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June 29-30 2023, Paris

EDITOR
Kristine Museliani

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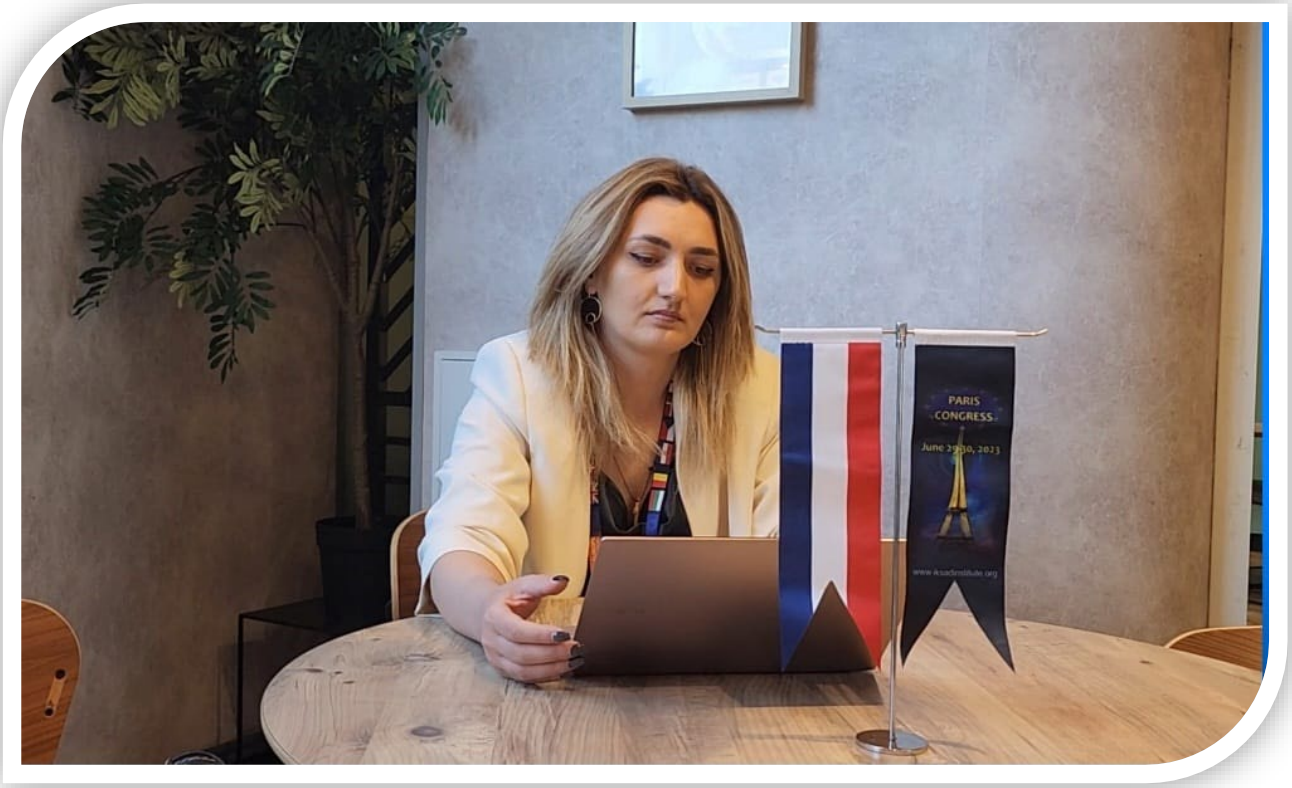

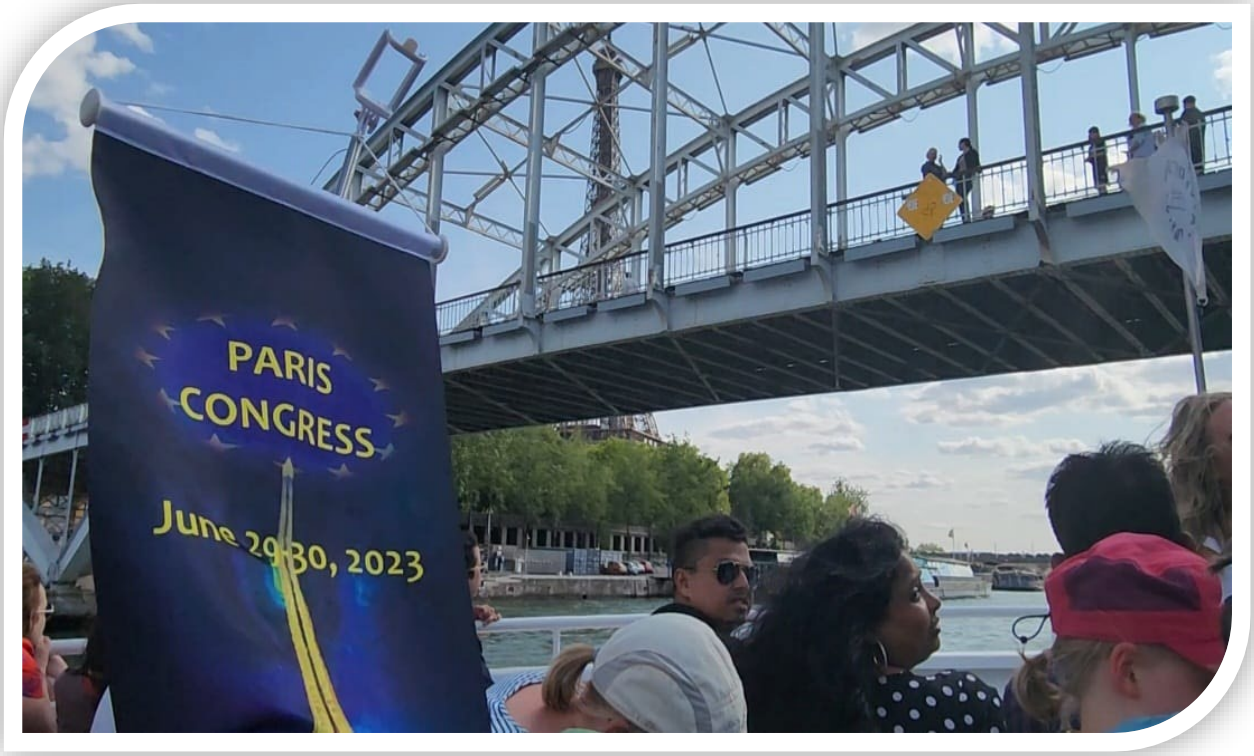

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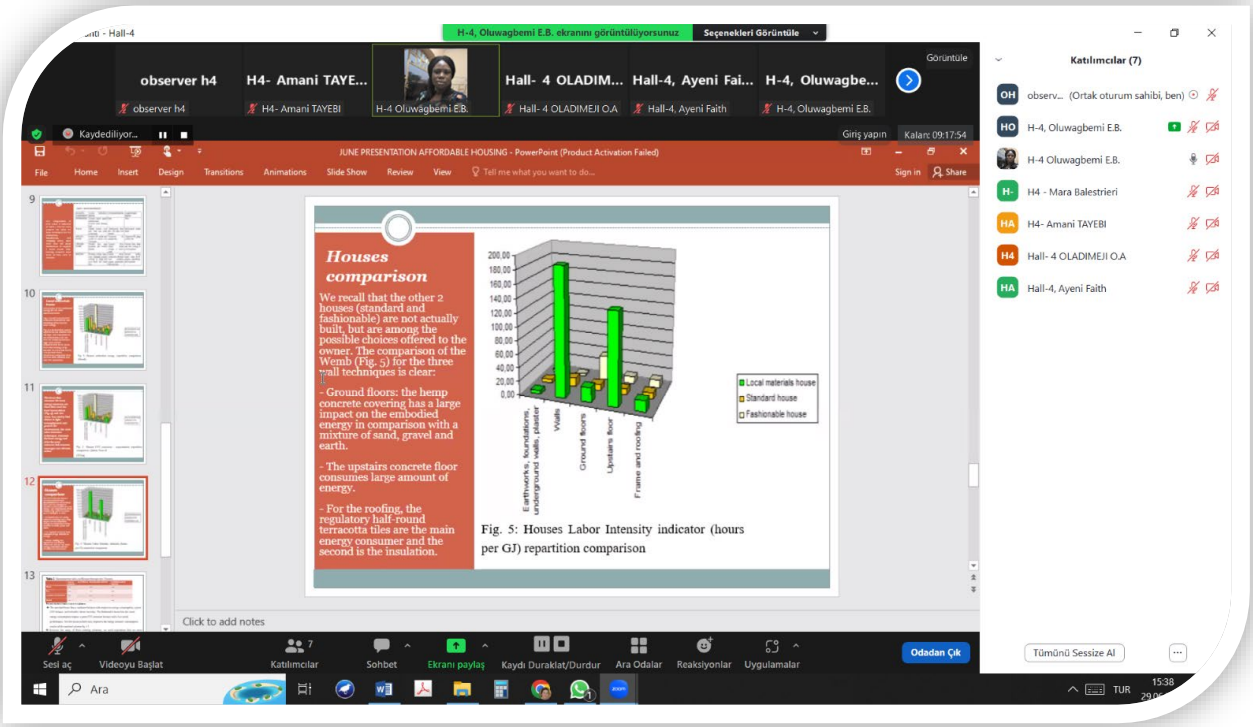

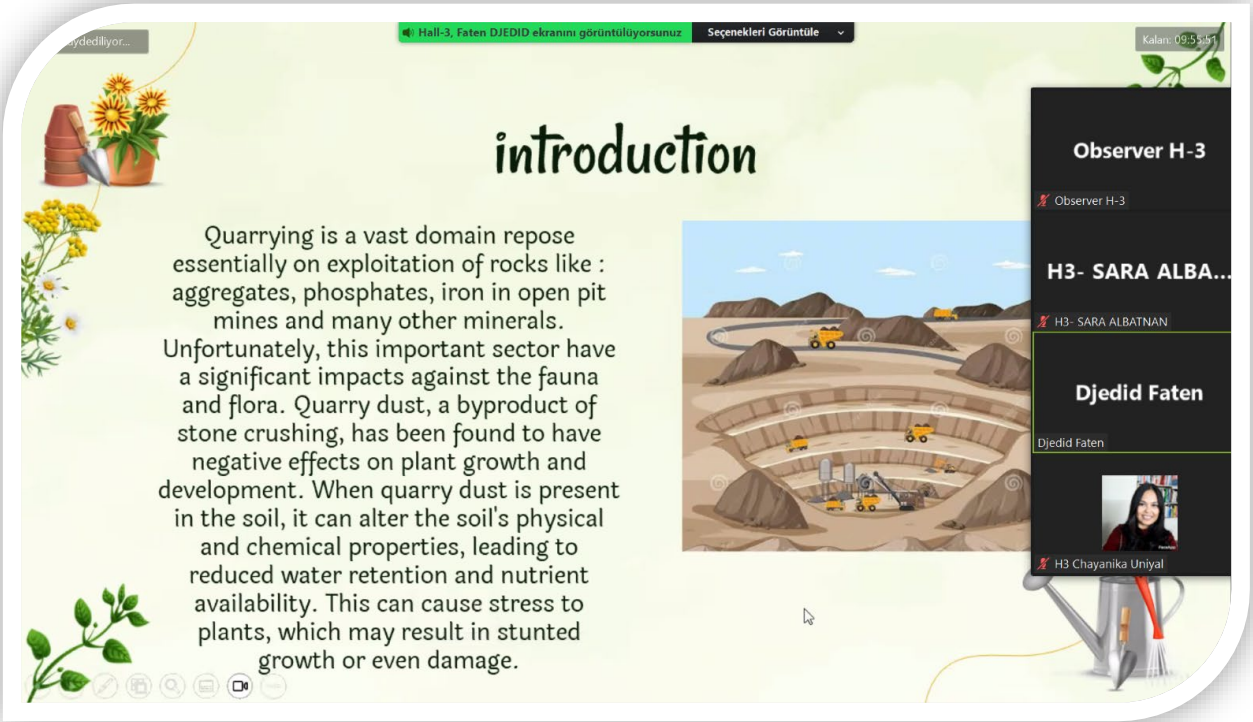

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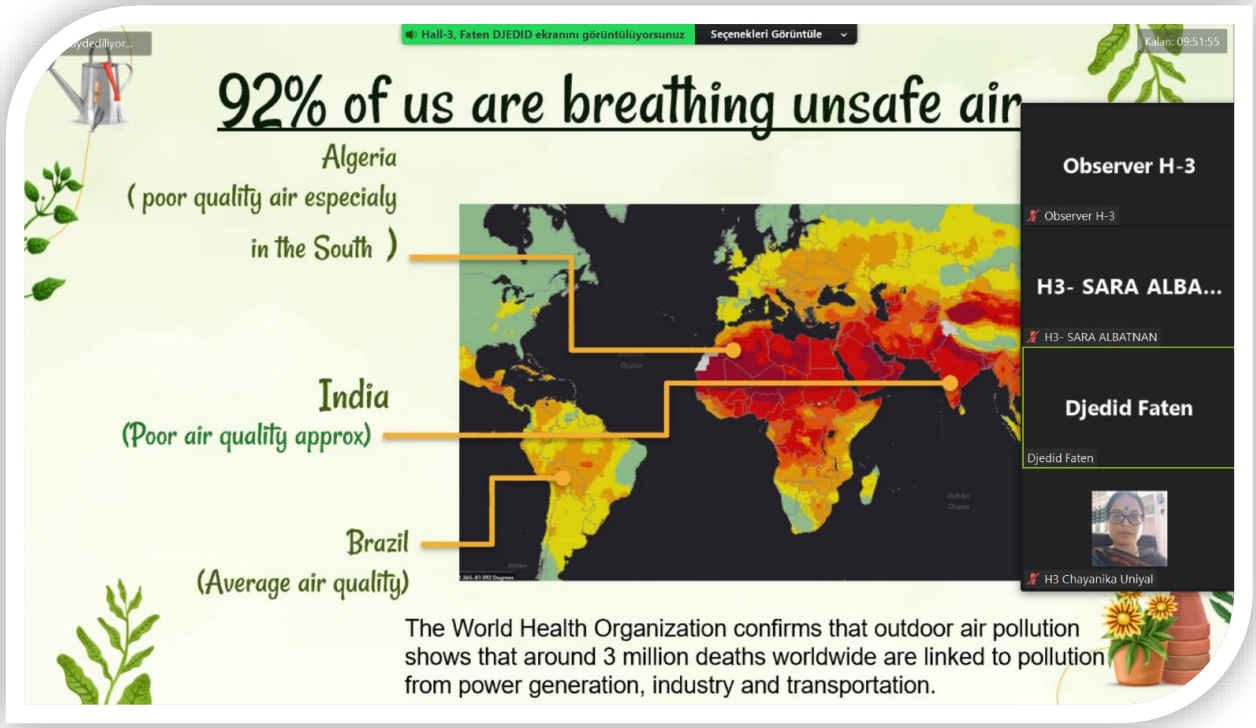

