data was statistically analyzed by using the statistic package for social science (SPSS 1.6). The T test was used to compare the means between the two groups. The significant difference was considered at ($P < 0.01$). The result of the current study showed insignificantly ($P > 0.01$) difference PPP in middle age cows compared to old age cows shorter (68.80 ± 12 and 74.60 ± 11.66 days respectively). In contrast, this study revealed that the number of services per-conception (NSPC) of the middle age cows was significantly ($P < 0.01$) lower (3.30 ± 0.57) compared to the old age cows (8.3 ± 1.16). Similarly, the day open (DO) and inter-calving intervals (ICI) were significantly ($P < 0.01$) shorter (99.60 ± 16 and 389.60 ± 14.835) in the middle age cows compared to the old age cows (728.00 ± 488.89 days and 1008.00 ± 488.89 days) respectively. This study concluded that, the age of the cow influences the PP reproductive efficiency of cross-bred dairy cows accepts the PPP.

Key words: Impact, Age, Postpartum Period, Number of services per-conception, Day open and Inter-calving interval

Introduction

The productive life of dairy cow is an indication of her utility and is influenced by her age, PPP, DO, NSPC and ICI (Hare, et al 2006). The age is an environmental factor that influences PP reproductive efficiency of dairy cows (Pirlo, et al 2000). According to Ojanbo and Pollott (2001), age has significant influence on the total cost of raising dairy replacements with calving heifers is being more expensive. Furthermore, reducing age can also improve the PP reproductive performance and the profitability of the enterprises by increasing life time milk production (Lin, et al, 1998). The Sudan endowed with a huge animal wealth that estimated to be over 116 million head of cows, sheep, goats, camels and horses (31, 41, 32, 5, and 8 million respectively) (Omer, 2017 and M.A.R 2020). The same authors reviewed that, the population of the Sudanese local dairy breeds (cross-bred, Butan and Kenana) are estimated to be 10 million head (2, 3 and 5 million respectively) which offered about 60% of milk for local consumption. However, the annual cost of the imported milk to cover the shortage (40%) is estimated to be 200 million US\$ (C.B.S, 2018). On the other hand, it is well known that, the Sudan is considered one of the countries the world depend on to participate in the world food security (Omer 2017 and M.A.R 2020). Up-to-date, more than 80% of animal population lives in the remote rural areas under traditional system of management (M.A.R, 2020). In consequence, it has little economic value (Omer 2017 and C.B.S 2018). In 2020, the ministry of animal resources (M.A.R) mentioned that, contribution of the animal wealth to the growth domestic product (GDP) is estimated to be 20% (1.500 billion \$), however, the potential of the country to produce animal feed is great considering that half of total area (200 million fedan) of the country is suitable for animal grazing (Omer, 2017). On the other hand, the infertility associate with PPP in dairy cows is frustrating and results in increased NSPC, long PPP, DO, ICI, reduced milk production, increase culling rate, increased cost for replacement of animals as well as increase of veterinary services (Nanda, et al, 1989, Omer 2017). The most reproductive failure in Sudanese dairy herds is due to mismanagement of PPP (Mohamed, 2021). The most significant benefits reproductive herd health program is the stimulation of improvement of heat detection that reduces PPP, NSPC, DO and ICI (Ahmed

and Elshiekh 2004 and Arthur, *et al*, 2009). The long ICI is considered to be the main causes of economic losses and the major problem that limits the improvement of reproductive performance of dairy cows reared under tropical condition (Ahmed and Elsheikh 2004 and Kumar, 2009). Elhag (2001) and Ahmed and Elsheik (2004) indicated that, the Sudanese dairy cows are known to have a long PPP which reduces their reproductive performance. Consequently, the annual economic losses due to prolonged ICI in dairy cows in the Sudan are estimated to be 12.9 billion \$(Ahmed, *et al*2021).

In view of the above mentioned findings, the objectives of the present study were to determine the length of PPP, NSPC, DO and ICI in cross-bred dairy cows.

Materials and Methods

Study area

This study was conducted out at the University of Khartoum teaching dairy farm about 4 km North to the Faculty of Veterinary Medicine, Shambat, Khartoum North, Sudan during the period between March to May 2021.

Housing and management

Throughout the experimental period, the cows were maintained as 2 groups according to their age, lactation and housed under similar conditions of feeding and management.

Table 1. Proximal composition of supplementary feed provided to dairy cows.(Abu Damir *et al*.,1983 and Alameen and Abdelatif 2012).