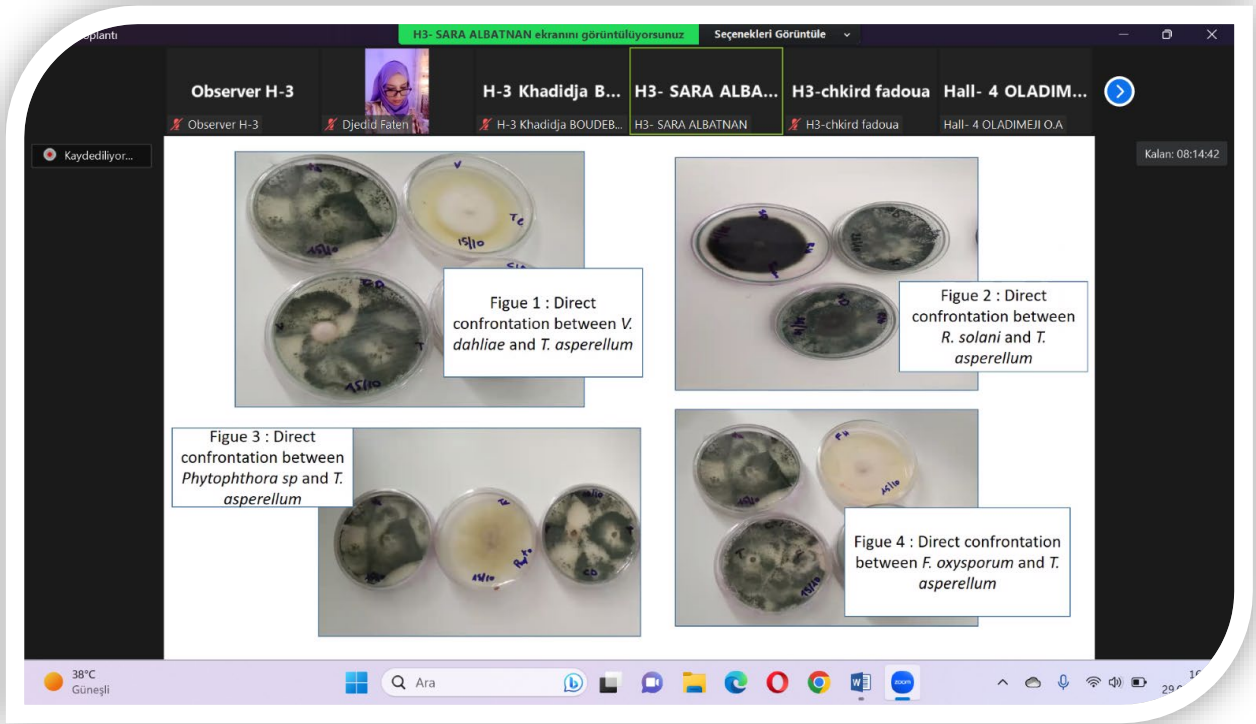

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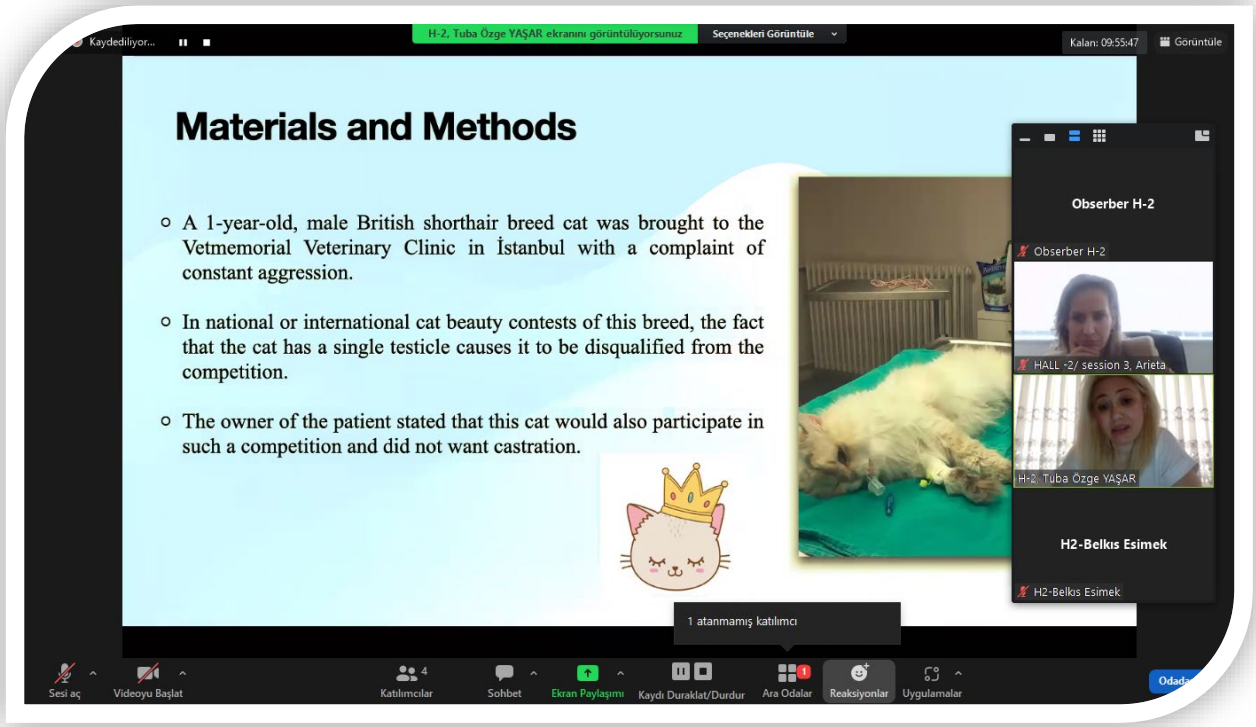

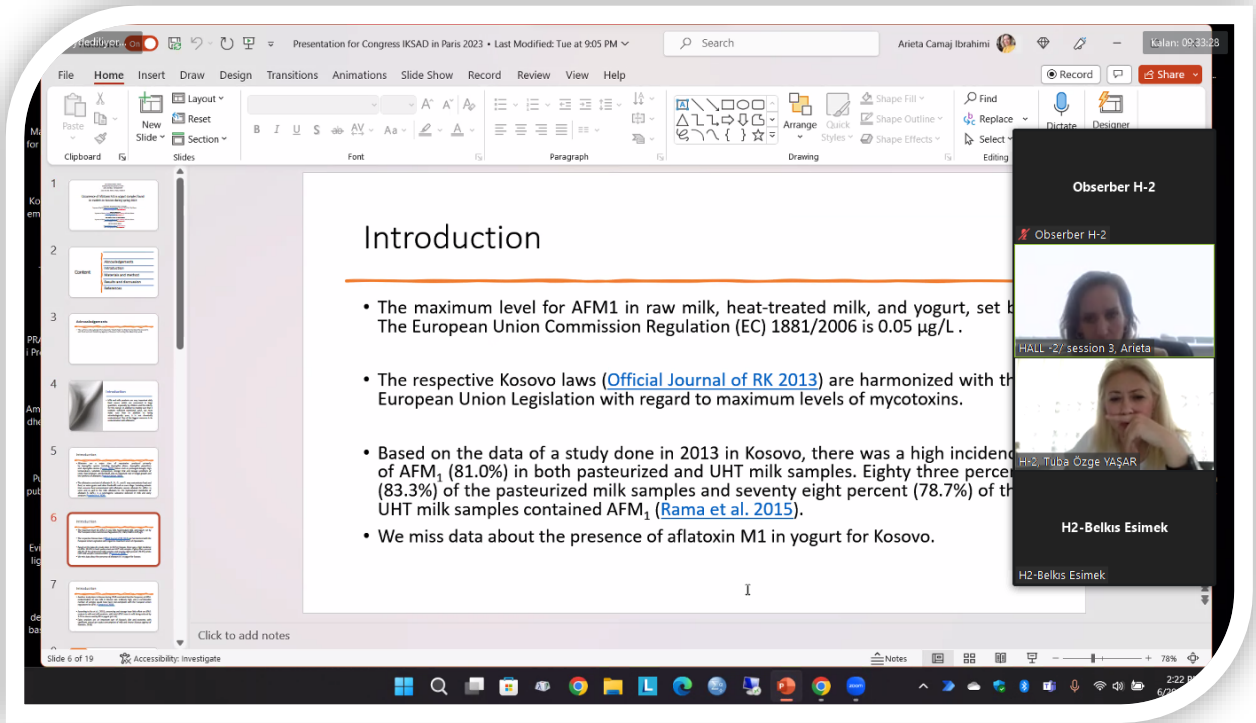

INTERNATIONAL PARIS CONGRESS ON AGRICULTURE AND ANIMAL HUSBANDRY

June 29-30, 2023 / Paris, FRANCE

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IN PERSON PRESENTATIONS

30.06.2023

PARIS LOCAL TIME | $13^{30} : 15^{30}$

HEAD OF SESSION: Dr. Mustafa Latif EMEK

AUTHORS	AFFILIATION	TOPIC TITLE
Kristine Museliani	Agricultural University of Georgia, GEORGIA	EXPLORING CASEIN-SPECIFIC PROTEASE: PURIFICATION, PROPERTIES AND MILK CURDLING CONFIRMATION
Assoc. Prof. Dr. Mükremin ÖLMEZ Prof. Dr. Tarkan ŞAHİN Assist. Prof. Dr. Buket BOĞA KURU Assoc. Prof. Dr. Özlem KARADAĞOĞLU Assoc. Prof. Dr. Mushap KURU Prof. Dr. Mehmet Akif YÖRÜK	Kafkas University, TÜRKİYE	EFFECT OF VITAMIN-MINERAL COMBINATION TREATMENT ON LAMB BIRTH WEIGHT AND MORTALITY RATE IN AKKARAMAN EWES DURING THE BREEDING SEASON
Prof. Dr. Barış SARI Assist. Prof. Neslihan ÖLMEZ Assist. Prof. Nilgün AYDIN Prof. Dr. Mete CİHAN Ress. Assist. Mesut Erdi IŞIK Ress. Assist. Burak BÜYÜKBAKİ	Kafkas University, TÜRKİYE	FIRST REPORT OF CRATAERINA PALLIDA (OLIVIER IN LATREILLE, 1811) IN APUS APUS BIRDS IN TÜRKİYE: A CASE SERIES
Assoc. Prof. Kadir BOZUKLUHAN Assoc. Prof. Oğuz MERHAN Assist. Prof. Neslihan ÖLMEZ	Kafkas University, TÜRKİYE	OXIDATIVE STRESS INDEX IN CALVES WITH ASCARIDIOSIS (Toxocara vitulorum)

ONLINE PRESENTATIONS

29.06.2023 / HALL-1 / SESSION-3

PARIS LOCAL TIME	ANKARA LOCAL TIME
14 00 : 16 00	15 00 : 17 00

HEAD OF SESSION: Assoc. Prof. Dr. Duygu BOYRAZ ERDEM

AUTHORS	AFFILIATION	TOPIC TITLE
Dr. Erhan KAHYA Dr. Fatma Funda ÖZDÜVEN Yasin ASLAN	Tekirdağ Namık Kemal University, TÜRKİYE Freelance Senior Software Developer,Tekirdağ, TÜRKİYE	PEPPER HARVESTING WITH DEEP LEARNING
Şule GÜZEL İZMİRLİ	Recep Tayyip Erdoğan University, TÜRKİYE	A SURVEY ON THE MACRO-ELEMENT CONTENTS of Hylocereus ocamponis and Hylocereus polyrhizus
Assoc. Prof. Dr. Harun ÇOBAN	Çanakkale Onsekiz Mart University, TÜRKİYE	THE EFFECT OF GIRDLING AND CLUSTER TIPPING ON NUTRIENT CONTENT OF SUPERIOR SEEDLESS (Vitis vinifera L.) GRAPE VARIETY
Assoc. Prof. Dr. Harun ÇOBAN Prof. Dr. Alper DARDENİZ	Çanakkale Onsekiz Mart University, TÜRKİYE	DETERMINATION OF BUD FERTILITY AND PRUNING LEVELS IN EARLY SWEET GRAPE VARIETY
Assist. Prof. Dr. Muhammed GÜNGÖREN Assist. Prof. Dr. Aziz KORKMAZ	Mardin Artuklu University, TÜRKİYE	INVESTIGATION OF SOME THERAPEUTIC COMPONENTS OF OLIVE OILS OBTAINED FROM DIFFERENT REGIONS
Assist. Prof. Dr. Ahmet YENİKALAYCI Assoc. Prof. Dr. Sedat BOZARI	Muş Alpaslan University, TÜRKİYE	DETERMINATION OF THE ESSENTIAL OILS COMPOSITION OF MEDICINAL SAGE (Salvia officinalis L.) AND ANATOLIAN SAGE (Salvia fruticosa MILL.) CULTIVATED IN MUŞ PROVINCE OF TÜRKİYE
Dr. Habibe Elif GÜLŞEN AKBAY	Mersin University, TÜRKİYE	USE OF FERMENTED SLUDGE FORMED IN THE BIOGAS PRODUCTION PROCESS IN AGRICULTURAL ACTIVITIES
Assoc. Prof. Dr. Duygu BOYRAZ ERDEM	Tekirdağ Namık Kemal University, TÜRKİYE	EVALUATION OF SUITABILITY CLASSES FOR AGRICULTURAL USE OF SOME SOIL ORDOS IN THE THRACE REGION, TURKEY

ONLINE PRESENTATIONS

29.06.2023 / HALL-2 / SESSION-3

PARIS LOCAL TIME	ANKARA LOCAL TIME
14 00 : 16 00	15 00 : 17 00

HEAD OF SESSION: Assist. Prof. Dr. Tuba Özge YAŞAR

AUTHORS	AFFILIATION	TOPIC TITLE
Assist. Prof. Dr. Tuba Özge YAŞAR Cem PERK	Tekirdağ Namık Kemal University, TÜRKİYE	ORCHIOPEXY TECHNIQUE IN A CRYPTORCHID BRITISH SHORT HAIR CAT: THE FIRST CASE IN TURKEY
Dr. F.Belkıs ESİMEK Prof. Dr. Ali KÜDEN Prof. Dr. İbrahim Ortaş Prof. Dr. Ayzin B. KÜDEN	Alata Horticultural Research Institute, Mersin, TÜRKİYE Çukurova University TÜRKİYE	DETERMINATION OF MYCORRHIZA INFECTION RATES IN SOME PRUNUS ROOTSTOCKS UNDER DROUGHT STRESS
Dr. Firoz FAOZİ	University Member in Kabul State University, AFGHANISTAN	CHEMICAL METHODS USED IN MEAT PROTECTION
Prof. Ass. Dr. Arieta Camaj Ibrahimi Prof. Dr. Arben Haziri Msc. Aferdita Camaj Isa Msc. Hata Dibrani Sopjani	University "Haxhi Zeka", Peja, KOSOVO University of Prishtina, KOSOVO Food and Veterinary Agency, Prishtina, KOSOVO	OCCURRENCE OF AFLATOXIN M1 IN YOGHURT SAMPLES FOUND IN MARKETS IN KOSOVO DURING SPRING 2023
Babaev Kh.F. Shukurova P.A. Abbasov R.Y. İbrahimova Zh.M. İsrafilova A.S. Alieva R.İ.	Institute of Physiology named after Academician Abdulla Garayev Ministry of Science and Education, AZERBAIJAN	POSSIBLE MECHANISMS OF RETINOPROTECTIVE EFFECTS OF ENDEMIC SAFFRON (Crocus sativus L.)