DM	CP	EE	NFE	Ash	Moisture
92.40	20.80	6.40	52.20	4.90	7.60

Table 2. Proximal composition of forages of abu 70 (sorghum vulgare) and alfalfa/Burseem as % (Abu Damir *et al*.1983 and Alameen and Abdelatif 2012).

Feed	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	Ash (%)
Abu70	93.50	10.73	40.14	1.37	37.15	10.66
Burseem	93.48	22.93	30.40	1.63	32.70	12.35

Table 3. Mineral composition of abu 70 and Barseem as % (Abudamir *et al*.1983 and Alameen and Abdelatif 2021).

Feed	Ca	Mg	P	Na	K	Cu	Zn	Mn
Abu70	0.44	0.30	0.24	0.02	2.64	7.84	25.4	53.1
Burseem	2.1	0.28	0.22	0.034	3.18	10.38	22.0	55.6

Postpartum period (PPP)

It was calculated according to Arthur *et al* (2009) where it is the period extended from calving until ovarian rebound and the cow display the first oestrous,

Number of services per conception (NSPC)

It was calculated according to Arthur, *et al* (2009), from the number of services given to the cows after 42 day PP and resulted in a diagnosed pregnancy not less than 45 days after insemination

Day open (DO):

It was calculated from the day of calving until occurrence of successful fertilization which monitored by the absence of the subsequent heat. The optimum DO is 85 days in dairy cattle (Arthur, *et al*; 2009).

Inter-Calving interval (ICI):

It was calculated according to Bath, *et al* (1985) and Arthur, *et al* (2009) where ICI is the period between two consecutive calving. The optimum ICI is 365 days in dairy cows..

Heat detection:

Well-trained herdsman observed all animals thrice daily for heat symptoms. The animals were observed for duration of 30 minutes at 6:00 a.m, 2:00 p.m and 6: p.m. The cows are considered on heat when it stand to be mounted by other cows, mounted others, a clear vaginal mucous discharge hanging from its vulva and when it bellowed (Gong *et al*, 2002).

Cow services:

Cows exhibit oestrous behavior in period less than 42 days PP were not allows to be served. In contrast, cows exhibit oestrous behavior after that time was served with bulls with a proven fertility (Ahmed and Elsheikh, 2004).

Questionnaire data:

It was designed to collect the data of this study (age, parity, body condition score, PPP, NSPC, DO and ICI) from the records of the University of Khartoum teaching dairy farm.

Experimental design:

Thirty (30) apparently healthy multiparous (3 – 7 progenies) cross-bred (Holestian Friesian×Kenana) dairy cows (6 - 17) years old and their BCS between (2.50 – 3.00) were employed for this study. The body condition score (BCS) was determined by the method adopted by Wildman et al., (1982). This study was designed to determine the length of the PPP, NSPC DO and ICI indairy cows. The data were collected via a questionnaire. The animals were assigned according to their age into two equal groups A and B (15 cows each). Group A included middle age cows (6– 8 years). Group B included old age cows (13 – 17 years). The above mentioned PPP traits were assessed as mentioned in the materials and methods.

Statistical analysis:

The statistical analysis was performed by using SPSS version 1.6. The independent Sample T test was used to compare the means between the two groups. The results were expressed as means± standard deviation (SD). The significant difference was considered at ($P \leq 0.01$).

Results

The result of this study revealed that, the PPP of the middle age cows and the old age cows was insignificantly difference ($P > 0.01$).

The mean values of PPP of the middle age cows and the old age cows were (68.80 ± 12.84 days and 74.60 ± 11.66 days respectively) as shown in (figure 1)

The result of the current study indicated that the NSPC of the middle age cows was significantly ($p < 0.01$) decreased compared to the old age cows.

The mean values of the NSPC for the middle and old age cows were (3.30 ± 0.57 and 8.3 ± 1.16 respectively) as shown in (figure 2).

Figure (3) revealed that, the DO of the middle age cows was significantly ($P < 0.01$) shorter compared to the old age cows,

The mean value of the DO of the middle age cows was (99.60 ± 16.05 days) and the DO of the old age cows was (728.00 ± 488.89 days).

Figure(4) indicated that, the ICI of the middle age cows was significantly ($P < 0.01$) shorter compared to the old age cows.

The mean value of ICI of the middle age cows was (389.60 ± 14.83 days) and the ICI for the old age was (1008.00 ± 488.89 days).

Table 4. Postpartum reproductive traits of Cross-bred Dairy cows in University of Khartoum teaching dairy farm.