ONLINE PRESENTATIONS

29.06.2023 / HALL-3 / SESSION-3

PARIS LOCAL TIME	ANKARA LOCAL TIME
14 00 : 16 00	15 00 : 17 00

HEAD OF SESSION: Assoc. Faten DJEDID

AUTHORS	AFFILIATION	TOPIC TITLE
Assoc. Faten DJEDID Prof. Mohamed BOUNOUALA	University of Badji Mokhtar Annaba, ALGERIA	PLANTS UNDER STRESS: THE IMPACTS OF QUARRIES DUST
Assist. Prof. Dr. Chayanika Uniyal	University of Delhi, INDIA	FEMINISATION OF AGRICULTURE: A CASE STUDY OF INDIA
Dr. Khadidja BOUDEBAZ	University of Mohamed Seddik Ben Yahia Jijel, ALGERIA	CORRELATION BETWEEN PHENOLIC COMPOUNDS CONTENT AND ANTIOXIDANT ACTIVITY OF HONEY FROM DIFFERENT BOTANICAL ORIGINS
Dr. TAREK MOKNANE Dr. Sabah Adjlane Dr. Roukaya Khiari	CRSTRA, ALGERIA	AGRO INPOTS DISTRIBUTOR AS A KEY CONTRIBUTORE TO THE AGRICULTURA DYNAMICS IN THE REGION OF EL OUED SOUF
Atika SOUALILI Salima ATTOUTI Benaouda BESTANI Mourad TERMOUL Mokhtar BENZEKRI BENALLOU Noureddine BENDERDOUCHE	University of Mostaganem, ALGERIA	PHOSPORIC ACID ACTIVATION EFFECT ON THE PROPERTIES OF A BIOADSORBENT DERIVED FROM LIGNOCELLULOSIC WASTE
Kamal El fallah Khadija El kharrim Driss Belghyti	University Ibn Toufail, MOROCCO	ECOLOGICAL NICHE MODELING OF AN AGRICULTURAL INTEREST SPECIES BY USING BIOCLIMATIC AND NON-BIOCLIMATIC VARIABLES
Fadoua CHKIRD Azzouz BOUKROUTE Abdelbasset BERRICHI Nour-Eddine KOUDDANE	Université Mohamed Premier, MOROCCO	LA VALORISATION DES ESPACES VERTS : UNE RESSOURCE INDISPENSABLE POUR LA BIODIVERSITE ET LE DEVELOPPEMENT DURABLE
Sara Albatnan Hanane El Kaissoumi Amina Ouazzani Touhami Allal Douira Prof. Ouazzani Touhami Amina	Université Ibn Tofail, MOROCCO	BIOCONTROL IN VITRO EFFICACY OF TRICHODERMA ASPERELLUM AGAINST SOIL BORNE FUNGAL PATHOGENS

ONLINE PRESENTATIONS

29.06.2023 / HALL-4 / SESSION-3

PARIS LOCAL TIME	ANKARA LOCAL TIME
14 00 : 16 00	15 00 : 17 00

HEAD OF SESSION: Prof. Hicham HARNAFI

AUTHORS	AFFILIATION	TOPIC TITLE
M.A. Akomolafe E.B. Oluwagbemi AJAO F. O.	Osun State Polytechnic, NIGERIA	A QUANTITATIVE AND QUALITATIVE APPROACH TO THE ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF BUILDING MATERIALS
M.A. Akomolafe AJAO F. O.	Osun State Polytechnic, NIGERIA	AFFORDABLE STRATEGY FOR USING LOCAL MATERIALS IN BUILDING:A CASE STUDY OF HOUSING THE URBAN POOR IN NIGERIA
Oladimeji O.A Oyejide O.T. Sojobi O.A Mabosanyinje A. Ogunsanya B.G	Osun State Polytechnic, NIGERIA	IMPACT AND VARIABILITY OF CLIMATIC FACTORS ON THE YIELD OF TOMATOES IN NIGERIA
Amani TAYEBI Mohammadine MOUMOU Hicham HARNAFI	Université Mohammed Premier, MOROCCO	ÉVALUATION DE L'EFFET DES EXTRAITS DE BASILIC (OCIMUM BASILICUM L.) SUR LA STABILITÉ DE L'HUILE DE SOJA
Dr. Mara Balestrieri	University of Sassari ITALY	UNRESOLVED MATTERS WITHIN THE DISCUSSION ON RURAL LANDSCAPES

CONTENTS

ÉVALUATION DE L'EFFET DES EXTRAITS DE BASILIC (*OCIMUM BASILICUM* L.) SUR LA STABILITÉ DE L'HUILE DE SOJA

Amani TAYEBI

Laboratoire des Bioressources, Biotechnologies, Ethnopharmacologie et Santé, Faculté des Sciences, Université Mohammed Premier, Oujda 60000, Maroc;

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Hicham HARNAFI

Laboratoire des Bioressources, Biotechnologies, Ethnopharmacologie et Santé, Faculté des Sciences, Université Mohammed Premier, Oujda 60000, Maroc;

RESUME

Les antioxydants jouent un rôle essentiel dans la préservation de la qualité des huiles végétales en empêchant l'oxydation des lipides. Le basilic (*Ocimum basilicum*) est une plante aromatique riche en composés bioactifs, parmi lesquels certains ont montré des propriétés antioxydantes prometteuses. Cette étude se concentre sur l'évaluation du potentiel des extraits de basilic sur la stabilité oxydative de l'huile de soja.

Les feuilles séchées de basilic ont été soumises à une extraction en utilisant différents solvants afin d'isoler les composés actifs. Les extraits ainsi obtenus ont ensuite été évalués quant à leur capacité antiradicalaire et antioxydante en utilisant la méthode au DPPH (2,2-diphényl-1-picrylhydrazyle) et le dosage des malondialdehydes (MDA). L'extrait brut ayant présenté la plus grande activité antioxydante a été sélectionné pour être ajouté à l'huile de soja à différentes concentrations dans le but d'augmenter sa stabilisation après stockage à 60°C et à température de friture. Plusieurs indices de qualités ont été suivi dont l'indice de peroxyde, l'indice d'acide, l'indice de paraanisidine et le taux des MDA.

Nos résultats montrent que l'extrait brut du basilic présente une forte activité antiradicalaire qui se traduit par la stabilisation oxydative de l'huile de soja.

En conclusion, l'extrait du Basilic pourrait être considéré comme une source d'antioxydants naturels à application dans la stabilisation de la matière grasse alimentaire.

Mots clés : Basilic ; *Ocimum basilicum* L. ; Activité antioxydante ; Stabilisation oxydative ; Huile de soja

USE OF FERMENTED SLUDGE FORMED IN THE BIOGAS PRODUCTION PROCESS IN AGRICULTURAL ACTIVITIES

BİYOGAZ ÜRETİM PROSESİNDE OLUŞAN FERMENTE ÇAMURLARIN TARIMSAL FAALİYETLERDE KULLANIMI

Dr. Habibe Elif GÜLŞEN AKBAY

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ABSTRACT

Increasing transportation activities and vehicle density in traffic, rising quality of life and standards, increase in mechanization in industry, increase in technological products and related activities have led to an acceleration in energy demand day by day. However, these sudden increases in energy consumption negatively affected the balance between energy supply and demand. Although the emerging high energy demand continues to be met mostly by fossil resources, it has begun to be replaced by renewable energy resources due to reasons such as the exhaustion of these resources, polluting the environment and creating a global warming problem due to greenhouse gas emissions.

At this point, biogas/methane production with anaerobic digestion processes, which is a sub-topic of renewable biomass energy that is actively preferred in many countries, is an alternative method with many advantages to promote the concept of sustainable and environmentally friendly energy. As a result of digesting a wide variety of urban, agricultural, or industrial organic wastes and wastewaters with microbiological reactions under anaerobic conditions, biogas that can be converted into energy is produced and organic fermented sludge (bio-fertilizer or digestate) rich in macro and micronutrients can be obtained as a process by-product.

Fermented sludge, which is purified from pathogens at a very high rate by the sanitation process after the anaerobic digestion process, can be used in agricultural activities, plant cultivation and soil improvement, thus reducing the demand for synthetic fertilizers. However, the unconscious and excessive use of fermented bio-fertilizer can cause crop damage, decrease in soil fertility, accumulation of heavy metals and their transport to consumers via the food chain. In conclusion to manage the agricultural application of anaerobic fermentation by-product bio-fertilizer with maximum benefit, the application dose and application time of the fermented sludge needs to be optimized. In this study, the applicability of fermented sludge as an alternative organic bio-fertilizer was discussed by comparing it with other organic fertilizers currently offered for consumer use in the market in terms of content and application.

Keywords: Anaerobic digestion, Bio-fertilizer, Fermented sludge, Organic fertilizer Organic waste

ÖZET

Artan ulaşım faaliyetleri ve trafikteki araç yoğunluğu, yükselen yaşam kalitesi ve standartları, sanayide makineleşmenin artması, teknolojik ürünlerin ve buna bağlı faaliyetlerin artması enerji talebinin her geçen gün artacak şekilde ivmelenmesine yol açmıştır. Bununla birlikte enerji tüketiminde yaşanan bu ani artışlar arz ve talep arasındaki dengeyi de olumsuz etkilemiştir. Ortaya çıkan yüksek enerji talebi halihazırda daha çok fosil kaynaklar ile karşılanmaya devam edilse de bu kaynakların tükenebilirliği bir yana çevreyi kirletmesi, sera gazı emisyonlarına bağlı küresel ısınma sorunu oluşturması gibi nedenlerden dolayı yerini yenilenebilir enerji kaynaklarına bırakmaya başlamıştır.

Bu noktada birçok ülkede aktif olarak tercih edilen yenilenebilir biyokütle enerjisinin bir alt kolu olan anaerobik fermantasyon prosesleri ile biyogaz/metan üretimi, sürdürülebilir ve çevre dostu enerji kavramının teşvik edilmesi için birçok avantaja sahip alternatif bir yöntemdir. Kentsel, tarımsal ya da endüstriyel çok çeşitli organik atıkların ve atıksuların anaerobik koşullarda mikrobiyolojik reaksiyonlar ile fermente edilmesi sonucunda hem enerjiye dönüştürülebilen biyogaz üretilmektedir hem de proses yan ürünü olarak makro ve mikro besinler açısından zengin organik fermente çamur (biyo-gübre ya da digestat) elde edilebilmektedir.

Anaerobik fermantasyon prosesi sonrasında sanitasyon prosesi ile patojenlerden çok yüksek oranda arındırılan biyo-gübre tarımsal faaliyetlerde bitki yetiştiriciliğinde ve toprağın iyileştirilmesinde kullanılabilmekte ve böylece sentetik gübreye olan talebi azaltabilmektedir. Fakat, fermente biyo-gübrenin bilinçsiz ve aşırı kullanımı mahsulün zarar görmesine, toprak verimliliğinin azalmasına, ağır metal akümülasyonuna ve bunların besin zinciri yolu ile tüketicilere taşınmasına neden olabilir. Sonuç olarak, anaerobik fermantasyon yan ürünü biyo-gübrenin tarımsal uygulamasını maksimum fayda ile yönetmek için, fermente çamurun uygulama dozunun ve uygulama süresinin optimize edilmesi gerekmektedir. Bu çalışmada fermente çamurların halihazırda piyasada tüketici kullanımına sunulan diğer organik gübreler ile içerik ve uygulama bakımından karşılaştırılması yapılarak alternatif organik biyo-gübre olarak değerlendirilebilirliği tartışılmıştır.

Anahtar Kelimeler: Anaerobik fermantasyon, Biyo-gübre, Fermente çamur, Organik atık, Organik gübre

GİRİŞ

Günümüzde elektrik enerjisi ve yenilenebilir enerji gibi kullanım alanı genişleyen ve geliştirilen alternatiflere rağmen fosil yakıt kullanımı belirgin prosedür ve alışkanlıklar nedeni ile hala artan oranda tercih edilmektedir. Ayrıca evsel ve endüstriyel atıkların uygun olmayan şekilde bertaraf edilmesi ve bilinçsizce gerçekleştirilen tarımsal faaliyetlerin doğrudan ve/veya dolaylı yollardan neden olduğu insan kaynaklı küresel iklim değişikliği gibi büyük sorunlar tüm canlıların ve içinde bulunulan çevrenin geleceğini tehdit etmektedir. Yenilenebilir enerji kaynaklarının kullanımının özendirilmesi ve atıkların tekrar kullanım, geri dönüşüm ve geri kazanım gibi alternatif yöntemler ile

değerlendirilmesi için küresel ölçekte mevcut atık yönetimlerinin iyileştirilmesi, bu tür çevresel sorunların çözülmesi açısından önemlidir.