Parameters	Postpartum period (in days)	Number of services	Day open (in days)	Inter-calving interval (in days)
group of cows				
Group A (6 – 8 year)	69.40 ± 8.82	3.30 ± 1.06	109.00 ± 21.62	385.50 ± 20.07
Group B (13-17 years)	111.70 ± 22.21	8.3 ± 1.16	728.00 ± 488.89	1008.00 ± 488.89
Significant	**	**	**	**
**Significant at ($P < 0.01$)				

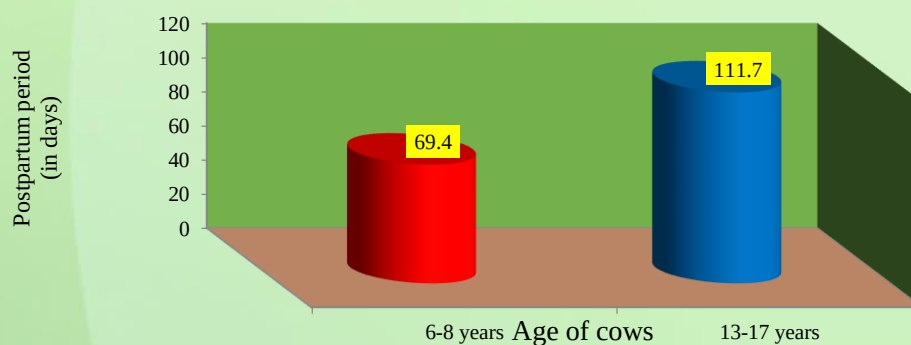


Figure 1. The Postpartum period (in days) of cows according to their age.

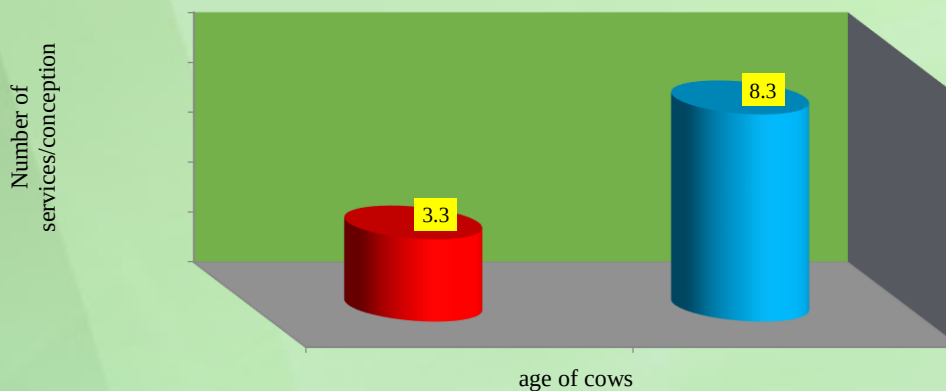


Figure 2. The number of services per conception of cows according to their age.

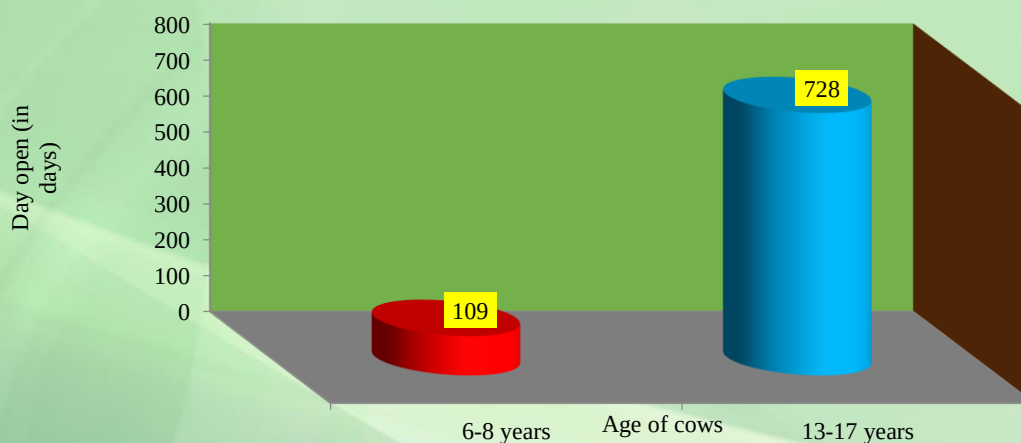


Figure 3. The day open (in days) of cows according to their age.