Yenilenebilir enerji çeşitleri içerisinde önemli bir noktada olan biyokütle enerjisi ile enerji üretiminde kaynak olarak genellikle organik ve biyobozunur nitelikteki atıkların kullanılması bu tür atıkları bertaraf etmenin en avantajlı seçenekleri arasında yer almaktadır (Panuccio ve diğ., 2016). Bununla birlikte tekli veya çoklu anaerobik fermantasyon (anaerobik sindirim) prosesleri ile oksijensiz ortamda faaliyet gösteren mikroorganizmaların, organik atıkları hidroliz, asideojenesiz, asetojenesis ve metanojenesis olarak adlandırılan fermantasyon basamaklarından geçirerek elektrik ya da ısı enerjisi elde edilmesine imkân veren biyogaza dönüştürmesi, biyokütle enerjisi çeşitleri içerisinde atık yönetimi ve alternatif enerji üretimi açısından en umut verici yöntemlerden birisidir (Kumar Khanal ve diğ., 2021; Lee ve diğ., 2009). Organik atıkların bu şekilde fosil olmayan bir enerji kaynağına dönüştürülmesi ile sera gazı emisyonları azaltılabilir, atıkların düzenli depolanması için gerekli alanlar küçültülebilir, kontrolsüz atık bertarafının önüne geçilerek su ve hava kirliliği engellenebilir (Dennehy ve diğ., 2016).

Anaerobik fermantasyon (AF) prosesinden sonra biyoreaktörde kalan atık akışları, nütrientler, mineraller ve çözünmüş organik maddeler açısından zengin, yüksek nemli organik/inorganik bir matristir ve genel olarak biyo-gübre, fermente çamur ya da digestat olarak adlandırılır. Ayrıca fermente çamurun hacmini azaltarak depolama ve nakliye maliyetlerini düşürmek ve süreç verimliliğini kolaylaştırmak için uygun maliyetli bir katı-sıvı ayırma işlemiyle katı kısım-katı parçalama ürünü ve sıvı kısım-sıvı çürütme ürünü olarak ayrıştırılabilir (Abomohra ve diğ., 2021). Bu durumda azot (N) ve potasyum (K) açısından zengin sıvı çürütme ürünü, biyoreaktördeki toplam kütlenin yaklaşık %80-90'ını temsil ederken, karbon (C) ve fosfor (P) açısından zengin katı fermente çamur da yaklaşık %10-20'sini oluşturur(Selvaraj ve diğ., 2021). Bununla birlikte fermente çamurlar, biyoreaktörde substrat olarak kullanılan atık türüne göre kadmiyum (Cd), krom (Cr), bakır (Cu), kurşun (Pb), arsenik (As), çinko (Zn) ve nikel (Ni) gibi ağır metaller de ihtiva edebilir. Bu nedenle bu şekilde fermente edilen atıkların nihai ürünlerinin uygun bir şekilde yönetilmesi büyük önem taşımaktadır (Eraky ve diğ., 2022).

Biyogaz üretimi sonucu oluşan fermente çamurun tarımda gübre, toprak iyileştirici veya yetiştirme ortamı olarak değerlendirilmesi muhtemel çevresel etkileri önlemek veya asgari seviyeye düşürmek için en basit atık yönetimi çözümlerinden biridir. Bununla birlikte, N, K ve P gibi önemli besin maddelerinin toprağa geri verilmesi, toprak erozyonunun dengelenmesine katkıda bulunabilir (Slepetiene ve diğ., 2020). Tarımsal faaliyetlerde fermente çamur kullanımı, yüksek mikro ve makro besin içeriği göz önüne alındığında bitki tarafından sağlanan besin maddelerini geliştirdiği için kimyasal gübre uygulamasını azaltmak için de uygun bir alternatiftir. Ayrıca fermente çamur, anaerobik fermantasyon gibi prosesler ile işlenmeden direkt toprağa uygulanan hayvan gübresi gibi organik atıklar ile karşılaştırıldığında mikrobiyal olarak daha stabil, hijyenik ve kokusuzdur (Pivato ve diğ., 2016). Bununla birlikte, fermente çamur özellikleri, AF proseslerinde kullanılan substrat sayısının ve tipinin yanı sıra bakteriyel aşı kaynağı, AF çalışma parametreleri, biyoreaktör tipi ya da proses öncesinde/sonrasında uygulanabilen ek işlemler ile büyük ölçüde değişmektedir (Chong ve diğ., 2022). Dolayısı ile AF sonrası ortaya çıkan fermente çamurların da içeriği ve kalitesi değişkenlik göstermektedir. Bununla birlikte fermente çamurun iletkenlik ve pH değeri, içerdiği nütrient ve besin derişimine göre de uygulama yapılacak ekinlerin ihtiyaçlarına ve gübre uygulama mevsimlerinin toleranslarına göre değişiklik gösterebilir. Fermente çamurun stabilitesine ve son tüketim tarihine ve uygulama şartlarına bağlı olarak uygulanan alanda patojenler, inatçı organikler ve ağır metaller akümüle olabilir ve toprağa zarar verebilir. Örneğin, fermente çamurun

toprağa erken uygulanması ve ekinler tarafından kullanılmadan toprakta uzun süreler tutulması sonucunda içerdiği bitki besin maddeleri kaybolabilir ve/veya yine erken uygulama nedeni ile bunların yağmur suları ile yıkanarak yer altı sularına fazla oranda karışmasına yol açabilir. Bu nedenle, her tür fermente çamurun uygulanacak ekinlere, yönteme ve mevsime göre karakterize edilmesi sürdürülebilir tarım ve çevre olgularını en verimli şekilde gerçekleştirmek ve devam ettirmek açısından önemlidir. Bu çalışmada literatür verilerine göre fermente çamurların karakterizasyonları, farklı ülkelerdeki kullanım sınırlamaları ve halihazırda piyasada tüketici kullanımına sunulan diğer organik gübreler ile içerik ve uygulama bakımından karşılaştırmaları yapılarak tarımsal faaliyetlerde uygulanabilirliği değerlendirilmiştir.

SUBSTRATA BAĞLI FERMENTE ÇAMUR ÖZELLİKLERİ

Gıda ve Bitkisel Temelli Organik Atıklar

Gıda bazlı fermente çamurlar atıkların evsel/endüstriyel olmasına ya da meyve/sebze/et ürünü gibi farklı türde gıdalar içermesine bağlı olarak değişebilmektedir. Örneğin sebze kullanılan biyoreaktörlerde oluşan fermente çamurların hayvan gübresinden daha yüksek N içeriğine sahip olduğu belirtilmiştir. Fakat aynı zamanda yüksek pH değerine sahip olan sebze temelli fermente çamurların toprağa uygulanması sonrasında mevsim şartlarına bağlı olarak buharlaşma faktörü nedeni ile daha fazla N kaybına neden olabileceği de belirtilmiştir (Nicholson ve diğ., 2017). Bitki temelli fermente çamurların diğer bir yararlı özelliği, tarımsal ürünlerin kalitesini, toprağın fiziksel özelliklerini ve bitkilerin hastalık direncini artıran K elementinin yüksek derişimlerine imkân vermesidir (Römheld & Kirkby, 2010). Lif içeriği düşük olan gıda temelli substratların anaerobik fermantasyon sonrası yüksek lif içeren atıklara oranla daha az fermente çamur ürettiği raporlanmıştır (Negri ve diğ., 2016). Bu da üretilen fermente çamurun katı madde oranının yüksek lif artışı ile artmasına ve akışkanlığının azalmasına yol açmaktadır. Bununa birlikte sıvı formdaki bitkisel temelli fermente çamurun toprağa uygulanması daha kolay olduğu gibi fazlasının yine biyoreaktör içerisine geri beslenmesinin AF prosesi içinde metanojenik popülasyonu iyileştirme, pH değerini, organik madde ve nem içeriğini artırması ve AF sürecinin başlatmasını ifade eden lag fazı süresini azaltması gibi avantajları da bulunmaktadır (Sukhesh & Rao, 2018).

Buğday, mısır, çeltik, arpa, ayçiçeği gibi enerji bitkilerinin lignoselülozik malzeme olduklarından biyolojik bozunmaya karşı dirençli olmaları ve faydalı yarı bozunmuş organik madde içermeleri nedeni ile hasat ya da ürün işlenmesi sonrası oluşan atıklarının AF prosesinde substrat olarak kullanılması sonucu oluşan fermente çamurların, toprak kalitesini artırabileceği ve toprak iyileştirici olarak değerlendirilebileceği raporlanmıştır (Lansing ve diğ., 2010; Zacharof ve diğ., 2015). Örneğin, buğday samanının %6 potasyum hidroksit (KOH) ile ön işleme tabi tutulması ile gerçekleştirilen AF prosesinde oluşan fermente çamurların, kalsiyum, magnezyum ve potasyum açısından oldukça zengin olduğu ve toprak düzenleyici olarak kullanımının çok faydalı olacağı belirtilmiştir (Jaffar ve diğ., 2016). Ayrıca belediye katı atıklarının anaerobik fermantasyonu sonucu oluşan fermente çamurların, 8,3 gibi zayıf alkali bir pH değerine sahip olduğu, makro (N, P, K, Ca, S ve Mg) ve mikro (B, Cl, Mn, Fe, Zn, Cu, Mo ve Ni) besinlerin AF sırasında art arda diğer kimyasal formlara dönüştürülebildiği raporlanmıştır. Fermente çamurdaki toplam N içeriğinin %60 ila %80'ini NH_3 tarafından karakterize edilir, AF sonunda biyoreaktörde bozunmadan kalan karbon yüzdesi, fermente çamurun uygulandığı topraktaki organik materyali stabilize eder. Ayrıca çamurun sıvı kısmı, toplam fosforun %35 ila %45'ini

içermektedir (Logan & Visvanathan, 2019). İnorganik kirleticiler ve ağır metaller bu tür gıda ve bitki temelli evsel ve endüstriyel atıkların kalitesini tehdit edebilmesine rağmen, bu atıkların organik fraksiyonunun uygun şekilde ayrılması, safsızlıkların sayısını mevzuat tarafından onaylanan bir seviyeye düşürebilir ya da tamamen ortadan kaldırılabilir.

Hayvan Gübresi Temelli Organik Atıklar

Hayvan gübresinin anaerobik fermantasyonu, karışımdaki toplam katıların azaltılması için etkili bir atık işleme seçeneğidir. Literatürde özellikle büyükbaş hayvanların tükettiği besinler besin içeriği açısından çimenden daha zengin olduğunda (örneğin mısır, soya fasulyesi) biyoreaktörde üretilen fermente çamurun daha besleyici bir gübre olduğu raporlanmıştır (Mendonça ve diğ., 2016). Bununla birlikte, Dünya Sağlık Örgütü (WHO) yönergelerine göre fermente çamurun sulama ve uygulama kısıtları nedeni ile hemen kullanılmayan fazla kısmının (özellikle atıksuyun) patojenlerin üreyip çevresel tehlike oluşturması nedeni ile arıtılması gerektiğini belirtmiştir (Castro ve diğ., 2017). Bununla birlikte küçükbaş, büyükbaş ya da kümes hayvanların yetişmesinde tıbbi ya da hızla geliştirme gibi amaçlar için kullanılan antibiyotiklerin, bu hayvanların bünyesinde %50-90 oranında emilmediği ve direkt olarak hayvan dışkısı (1-136 $mg/kg_{kurumadde}$) ile atılabildiği bilinmektedir. Bu nedenle bu tür ilaç kullanan hayvanların gübrelerinin AF proseslerinde substrat olarak kullanımının ekosistem sağlığını olumsuz etkileyebileceği bildirilmiştir (Nõlvak ve diğ., 2016). Bu durumda bu tür gübrelerin AF uygulanmadan kullanılması daha da sakıncalı olacaktır. Ayrıca bu tür gübrelerin toplandığı ahır, ağıl, kümes gibi merkezlerde sıvı ve katı atık ayrımı düzenli yapılmadığından gübre karışımına idrar da eklendiği için karışımın N oranı da artacaktır. Bu durumda hem biyoreaktörün işletilme şartları farklılık gösterecek hem de üretilen fermente çamurun karakteristik özelliklerine göre ekinleri yakmaması ya da azot emisyonlarına ihtimal vermemesi için seyreltilerek kullanılması ya da çeşitli ön işlemlerden geçirilmesi gerekecektir.

Çoklu Atık Temelli Karışımlar

Farklı türdeki substratların (meyve-sebze atıkları, endüstriyel atıklar, kâğıt atıkları, arıtma çamurları vb.) çoklu sistemlerde birlikte fermente edilmesi, anaerobik fermantasyondaki reaksiyonların stabilitesini arttırdığı gibi karışımdaki pH dengesi, optimum C/N oranı gibi birçok sistem işletme parametresinin de istenilen oranlarda sağlanması açısından avantajlı olduğundan günümüzde özellikle yüksek verimde biyogaz/metan üretiminde tercih edilmektedir ve anaerobik kofermantasyon adı ile tanımlanmaktadır. Tarımsal, bitkisel, endüstriyel ve hayvansal atıkların birlikte kofermantasyonu, toprağa uygulanmadan önce stabilizasyonları ve arıtımlarının yapıldığı durumlarda bile çevre için oldukça yararlıdır. Çünkü kirlilik etki dereceleri (hava, toprak ve su salınımları) azalır ve kimyasal bileşimleri AF mekanizması gereği bozunarak bitkiler tarafından özümsenebilecek şekile dönüştürülür (Nayal ve diğ., 2016). Anaerobik kofermantasyondan kaynaklanan fermente çamurun özellikleri, çeşitli substrat türlerinin içeriğine bağlıdır ve enerji dengesi de değişkendir (Morero ve diğ., 2017); bu nedenle anaerobik kofermantasyon ile üretilen fermente çamurun toprağa uygulanması toprağın, ekininin türüne göre genellenmemeli ve güncel olarak değerlendirilmelidir. Farklı substratların anaerobik fermantasyonu sonucu üretilen fermente çamurlara ait fizikokimyasal özelliklerin bazıları literatür verileri doğrultusunda Tablo 1'de verilmiştir.

Tablo 1. Anaerobik fermantasyon ile üretilen fermente çamurların bazı fizikokimyasal özellikleri

Substrat	Proses İşletme şartları	Toplam katı (%)	pH	Toplam organik karbon (mg/L)	N-NH_4^+ (mg/L)	P-P_2O_5 (mg/L)	K (mg/L)	Patojen miktarı	Kaynak
Domuz gübresi	Mezofilik	-	8,2	%0,3	2,0 (g/kg)	75,9 (mg/kg)	1127,0 (mg/kg)	-	(Jin ve diğ., 2022)
Büyükbaş gübresi	Mezofilik, Boru biyoreaktör HBS:35 gün	-	7,47	-	96	114	158	Fekal koliform $1,06\times10^6$ CFU/gTS	(Castro ve diğ., 2017)
Enerji bitkileri, büyükbaş gübresi ve tarımsal sanayi atıkları	Termofilik TKBR, HBS: 40 gün (çürütücü), 10 gün (AF sonrası)	0,35	8,7	277,86	79,07	18,83	-	-	(Pognani, ve diğ., 2009)
Pancar yaprağı ve diğer ekin atıkları	Mezofilik kesikli-beslemeli, karıştırıcılı biyoreaktör	6	7,4	-	78	24	252	-	(Gunnarsso ve diğ., 2011)
Büyükbaş gübresi ve tarım endüstrisi atıkları	Mezofilik, Endüstriyel ölçekli TKBR, HBS: 25 gün	9,01	7,5	3036,37	216,24	72,08	279,31	-	(Alburquerque ve diğ., 2012)
Yemek atıkları (ekmek, kırmızı et, meyve ve sebzeler)	Termofilik	17.1	4,4	-	3,50	3,81	5,44	-	(Rigby & Smith, 2013)
Domuz gübresi	Boru biyoreaktör HBS:60-75 gün	0,70	7,10	139,30	201,83	188,94	250,9	E. coli: $1,70\times 10^7$ MPN/mL Toplam Koliform: 1.70×10^8 MPN/mL	(Garfí ve diğ.,2011)

HBS: Hidrolik bekleme süresi, TKBR: Tam karışımlı biyoreaktör

FERMENTE ÇAMURUN TARIMDA GÜBRE OLARAK KULLANIMI

Anaerobik fermantasyon sonucunda oluşan fermente çamurlar organik ve inorganik besinlerden oluşur, bu nedenle toprağı zenginleştirebilir, yapısını ve emme kapasitesini geliştirebilir (Manasa ve diğ., 2020a; Manasa ve diğ., 2020b). Substrata bağlı besin maddelerinin yüksek içeriği nedeniyle, çürütücüler bitki gübrelemesinde başarıyla kullanılabilir ve mineral gübrelemeye tamamlayıcı veya alternatif olabilir. Bununla birlikte fermente çamur uygulamasının mahsul verimliliğini ve mahsul büyüme hızını arttırdığı da raporlanmıştır (Kataki ve diğ., 2019; Tshikalange ve diğ., 2020). Çeşitli fermente çamurların ekinler üzerindeki gelişim denemelerine ait analiz sonuçları Tablo 2'de verilmiştir.

Tablo 2. AF prosesi ile üretilen fermente çamurların ekinler üzerindeki gelişim denemelerine ait analiz sonuçları ((Samoraj ve diğ., 2022) alıntılanmıştır)

Fermente çamur içeriği	Uygulanan bitki ve uygulama koşulları	Uygulama sonuçları	Kaynak
Büyükbaş ve tavşan gübresi, Çam odunu biyokömürü	Çin kavunu, sera tarımı	Bitkilerin büyümesi, verimi, su kullanım etkinliği ve fotosentetik oranı üzerinde olumlu etkiler görülmüştür. Normal sulamada maksimum verimler, fermente çamur ile 218,87 t/ha ve biyokömür ile birleştirilmiş fermente çamur için 210,69-118,8 t/ha oranlarında elde edilmiştir.	(Elbashier, ve diğ., 2018)
Büyükbaş gübresi	Ispanak, tarla tarımı (N: 125 kg/ha)	İnorganik gübre ile gübrelenmiş gruplara göre bitki başına 479 g daha yüksek taze bitki ağırlığı elde edilmiştir (kontrol grubu için bitki başına 201 g).	(Tshikalange ve diğ., 2020)
Büyükbaş gübresi, pirinç küspesi ve biyokömürü	Mısır, çimlenme testleri ve saksı denemeleri, (N:120 kg/ha; P: 40 kg/ha; K: 40 kg/ Ha)	Bitki büyümesi ve verimi iyileşmiştir. Yüksek amonyak içeriği nedeniyle, fermente çamur uygulama zamanlaması ve yönteminin ayarlanması gerektiği belirtilmiştir. Mevcut makro besinlerin içeriği değişmiştir.	(Kataki ve diğ., 2019)
Gıda atıkları ve domuz gübresi	Çok yıllık çavdar otu (*Lolium perenne L.*) ve ak üçgül (*Trifolium repens L.*), sera tarımı (N: 113 kg/ha)	Daha yüksek verim ve yaprak alanı indeksi ile sonuçlanmıştır.	(Jurgutis ve diğ.,2021)
Mısır, tritikale silajı, büyükbaş gübresi ve üzüm sapları	Marul (*Lactuca sativa*), hidroponik kültür	Araştırmalar, katı çürütücünün topraksız mahsullerde standart yetiştirme ortamının yerini alabileceğini, sıvı çürütücünün ise topraksız mahsul sistemlerinde gübrenin yerini alabileceğini göstermiştir.	(Ronga ve diğ., 2019)

Fermente çamurlar, sebzeler, süs bitkileri ve çimenler gibi ürünlerin gübrelenmesi için uygundur ve fraksiyonlama olmadan (yarı katı formda) veya katı/sıvı fraksiyonlara ayrıldıktan sonra da kullanılabilirler. Fermente çamurun en yaygın kullanımı toprağa doğrudan ya da su ile seyreltilerek uygulanmasıdır. Bazı çalışmalarda ise fosfat tuzları gibi fermente çamur bileşenleri ekstrakte edilerek toprağa ya da hidroponik kültürlere uygulanmaktadır (Ehmann ve diğ., 2019). Fraksiyon seçimi, bitkinin gereksinimleri ve yetiştirme koşulları dikkate alınarak belirlenmelidir. Ayrıca, fermente çamurlar kullanılırken ağır metal içeriği, sıvı fraksiyonların tuzluluğu ve fitotoksisite indeksleri de dikkate alınmalıdır.

TARIMDA FERMENTE ÇAMUR KULLANIMINDA YASAL SINIRLAMALAR

Tarımsal alanlarda fermente çamur uygulamasına ilişkin yasal sınırlamalar ülkeler arasında değişkenlik göstermektedir ve ortak bir standart uygulama bulunmamaktadır. Almanya, fermente çamurların çoğu uygulamasına daha fazla ek işlem yapılmadan onay verirken, Hollanda biyolojik ve gıda temelli atıklarından elde edilen fermente çamurun doğrudan uygulanmasını yasaklamıştır.

Avusturya, İtalya, Kıbrıs, Litvanya, Portekiz ve Hollanda'da fermente çamur uygulamaları için yasal standartlar bulunmamaktadır (Foster & Prasad, 2021). Bununla birlikte, Birleşik Krallık- PAS 110; Almanya-biyoatıklardan ve yenilenebilir enerji bitkilerinden elde edilen atıklar için sırasıyla RAL GZ245 ve RAL GZ246'yı kalite standartları olarak belirlemiştir. Ayrıca İsveç, fermente çamurlar için SPCR 120 adlı gönüllü bir sertifika sistemini oluşturmuştur (Hans & Peter, 2013; Malhotra ve diğ., 2022).

Türkiye'de ise 10/10/2015 tarihli ve 29498 sayılı Resmî Gazete'de yayımlanan "*Mekanik Ayırma, Biyokurutma ve Biyometanizasyon Tesisleri ile Fermente Ürün Yönetimi Tebliği*" ve 23/02/2018 tarihli ve 30341 sayılı Resmî Gazete'de yayımlanan "*Tarımda Kullanılan Organik, Mineral ve Mikrobiyal Kaynaklı Gübrelere Dair Yönetmelik*" kapsamında belirlenen yasal sınırlamalar doğrultusunda değerlendirilmektedir. Fermente çamurların tarımsal uygulaması açısından bazı yasal standartlar Tablo 3'te verilmiştir.

Bununla birlikte Tablo 3'te yer alan parametrelere ek olarak fermente çamurlara ait ağır metal sınır değerleri de bulunmaktadır. Örneğin Türkiye'de insan ve çevre sağlığının korunması için toprağa uygulanacak fermente çamurların Cd, Cu, Ni, Pb, Zn, Hg, Cr ve Sn gibi ağır metallere ait sınır değerleri sırası ile 3, 450, 120, 150, 1100, 5, 350 ve 10 ppm (mg/kg) değerini geçmeyecek şekilde olması istenmektedir.

Ayrıca "*Tarımda Kullanılan Organik, Mineral ve Mikrobiyal Kaynaklı Gübrelere Dair Yönetmelik*" EK-1 kapsamında yer alan No:8'e göre "fermantasyon sonucu elde edilen organik gübreler" için organik madde en az %20 olarak belirlenirken No:9'a göre "fermantasyon sonucu elde edilen sıvı organik gübreler" için organik madde en az %2 olarak sınırlandırılmıştır ve ürünlerin piyasaya sunulması aşamasında etiket beyanında pH ve EC (iletkenlik) değerlerinin de yer alması istenmiştir.

Tablo 3. Fermente çamurların tarımsal uygulaması açısından bazı yasal standartlar

Ülke	EU	EU	UK	Almanya	İsveç	Türkiye * ve**	
Standart-Yönetmelik	End of waste criteria	ECN-QAS	PAS 110:2014	RAL GZ 245, RAL GZ 246	SPCR 120	Sıvı fermente çamur	Katı fermente çamur
Organik madde (%)	≥15	≥15	-	≥30	≥20	≥20 (kuru madde bazında)	>35(kuru madde bazında)
Patojen *Salmonella*	25 g'da yok	25 g'da yok	25 g'da yok	50 g'da yok	25 g'da yok	25 g'da yok	25 g'da yok
E. coli (CFU/g taze fermente çamur)	≤ 1000	-	≤ 1000	≤ 1000	≤ 1000	≤ 1000	Yok
İstenmeyen bitki tohumu (tohum/L)	≤ 2	≤ 2	-	≤ 2	≤ 2	≤ 2	< 5
Toplam cam, metal, plastik> 2 mm (%)	≤ 0,5	≤ 0,5	≤ 0,5	≤ 0,5	≤ 0,5	≤ 0,5	≤ 2
Kalıntı Biyogaz (L/g VS)	≤ 0,25	-	≤ 0,45	-	-	≤ 0,25	-

*Mekanik Ayırma, Biyokurutma ve Biyometanizasyon Tesisleri ile Fermente Ürün Yönetimi Tebliği
**Tarımda Kullanılan Organik, Mineral ve Mikrobiyal Kaynaklı Gübrelere Dair Yönetmelik

PİYASADA SATILAN ORGANİK GÜBRELER İLE FERMENTE ÇAMURLARIN KARŞILAŞTIRMASI

Bitki besin kaynağı olarak kullanılan ve tüketiciye sunulan organik gübreler genel olarak bitki, hayvan veya insan kaynaklı atık veya artıkları içermektedir. Günümüzde organik gübre piyasasında satışı gerçekleştirilen bazı gübreler ve içerikleri Tablo 4'te verilmiştir.

Tablo 4. Organik Gübre Piyasasında Satışı Gerçekleştirilen Bazı Gübreler ve İçerikleri

Parametre	Sıvı organik gübre markaları			Katı organik gübre markaları			Fermente Çamur (Häfner, Hartung, & Möller, 2022)		
	Complex	Higro	YeşilVadi Solucan	Biofarm	Ferbio	Ekobigsol	Silajlık mısır	Yemek Atığı	Büyükbaş gübresi
pH	4-6	4-6	7-8	6,8-8,8	8	6-8	7,8	7,9	7,4
Toplam Azot (Kjeldahl %)	3	1,2	0,26	2	2,1	2,2	8,79	16,42	6,08
Fosfor Penta Oksit (P_2O_5)	-	-	1,5	2	0,68	0,46	1,01	1,5	1,06
Suda Çözünür Potasyum(K_2O)	5	3,8	2,25	2	1,1	-	4,82	4,1	6

-Ürün etiketinde belirtilmemiş.

Tablo 4'te yer alan gübrelerin kullanım kılavuzları incelendiğinde genel olarak yaprakta kullanım için ortalama 350-450 kat arası su ile seyreltildikten sonra, toprakta damlama ile sulama için ise 300 kat seyreltildikten sonra dekar başına yaklaşık 3 L olacak şekilde kullanılması önerilmektedir. Çeşitli atıklardan elde edilen fermente çamurların N, P ve K gibi içeriklerinin, piyasada satılan diğer organik gübreler ile karşılaştırıldığında bitki besin maddeleri açısından oldukça rekabetçi olduğu gözlemlenmiştir. Bununla birlikte, fermente çamurların toprağa ve bitkiye yarayışlı olup olmadığını ve piyasada sıkça tercih edilen kimyasal gübreler ile yarışabilir nitelikte olup olmadığını net bir şekilde anlamak için laboratuvar ve pilot ölçekli saha çalışmalarının yapılması uygun olacaktır.

SONUÇ

Besin içeriği nedeniyle fermente çamurların bir organik gübre ya da toprak iyileştirici olarak kullanılması, çevre ve insan sağlığı üzerindeki doğrudan ve dolaylı negatif etkileri en aza indirmek ve biyogaz üretim tesislerinin ekonomik karlılığını artırmak için oldukça faydalı uygulamalardan biridir. Fermente çamurun bitki yetiştirme denemelerine ait literatür çalışmalarının birçoğunda bitkide bulunan besin maddelerinde ve mahsul veriminde artış gerçekleştiği belirtilmiştir. Bununla birlikte, fermente çamurun sürdürülebilir ve güvenli kullanımını sağlamak için yönetmelikler, standartlar, yaşam döngüsü analizi, çevresel etkiler, toksik madde içerikleri, patojen miktarı ve agronomik özellikler gibi pek çok değer ve sınırlandırma ölçütü de dikkate almalıdır. Gelecekteki çalışmalar, biyo-yararlı besin formlarını içeren organik-mineral gübre üretmek için fermente çamurların işleme yönteminin geliştirilmesine odaklanmalıdır. Bu şekilde elde edilen organik-mineral gübre ticarileşebilir ve fiyatları önemli ölçüde artan kimyasal ve mineral gübrelere uygun maliyetli ve çevreci bir alternatif sunabilir.