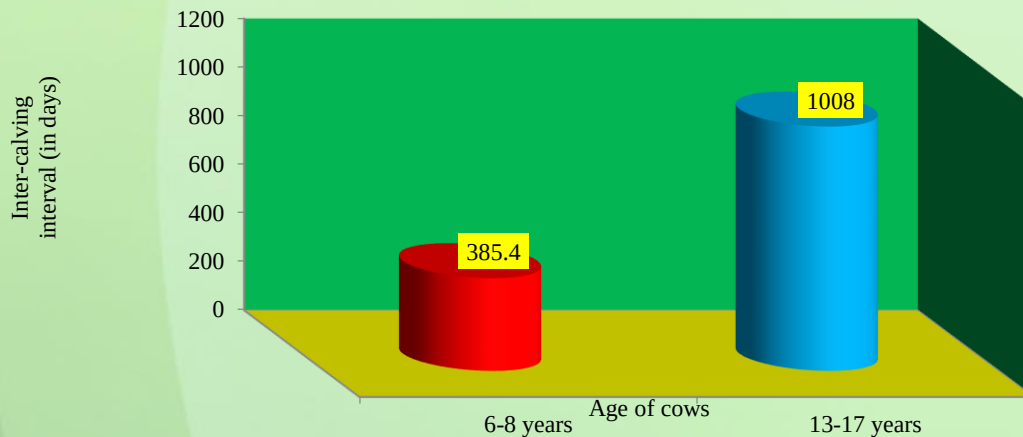


Figure 4. The Inter-calving interval (in days) according to their age.

Discussion

In the dairy industry, the genetic composition of the herd in combination with ideal housing, balance nutrition and proper management during PPP are important to achieve sound reproductive performance and acceptable economic benefits (Windeg, et al; 2005). For instance, several studies have shown that the continuous increase in milk production is coincided with a decrease in cow fertility that measured in terms of prolongation of the PPP, DO, ICI and increased NSPC (Hare, et al; 2006). It is well understood that, the PP infertility in dairy cows is frustrating and results in reduced milk production, increase culling rate, increased cost for replacement of animals as well as increase of veterinarian services (Nanda, et al, 1989 and Ahmed and Elshiekh, 2004). However, a short PPP, DO, ICI and decreased NSPC are known to increase the reproductive efficiency in dairy cows and reduce the annual net economic losses (Arthur et al, 2009). It is well known that, the most reproductive failure in dairy herds is due to mismanagement specially the PPP, DO, ICI and the NSPC which are considered to be the indicator for sound PP reproductive performance in cross-bred (Kumar, 2009). The most significant benefits of reproductive herd health program is the stimulation of improvement in heat detection that decreases PPP, DO, ICI and the NSPC (Arthur, et al, 2009).

The present study is to provide comprehensive data in the Sudan regarding the management of PPP in cross-bred dairy cows. Arthur et al (2009) mentioned that, the PPP is not influenced by age in dairy cows. The previous study agree with the result of the current study which found that the length of PPP is similar for the middle age and old age dairy cows, The results of the present study showed that the DO and the ICI of the middle age dairy cow were shorter than the old age cows which agree with findings of Arthur, et al (2009) and Mesafint and Guesh (2014) who mentioned that DO and ICI of the middle age dairy cows shorter compared to the old dairy cows. However, Esslemont and Kossaibati (2002), Singh et al (2015) and Khan et al (2016) reported that dairy cows of middle age have long DO and ICI, while the old age cows have shorter DO and ICI. The difference between the two above studies might be due to individual variation, nutritional insufficiency or breed variations. According to Arthur et al (2009) who reported that the middle age dairy cows have decreased NSPC compared to the old aged dairy cows. The previous finding is in consistent with the finding of the current study. In contrast, Esslemont and Kossaibati (2002), Singh et al (2015), Walters et al (2002) and Khan et al (2016) reported that dairy cows of middle age have increased NSPC compared to the old age cows. The different between the two findings might be due to individual or breed variations, nutritional insufficiency, and improper heat detection.

The current study concluded that, the age of the cow influences the number of services per-conception (NSPC), the day open (DO) and the inter-calving interval (ICI).