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LA VALORISATION DES ESPACES VERTS : UNE RESSOURCE INDISPENSABLE POUR LA BIODIVERSITE ET LE DEVELOPPEMENT DURABLE

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La présence d'espaces verts en ville est une vraie valeur ajoutée pour le milieu urbain. Compte tenu de la diversité des paysages du Maroc qui est illustrée par ses espaces verts qui comprennent multiples types tels que les parcs, les jardins, les squares, etc. tous plus caractéristiques les uns que les autres. Ces différentes formes de verdure assurent à chaque ville une continuité et proximité de l'élément naturel, une réduction de l'oppression des espaces construits et l'amélioration de la qualité du cadre de vie et du paysage urbain de la ville qui joue un rôle essentiel dans le concept du développement durable puisque la qualité de vie devient un bienfait d'une part pour le coté économique et d'autre part pour le développement touristique.

L'objectif de travail est de faire une analyse des espaces verts selon une démarche scientifique dans le but d'établir un état des lieux en matière d'aménagement des espaces verts.

La méthode adaptée pour cette étude faite à partir une analyse paysagère qu'est basée sur une observation in situ et une analyse des plans de représentations et de plantation, accompagnées d'une localisation, d'une couverture photographique, de mesures... toutes ces informations englobées s'appuient sur les sources d'archives, la bibliographie disponibles et les outils

cartographiques. En renforçant ce que déjà mentionné par un exemple sur le terrain qui illustre la méthodologie d'analyse adaptée. En effet, nous sommes penchés directement sur la ville d'Oujda. La ville riche en matière de jardins et de parcs : le Parc Lalla Aicha, le musée Lalla Meriem, le Parc Ecologique, la Place Syrte, l'Oasis Sidi Yahia en sont un exemple. Nous allons étudier les différents principes de compositions de l'un des espaces verts, en nous appuyant sur la méthodologie d'analyse paysagère qui font partie de l'art paysager. L'espace se construit selon des règles précises de perspectives et de composition pour comprendre les différents éléments architecturales, naturelles, et paysagères qui caractérisent le site tels que : les formes, les lignes, les reliefs, les limites visuelles, couverture du sol, etc. Ces éléments vont donner une structure à l'aménagement et leur action systémique va mener à la définition du style du jardin.

Cette méthodologie d'analyse vise valoriser les espaces verts consiste à engager des actions concrètes afin d'une part de faire prendre conscience de l'importance de ces espaces et d'autre part d'améliorer leur qualité afin de favoriser la biodiversité et une approche durable de la gestion des espaces verts pour préserver, et mettre en valeur cette richesse patrimoniale.

Mots clés : Analyse Paysagère, Biodiversité, Développement durable, Espace vert, Maroc, Paysage.

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ÖZET

Biber (Capsicum annuum) çeşitli iklim tiplerine hoşgörülü olmasına karşın genellikle en iyi gelişmeyi sıcak ve kuru iklimli yerlerde gösterir. Hasadı, biber uygun büyüklüğü aldığında, genellikle Haziran ayı sonu ve Temmuz ayı başlarından Ekim ayı ortalarına kadar yapılır. Haftada bir kere, toplamda ortalama 9-15 kez yapılmalıdır. Hasat, elle tek tek meyvelerin iki parmak arasına alınıp koparılarak bitkiden ayrılması ile yapılır. Biber hasadında, makinalı hasat yaygın bir uygulama değildir. Yaprak rengi ile meyve rengi aynı olduğundan seçici hasat açısından da tanımlanması zordur. Bu çalışma ile yetiştirildiği tarım alanında renginden dolayı seçilmesi ve toplanması vakit alabilen bir meyve olan biber meyvesinin hasadı üzerine bir makine öğrenimi çalışması gerçekleştirilmiştir. Derin öğrenme metodu için YOLOv5 (nano) kullanılmıştır.Oluşturan modelin tüm metrik değerleri incelenmiştir. En başarılı model YOLOv5n algoritmasıyla, 640x640 boyutundaki görsellerin 30 Batch, 120 Epoch ile eğitilmiş model olduğu görülmüştür. Model değerleri sonuçları “metrics/precision”, “metrics/recall”, “metrics/mAP_0.5” ve “metrics/mAP_0.5:0.95” olarak incelenmiştir. Bunlar, bir modelin tespit başarısını ölçen anahtar metriklerdir ve ilgili modelin doğrulama veri kümesinde gösterdiği performansı belirtmektedir. “YOLOv5 nano” modelinin metrik verilerinin diğer modellerle kıyaslandığında daha yüksek olduğu tespit edilmiştir. Ölçülen değer Model 1: Size: 640x640, Batch: 30, Epoch: 120, Algorithm: YOLOv5n ‘dur. Buradan “Model 1” ‘in robotik biber hasadında biberin dal ile ayrılmasında kullanılacak en iyi tespit modeli olduğu anlaşılmıştır. Model değerleri sonuçları “metrics/precision”, “metrics/recall”, “metrics/mAP_0.5” ve “metrics/mAP_0.5:0.95” olarak incelenmiştir. Bunlar, bir modelin

tespit başarısını ölçen anahtar metriklerdir ve ilgili modelin doğrulama veri kümesinde gösterdiği performansı belirtmektedir. “YOLOv5 nano” modelinin metrik verilerinin diğer modellerle kıyaslandığında daha yüksek olduğu tespit edilmiştir. Ölçülen değer Model 1: Size: 640x640, Batch: 30, Epoch: 120, Algorithm: YOLOv5n ‘dur. Buradan “Model 1” ‘in robotik biber hasadında biberin dal ile ayrılmasında kullanılacak en iyi tespit modeli olduğu anlaşılmıştır.

Anahtar kelimeler:Biber,hasat,derin öğrenme,YOLOV5n

ABSTRACT

Pepper (Capsicum annuum) is tolerant of various climate types, but generally does best in It thrives in hot and dry climates. Harvest when the pepper has reached the appropriate size, usually from late June and early July to mid-October. It should be done once a week, 9-15 times in total. Harvesting is done manually by picking the individual fruits between two fingers and separating them from the plant. Machine harvesting is not a common practice in pepper harvesting. Since the leaf color and fruit color are the same, it is difficult to identify in terms of selective harvesting. In this study, a machine learning study was carried out on the harvesting of pepper fruit, which is a fruit that can take time to select and collect due to its color in the agricultural area where it is grown. YOLOv5 (nano) was used for the deep learning method and all metric values of the model were analyzed. The most successful model was the model trained with the YOLOv5n algorithm with 30 Batches and 120 Epochs for 640x640 images. The results of the model values were analyzed as "metrics/precision", "metrics/recall", "metrics/mAP_0.5" and "metrics/mAP_0.5:0.95". These are key metrics that measure the detection success of a model and indicate the performance of that model on the validation dataset. The metric data of the "YOLOv5 nano" model was found to be higher compared to the other models. The measured value is Model 1: Size: 640x640, Batch: 30, Epoch: 120, Algorithm: YOLOv5n. From this, it is understood that "Model 1" is the best detection model to be used in robotic pepper harvesting to separate the pepper from the branch. The results of the model values are "metrics/precision", "metrics/recall", "metrics/mAP_0.5" and "metrics/mAP_0.5:0.95". These are key metrics that measure the detection success of a model and indicate the performance of that model on the validation dataset. The metric data of the "YOLOv5 nano" model was found to be higher compared to the other models. The measured value is Model 1: Size: 640x640, Batch: 30, Epoch: 120, Algorithm: YOLOv5n. From this, it is understood that "Model 1" is the best detection model to be used in robotic pepper harvesting for separating the pepper from the branch.

Keywords: Pepper,harvesting,Deep learning,cucumber,YOLOv5n

1.Giriş

Derin öğrenme, yapay zekâ alanında kullanılan bir öğrenme yöntemidir. Bu yöntem, insan beyninin çalışma biçimine benzer bir şekilde veri üzerinde otomatik olarak öğrenme ve karar verme yeteneği kazandırmak amacıyla tasarlanmıştır. Derin öğrenme, yapay sinir ağlarının çok katmanlı yapısını kullanarak büyük miktardaki verilerden örüntüler ve

ilişkiler çıkarabilen bir makine öğrenme tekniğidir. Derin öğrenme, genellikle evrişimli sinir ağları (convolutional neural networks - CNN), rekürrent sinir ağları (recurrent neural networks - RNN) ve derin birleştirme ağları (deep belief networks - DBN) gibi derin mimariler kullanır. Bu mimariler, birçok ardışık katmandan oluşur ve her katman, verinin farklı özelliklerini temsil eder. İlk katman, düşük seviyeli özellikleri (örneğin kenarlar veya şekiller) algılarken, daha sonraki katmanlar daha yüksek seviyeli özelliklere (örneğin yüzler veya nesneler) odaklanır.Derin öğrenme, birçok alanda etkileyici sonuçlar vermiştir. Görüntü ve ses tanıma, doğal dil işleme, oyun oynama, otomatik sürüş ve sağlık alanında tıbbi teşhis gibi birçok uygulama derin öğrenme tekniklerini kullanır. Ayrıca birçok alanda kullanılan derin öğrenme tarım sektöründe de bir çığır açmıştır. Bitki hastalığı tanıma,hasat tahmini, otomatik yabani ot tespiti ve su kaynakları yönetimi tarımsal uygulamalara örnek olarak gösterilebilinir.

Bu konuda birçok çalışma yapılmış ve yapılmaya devam etmektedir. Gholipoor M. ve ark (2019) yılında yaptıkları yapay sinir ağı kullanarak biberde meyve verimi tahmini adlı çalışmalarında 692 yerli genotipin tohumlarını ekerek tahmin çalışması yapmışlardır. Çalışmada verim tahmini sonucu olarak 8:10:1 mimarisine sahip YSA'nın en yüksek doğruluğu elde ettiğini (R2=0.97) bulmuşlardır. Bir başka çalışmada Subeesh A. ve ark(2022) de yaptıkları serada yetiştirilen dolmalık biberlerde yabancı ot tespiti için derin evrişimli sinir ağı modelleri adlı çalışmada Inception3 modelinin yabancı ot tespitinde kullanılabileceğini elde ettikleri verilere dayanarak kullanılabilecek yöntem olduğunu tespit etmişlerdir. Almadhoun H.R.(2021) yılnda yaptığı çalışmada derin öğrenme kullanarak dolmalık biber sınıflandırması yapmıştır. Çalışmada eğitim için 1243 görüntü, doğrulama için 533 görüntü ve test için 592 görüntü kullanmış.Oluşturduğu modelin test sonucunda %100 doğruluk elde etmiştir. Mohammed A.A. ve ark(2022) yılında yaptıkları derin öğrenme kullanarak biber sınıflandırması çalışmalarında görüntü tanımada yaygın olarak uygulanan bir derin öğrenme tekniğini kullanmışlardır. Oluşturdukları model sonucu eğitilen modelin test setinde %100 doğruluk elde etmişlerdir. Ropelewska E. ve ark.(2022) yılında yaptıkları çalışmalarında Lakto-fermantasyon sonucu dolmalık biberde oluşan değişikliklerin tespitini makine öğrenmesi ve görüntü özelliklerini kullanarak yapmışlardır. Geliştirdikleri modeller için en yüksek ortalama sınıflandırma doğruluğu %99'a ulaşmışlardır. Mustafa H. ve ark.(2022) yılında yapay sinir ağlarını kullanarak dolmalık biber yaprak hastalıklarının tespiti ve sınıflandırılması yapmışlardır. CNN modelini daha iyi eğitmek için,20.000 artırılmış görüntü üretilmişlerdir. Deneysel sonuçlar önerilen yöntemin optimize edilmiş-CNN modeli, biber bitkisi yaprağının sağlıklı veya bakteriyel olduğunu %99,99 oranında tahmin edebilir doğrululukla bulmuşlardır.

Bu çalışmada derin öğrenme modeli olarak YOLOv5 seçilmiştir. Yolov5, nesne tespiti ve sınıflandırma için kullanılan bir derin öğrenme modelidir. Model, görüntülerdeki nesneleri algılamak ve sınıflandırmak için kullanılır. Yolov5 modeli, konvolüsyonel sinir ağları (CNN) tabanlı bir mimari kullanır. Görüntüler önce bir dizi konvolüsyonel ve aktivasyon katmanından geçirilir. Ardından, tespit yapılacak olan nesnelerin farklı boyutlarına ve özelliklerine uyum sağlamak için ölçeklendirilirler.Model, daha sonra görüntülerdeki nesne sınırlayıcı kutularını (bounding box) tahmin etmek için özel bir yapıya sahip olan "tahmin yapıcıları" (predictors) kullanır. Her bir tahmin yapıcısı, belirli bir ölçek ve konumda nesneleri tespit etmek için tasarlanmıştır. Bu tahmin yapıcıları, ağın farklı ölçeklerdeki nesneleri algılamasını sağlar.Tahmin yapıcıları, her bir sınıf için olasılık değerleri üretir ve nesneleri farklı sınıflara sınıflandırır. Bu sayede, bir görüntüdeki birden çok nesne tespit edilebilir ve her bir nesne için doğru sınıf etiketi ve sınırlayıcı kutu tahminleri elde edilir. Yolov5 modeli, Python dilinde PyTorch kütüphanesi kullanılarak

uygulanabilir ve eğitim verileriyle eğitilerek özelleştirilebilir. Modelin temel özellikleri olan hızlı tespit, sınıflandırma ve çeşitli boyutlardaki nesnelerin algılanması, onu popüler bir nesne tespiti modeli haline getirir.