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Genome - Wide Analysis and Characterization of *Chenopodium quinoa* YABBY Transcription Factors

Esra Yaprak¹, Sümeyra Uçar¹, Murat Aydın², Emre İlhan¹

¹Department of Molecular Biology and Genetics, Faculty of Science, Erzurum Technical University, Erzurum, 25050, Turkey

²Department of Agricultural Biotechnology, Faculty of Agriculture, University of Ataturk, Erzurum, 25240, Turkey

ABSTRACT

The YABBY gene family, a subfamily of the zinc finger family, plays a vital role in regulating the development of plant leaf and flower organs. In this study, genome-wide analysis and characterization of YABBY gene family members belonging to quinoa plant were investigated. Ten YABBY genes have been identified in the quinoa genome. The identified YABBY gene family members were named CqYABBY. According to the analysis, CqYABBY-9 with the highest molecular weight of 23.51 kDa and CqYABBY-7 with the lowest molecular weight with 13.26 kDa were found among the CqYABBY members. In gene structure analyses, CqYABBY-2, CqYABBY-8, CqYABBY-9 genes had the highest number of exons, while the gene with the lowest number was CqYABBY-7. On the other hand, while the highest number of intron regions were founded CqYABBY-2, CqYABBY-8 and CqYABBY-9 genes, the lowest number was founded in CqYABBY-7 gene. As a result of gene duplication analyzes, CqYABBY-1/CqYABBY-5, CqYABBY-2/CqYABBY-9, CqYABBY-3/CqYABBY-8, CqYABBY-4/CqYABBY-6, CqYABBY-7/CqYABBY-3 and CqYABBY-8 genes were identified as duplicated genes. The phylogenetic tree forming 5 groups was drawn using quinoa, spinach and Arabidopsis YABBY proteins. The analysis of the data obtained from public databases performed under salt stress conditions, it was determined that the expression levels of CqYABBY gene family members were higher in shoot tissue compared to root tissue. The results of this study will provide a potential biotechnological resource and additional information for a better understanding of the molecular basis of the YABBY gene family in the quinoa plant.

Keywords: C₂C₂ zinc finger domain, salt stress, gene duplication, in silico analysis.

Kinoa Yabby Transkripsiyon Faktör Ailesinin- Genom Çaplı Analizi Ve Karakterizasyonu

ÖZET

Çinko parmak ailesinin bir alt ailesi olan YABBY gen ailesi, bitki yaprak ve çiçek organlarının gelişimini düzenlemede hayati bir rol oynar. Bu çalışmada kinoa bitkisine ait YABBY gen ailesi üyelerinin genom çaplı analizi ve karakterizasyonu araştırılmıştır. Kinoa genomunda 10 YABBY geni tespit edilmiştir. Belirlenen YABBY gen ailesi üyeleri CqYABBY olarak isimlendirilmiştir. Yapılan analizlere göre CqYABBY üyeleri içerisinde en yüksek moleküler ağırlığına 23,51 kDa ile CqYABBY-9 sahipken, en düşük moleküler ağırlığa 13,26 kDa ile CqYABBY-7 sahip olduğu tespit edilmiştir. Gen yapısı analizlerinde ise en yüksek ekzon sayısına CqYABBY-2, CqYABBY-9, CqYABBY-8 genleri sahipken en az sayıya sahip olan gen CqYABBY-7 olmuştur. Diğer taraftan en fazla intron bölgesi CqYABBY-2, CqYABBY-9 ve CqYABBY-8 genlerinde tespit edilirken en düşük sayı CqYABBY-7 geninde bulunmuştur. Ayrıca yapılan duplikasyon analizleri sonucunda CqYABBY-1/CqYABBY-5, CqYABBY-2/ CqYABBY-9, CqYABBY-3/CqYABBY-8, CqYABBY-4/CqYABBY-6, CqYABBY-7/ CqYABBY-3 ve CqYABBY-8 genleri duplike genler olarak bulunmuştur. Kinoa, ıspanak ve Arabidopsis YABBY proteinleri kullanılarak yapılan filogenetik ağaca göre 5 grup oluşmuştur. Tuz stresi koşullarında yapılan ve publik veri tabanlarından elde edilen verinin analizine göre CqYABBY gen ailesi üyelerinin kök dokusu ile karşılaştırıldığında sürgün dokusunda ifade seviyelerinin daha fazla olduğu tespit edilmiştir. Bu çalışmanın sonuçları kinoa bitkisinde YABBY gen ailesinin moleküler temelini daha iyi anlaşılması için potansiyel biyoteknolojik kaynak ve ilave bilgiler sağlayacaktır.

Anahtar Kelimeler: C₂C₂ çinko parmak domaini, tuz stresi, gen duplikasyonu, in siliko analiz