2.Materyal ve Yöntemler

Derin öğrenmenin hasat uygulamalarında olan biber hasadında derin öğrenme yöntemleri kullanmak için, biberlerin görüntülerini ve diğer ilgili verileri kullanarak bir derin öğrenme modeli oluşturmanız gerekmektedir. Öncelikle biber hasadıyla ilgili bir veri seti oluşturmanız gerekmektedir. Bu veri seti, biberlerin fotoğraflarını, büyüme aşamalarını, hastalıkları veya zararlıları gibi diğer ilgili verileri içermelidir. Sonraki adım topladığınız veri setini etiketlememizdir. Bu sayede modelin doğru şekilde öğrenmesini sağlar. Veri ön işleme yapılması gerekmektedir. Ön işleme gereksiz gürültüyü kaldırmak ve verileri uygun bir formata dönüştürmek için yapılması gereken adımları içerir. En uygun derin öğrenme modelin seçimi ve oluşturulması bu adımlardan en önemlisidir. Burada model girdi katmanı, evrişim katmanları, birleştirme katmanları, tam bağlantılı katmanlar ve çıkış katmanı gibi bileşenleri içermelidir. Bir sonraki adım modelin eğitilmesidir. Modeli eğitmek için, veri setinizi eğitim ve doğrulama setlerine ayırmamız gerekmektedir. Eğitim seti, modelin öğrenme sürecinde kullanılacak verileri içerirken, doğrulama seti, modelin performansını değerlendirmek için kullanılacaktır. Model değerlendirme ve ayarlama bir sonraki adımdır. Bu adımda eğitim süreci tamamlandıktan sonra, modelin performansını değerlendirmek için test veri seti kullanılır. Modelin doğruluk, hassasiyet veya diğer performans metriklerine göre nasıl performans gösterdiğini değerlendirebiliriz. Modelin performansını iyileştirmek için hiperparametreleri ayarlayabilir veya model mimarisini değiştirebiliriz.En son adım tahminler ve uygulamadır. Eğitilmiş modeli kullanarak, biber hasadı sırasında yeni verileri tahmin etmek veya sınıflandırmak için kullanabiliriz. Model, biberlerin olgunluk seviyelerini belirlemek veya hastalık teşhisi yapmak gibi görevleri gerçekleştirebilir.

Biber hem dünyada hem de ülkemizde sevilerek tüketilen, içeriğindeki zengin mineral ve vitaminleri bakımından insan beslenmesine katkısı olan bir sebze türüdür. Dünya'da biber hem yetiştiricilik bakımından hem de işleme sanayiye yönelik olarak büyük bir ihracat ve ithalat potansiyeline ulaşmıştır. Ülkemizde Ege, Marmara, Akdeniz, Güneydoğu Anadolu ve Karadeniz biber üretim bölgelerinin başında gelmektedir. Biber Solanaceae familyasında ve Capsicum cinsi içinde yer almaktadır. Capsicum iki ana tür grubuna sahiptir ve Capsicum annuum tek yıllık Capsicum frutescens ise tropik bölgelerde çok yıllık yetiştirildiği belirtilmektedir En çok tüketimi yapılan tür Capsicum annuum L.'dur (Eşiyok 2012, Demirkaya ve Gerçek, 2013, Şahiner 2019).

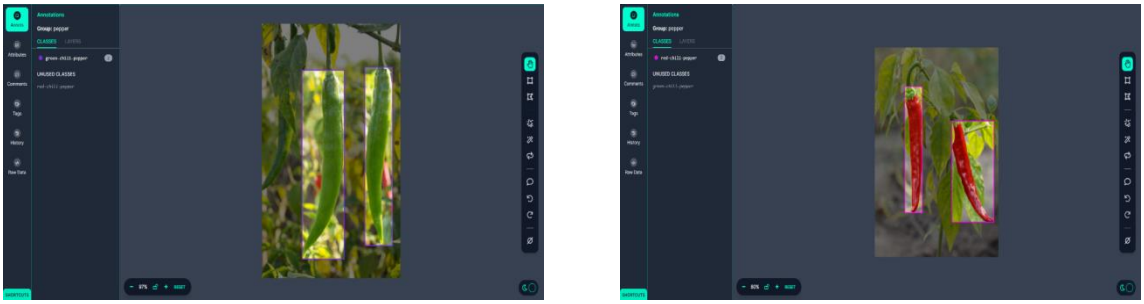
Meyvesi yenen sebzeler grubunda olan biber çiçek biyolojisine göre az oranda yabancı tozlanma görülen bir türdür. Meyveler, meyve et kalınlıkları ve renkleri bakımından oldukça fazla çeşitlilik gösterirler. Meyve et kalınlığı 1-2 mm ile 4-6 mm arasında olabilmektedir. Biber, meyve şekline göre sivri, çarliston, yağlık, dolmalık, süs ve domates biber olarak gruplandırılırken, tadına göre tatlı, az acı ve acı olarak gruplandırılabilmektedir. Biberler optimum 20-25°C sıcaklıklarda iyi yetişmektedir. Toprak özellikleri bakımından fazla seçici olmayan biberler % 65-70 nem bulunan, pH' sı 6,0-6,5 olan toprak reaksiyonunda en iyi neticeyi vermektedir (Vural ve ark. 2000, Bozokalfa, 2009. , Özalp 2010)

Veri Setinin Hazırlanması:

Proje kapsamında nesne tespiti ve analizi hedeflenen biber meyvesinin veri setini hazırlarken, sera ve tarlada çekilmiş hasat fotoğrafları kullanılmıştır. Biber, yeşil ve kırmızı biber olarak çeşitlenen bir meyve olduğu için, elde edilen fotoğraflarda iki çeşit bibere rastlamak mümkündür. Hasat esnasında ve yetişme sırasında bağında çekilmiş pek çok biber görseli toplanmıştır. Elde edilen görseller arasında, yapmış olduğumuz proje kapsamında değerlendiremeyeceğimiz görseller elenmiştir. Yapacağımız nesne tespit çalışması için sağlıklı olacak 47 adet görsel belirlenmiştir. Ayrıca her bir görselde birden fazla biber bulunabilmektedir.

Etiketleme:

Bir nesne tespiti modelinin, bir veri seti üzerinde eğitim gerçekleştirebilmesi için, tespit edilmesi hedeflenen nesnelerin eğitileceği veri setinde etiketlenmiş/imzalanmış olması gerekmektedir. Bu sebeple 47 görselin her birinde biber görüntüsünü içeren kısımların sınırlayıcı kutu alanı ile işaretlenmesi ve ait olduğu nesne sınıfı olan "yeşil biber veya kırmızı biber" sınıfına atanması gerekmektedir. Görsel etiketlemesi yapmak için, açık kaynak topluluklarında çok sayıda program, internet sitesi ve yardımcı araç bulunmaktadır. Bu araçlardan bir tanesi ise, nesne tespiti projelerinde sıklıkla kullanılan, popüler bir web sitesi olan Roboflow'dur. Roboflow, ham görüntüleri özel olarak eğitilmiş bir bilgisayar görme modeline dönüştürmek ve onu uygulamalarda kullanmak üzere dağıtmak için gereken tüm araçları sağlayan; görüntüler üzerinde alan seçimleri, işaretlemeleri ve sınıf etiketlemeleri yapılmasını sağlayan bir web sitesidir. Bu işaretleme ve etiketleme işlemi, sitenin sahip olduğu grafiksel kullanıcı arayüzü aracılığıyla kolaylıkla yapılmaktadır. Şekil 1'de Label (Etiket) ekranı gösterilmiştir.



Şekil 1.Label Ekranı

Açılan görsel arayüzün sol ve sağ kısımları kullanılarak, programın genel işlevleri yerine getirilmektedir. Açılan görüntünün işaretlemesi, sağdaki menüden "Bounding Box Tool" seçeneği ile aktifleşen işaretleme aracı ile yapılmaktadır. Araç ile ilgili nesnenin sınırlayıcı kutu (Bounding Box) alanının belirlenmesinin ardından, belirtilen nesnenin sınıf adının etiketlenmesi gerekmektedir. Projemiz dahilinde, bu sınıf adlarını "green chili pepper ve red chili pepper" olarak belirledik. İlgili nesne tespit modelinin eğitimi bu görüntülerle yapılacağından dolayı, seçim işleminin nesneyi içeren şekliyle doğru bir biçimde yapılması gerekmektedir. Seçim ve etiketleme işleminin ardından, ana menü kısmındaki "generate" sekmesinden yapılan işaretlemelerin çıktı formatı seçilmelidir. Proje kapsamında, kullanılacak modele uygun olan YOLO seçeneği seçilmiştir. Tüm bu işlemlerin ardından görüntü işlenerek otomatik kaydedilebilmektedir.

Eğitim Model Seçimi:

Yapmış olduğumuz projede, CNN yöntemiyle geliştirilmiş YOLO model ailesinin açık kaynak olarak geliştirilen YOLOv5 ailesi tercih edilmiştir. RCNN benzeri iki aşamalı ağ kullanan modellere göre oldukça avantaja sahip olan YOLO model ailesinin YOLOv5 modeli, kendisinden önce geliştirilmiş sürümlere doğruluk değerleri ve hız oranı açısından avantaj sağladığı için tercih edilmiştir. Üst bölümlerde detaylıca açıklandığı üzere, YOLOv5 modeli de kendi içerisinde modeller barındırmaktadır. YOLOv5n (nano) modeli derin öğrenme eğitimi için tercih edilmiştir.

Eğitimin Başlatılması:

Biber tespiti yapacak olan modelin eğitiminin başlatılması için, YOLOv5 modelinin bilgisayardaki konumuna gidildi ve burada bir Python çalıştırıcı editör açıldı. Ana dizinde bulunan ve YOLOv5 eğitimini sağlayan train.py programı, çalıştırılmak üzere kontrol edildi. Bu Python programının çalıştırılması, çeşitli parametreler ile özelleştirilebilmektedir.

Proje dahilinde, biber meyvesi için aşağıda yazılı olan kod içerisindeki parametreler ve düzenlemeler tercih edildi.

python train.py --img 640 --batch 30 --epochs 120 --data dataset.yaml --weights yolov5n.pt

--img: Eğitimi yapılacak görsellerin YOLOv5 modeli tarafından düşürüleceği piksel boyutu. Varsayılan değeri 640x640 olarak belirlenmektedir ve burada da bu şekilde seçilmiştir.

--batch: Modeli eğitirken, ekran kartı tarafından bir seferde kullanılacak veri noktası paketi sayısıdır.

--epochs: Modelin eğitimi yapılırken, tüm eğitim verilerinin eğitilen ağa gösterilme, ağırlıkların güncellenmesı sayısıdır.

--data: Veri setini içeren dosyanın genel yol ve sınıf bilgisini içeren .yaml dosyasının yoludur.

--weights: Modelin eğitiminde kullanılacak eğitim katsayılarını içeren ağırlık dosyasının konumudur.

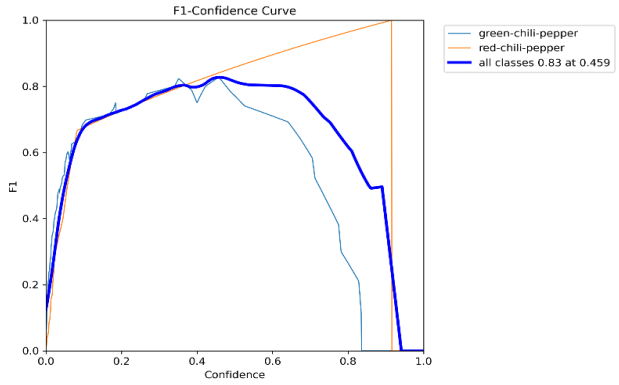
Bu kod satırlarının doğru şekilde çalıştırılması sonucunda, modellerin eğitim işlemi başlamıştır. Program, öncelikle YOLOv5 dosyalarını kontrol edip, herhangi bir güncelleme durumunu kontrol etmektedir. Ardından, belirlenen döngü sayısı (epoch) boyunca eğitim işlemi yapılmaktadır.

TARTIŞMA VE SONUÇLAR

Size: 640x640, Batch: 30, Epoch: 120, Algorithm: YOLOv5n algoritmasının sonuçlarının hata matrisi metriklerine göre incelenmesi ve sonuç değerleri;

F1 Score Analizi

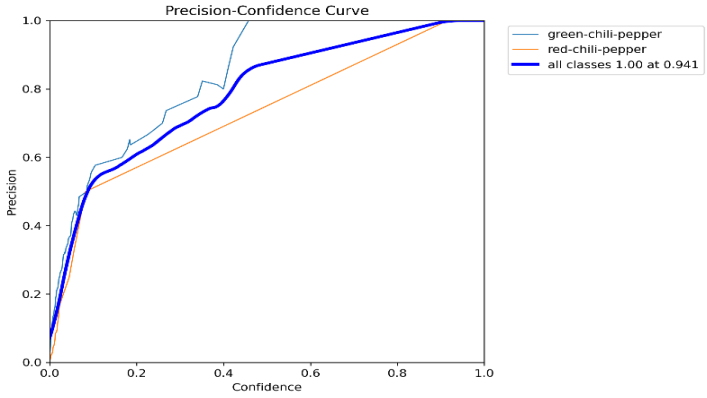
Bu analizde, YOLOv5 NANO modeli kullanılarak gerçekleştirilen nesne tespiti projesinde elde edilen F1 Score değerlerinin analizi yapılmıştır. F1 Score, modelin precision ve recall değerlerinin harmonik ortalaması olarak hesaplanır ve modelin genel performansını ölçmekte kullanılır. Grafikte, epoch sayısı ile F1 Score değerleri arasındaki ilişki gösterilmektedir. Epoch sayısı arttıkça, F1 Score değerlerinde genel bir artış trendi gözlemlenmektedir. Bu durum, modelin zamanla daha iyi performans gösterdiğini ve nesneleri daha doğru bir şekilde tespit etmeye başladığını gösterir.Ayrıca F1 Score değerinin ilk başlarda hızlı bir artış gösterdiği, ancak daha sonra yavaşça arttığı gözlemlenmektedir. Bu, modelin başlangıçta hızlı bir öğrenme sürecinden geçtiğini, ancak eğitimin ilerleyen aşamalarında performansının daha yavaş bir şekilde geliştiğini gösterir. Görsel analizine göre, model zaman içinde daha iyi performans göstermeye başlamıştır. F1 Score değerleri genel olarak artış göstermektedir, bu da modelin nesneleri daha doğru bir şekilde tespit edebildiğini gösterir.Şekil 2 ‘de analiz grafiği gösterilmiştir.



Şekil 2. F1 score analiz grafiği

Precision Analizi

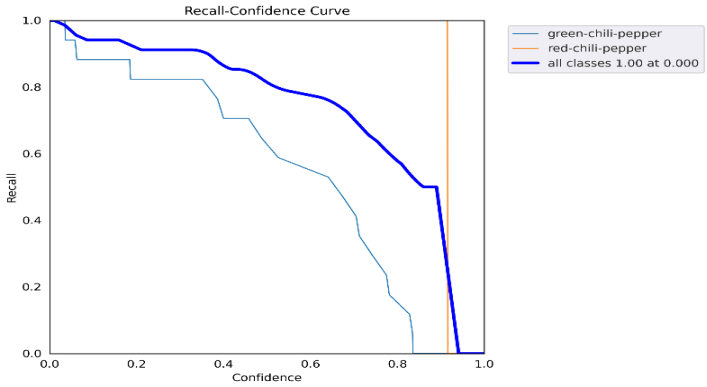
Bu analizde, YOLOv5 NANO modeli kullanılarak gerçekleştirilen nesne tespiti projesinde elde edilen Precision değerlerinin analizi yapılmıştır.. Precision, doğru pozitif tespitlerin, doğru pozitif tespitlerle yanlış pozitif tespitlerin toplamına oranıdır ve modelin doğruluk performansını ölçmekte kullanılır. Grafikte, epoch sayısı ile Precision değerleri arasındaki ilişki gösterilmektedir. Epoch sayısı arttıkça, Precision değerlerinde genel bir artış trendi gözlemlenmektedir. Bu durum, modelin zamanla daha doğru tespitler yapmaya başladığını gösterir.Precision değerinin ilk başlarda hızlı bir artış gösterdiği, ancak daha sonra daha stabilize bir artış göstermeye başladığı gözlemlenmektedir. Bu, modelin başlangıçta hızlı bir öğrenme sürecinden geçtiğini, ancak eğitimin ilerleyen aşamalarında performansının daha stabil bir şekilde geliştiğini gösterir.Görsel analizine göre, model zaman içinde daha doğru tespitler yapmaya başlamıştır. Precision değerleri genel olarak artış göstermektedir, bu da modelin doğru tespitler yapma yeteneğinin geliştiğini gösterir. Şekil 3 ‘de analizde kullanılan grafik gösterilmiştir.



Şekil 3. Precision analiz grafiği

Recall Analizi

Bu analizde,YOLOv5 NANO modeli kullanılarak gerçekleştirilen nesne tespiti projesinde elde edilen Recall değerlerinin analizi yapılmıştır. Recall, doğru pozitif tespitlerin, doğru pozitif tespitlerle yanlış negatif tespitlerin toplamına oranıdır ve modelin kapsayıcılık performansını ölçmekte kullanılır. Grafikte, epoch sayısı ile Recall değerleri arasındaki ilişki gösterilmektedir. Epoch sayısı arttıkça, Recall değerlerinde genel bir artış trendi gözlemlenmektedir. Bu durum, modelin zamanla daha fazla doğru pozitif tespit yapmaya başladığını gösterir. Recall değerinin ilk başlarda hızlı bir artış gösterdiği, ancak daha sonra yavaşça arttığı gözlemlenmektedir. Bu, modelin başlangıçta hızlı bir öğrenme sürecinden geçtiğini, ancak eğitimin ilerleyen aşamalarında performansının daha yavaş bir şekilde geliştiğini gösterir.Görsel analizine göre, model zaman içinde daha fazla doğru pozitif tespit yapmaya başlamıştır. Recall değerleri genel olarak artış göstermektedir, bu da modelin kapsayıcılık performansının geliştiğini gösterir. Şekil 4'de Recall analiz grafiği verilmiştir.

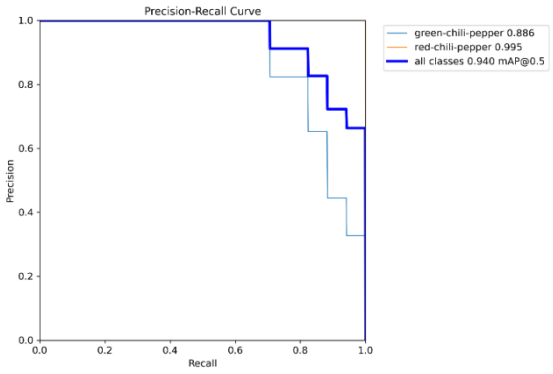


Şekil 4.Recall Analiz Grafiği

Precision-Recall Analizi

Bu analizde, YOLOv5 NANO modeli kullanılarak gerçekleştirilen nesne tespiti projesinde elde edilen Precision ve Recall değerlerinin analizi yapılmıştır. Precision ve Recall, bir modelin doğruluk ve kapsayıcılık açısından ne kadar iyi performans gösterdiğini ölçen metriklerdir. Grafikte, Precision değerleri yatay eksende ve Recall değerleri dikey eksende

gösterilmektedir. Her bir nokta, modelin farklı bir eşik değeri için Precision ve Recall değerlerini gösterir. Grafiğin sağ üst köşesine doğru uzanan eğri, modelin performansının ideal olmasına yakın olduğunu gösterir. Modelin yüksek bir Recall değeri için makul bir Precision değeri sağladığı görülmektedir. Bu, modelin tespit ettiği nesnelerin çoğunun doğru olduğu ve aynı zamanda olması gereken nesnelerin büyük bir kısmını tespit ettiği anlamına gelir. Precision-Recall grafiği, modelin genel performansını değerlendirmede önemlidir ve modelin nesne tespiti için hangi eşik değerlerinin kullanılması gerektiğine dair fikirler sunabilir. Bu değerlerin ölçülmesine göre YOLOv5 nano modeli en iyi performansı verdiği görülmektedir. Dolayısıyla, model seçimimizde, kullanılabilir kaynaklar ve uygulamanın gereksinimleri arasında bir denge olmalıdır. Buradan bir uygulamanın gerçek zamanlı çalışması gerekiyorsa ve kaynaklar sınırlıysa, biraz daha düşük performansla daha hafif bir modellemelerden olan YOLOv5 Nano'un kullanılmasının daha uygun olacağı anlaşılmaktadır.Şekil 5 'de Precision-Recall analizinde kullanılan grafik gösterilmiştir.



Şekil 5.Precision-Recall Analiz Grafiği

Eğitimde Kullanılan Veri Seti:

Şekil 6 ve 7 'de modellerin eğitilmesi sırasında kullanılan eğitim setinden görüntüler gösterilmiştir.

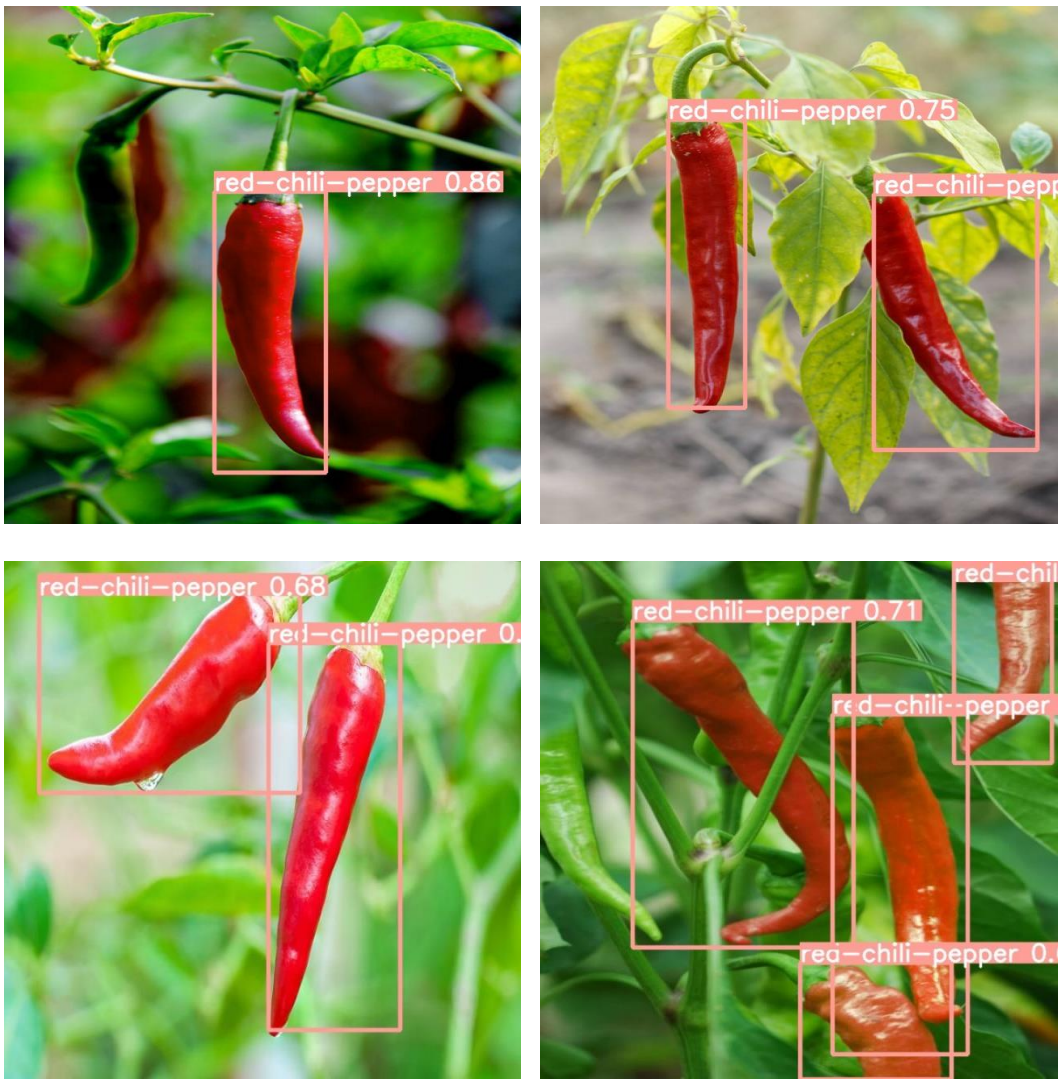
Şekil 6.Modellerin eğitilmesi sırasında kullanılan eğitim setinden görüntüler (yeşil biber)

Şekil 7.Modellerin eğitilmesi sırasında kullanılan eğitim setinden görüntüler (kırmızı biber)

Eğitim Sonucu:

Şekil 8 ve 9'da **m**odellerin eğitimlerinin sonucunda ortaya çıkan "Validation Batch" tahmin işaretlemeler gösterilmiştir.

Şekil 8.Modellerin eğitimlerinin sonucunda ortaya çıkan “Validation Batch” tahmin işaretlemeleri(yeşil biber)



Şekil 9.Modellerin eğitimlerinin sonucunda ortaya çıkan "Validation Batch" tahmin işaretlemeleri (kırmızı biber)

Modelin eğitiminin tamamlanmasıyla ortaya çıkan, her epoch sonunda bir sütun eklenerek oluşturulmuş detaylandırılmış istatistikler değerler Tablo 1'de verilmiştir.

(Özetlendirme amacıyla, modelin eğitiminden sadece ilk 3 ve son 3 epoch gösterilmiştir.)

Tablo1. 640x640, Batch: 30, Epoch: 120, Algorithm: YOLOv5n

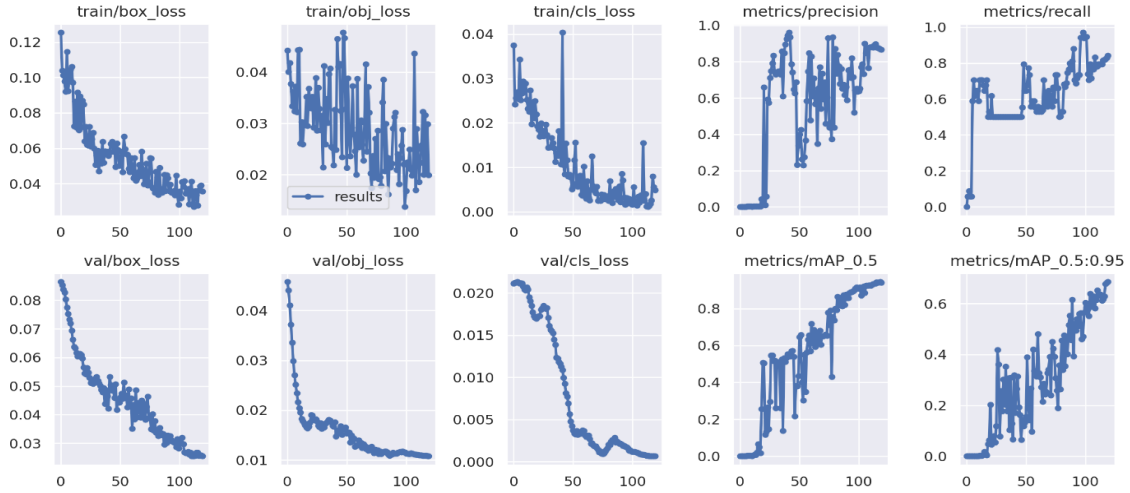
epoch	0	1	2		117	118	119
train/box_loss	0.125	0.10404	0.10133	..	0.03866	0.03913	0.03559
train/obj_loss	0.044	0.04001	0.04181	..	0.02023	0.02988	0.01991
train/cls_loss	0.037	0.02420	0.02560	..	0.00800	0.00560	0.00486
metrics/precisio	0	0.00086	0.00128	..	0.87378	0.86975	0.86586
metrics/recall	0	0.05882	0.08823	..	0.82221	0.83073	0.84293
	0	0.00074	0.00094	..	0.94344	0.94533	0.94064
metrics/mAP_0.	0	0.00074	0.00094	..	0.67778	0.68306	0.68639
val/box_loss	0.086	0.08528	0.08382	..	0.02575	0.02579	0.02551
val/obj_loss	0.045	0.04407	0.04108	..	0.01083	0.01076	0.01080
val/cls_loss	0.021	0.02122	0.02124	..	0.00065	0.00067	0.00067
x/lr0	0.099	0.09729	0.09549	..	0.00043	0.00034	0.00026
x/lr1	0.000	0.00029	0.00049	..	0.00043	0.00034	0.00026
x/lr2	0.000	0.00029	0.00049	..	0.00043	0.00034	0.00026

Bu araştırmada YOLOv5 NANO modeli kullanılarak gerçekleştirilen bir nesne tespiti eğitim sürecinin analizi yapılmaktadır. Toplam 120 epoch üzerinden gerçekleştirilen eğitim süreci değerlendirilmiş ve modelin performans metrikleri incelenmiştir.

Kayıp Fonksiyonları (Loss Function)

Eğitim sürecinin başlangıcında, 'train/box_loss', 'train/obj_loss' ve 'train/cls_loss' değerleri yüksektir. Epoch sayısı arttıkça bu değerler azalmaktadır, bu durum modelin eğitim setinde öğrenme yaptığını göstermektedir. Ayrıca, 'val/box_loss', 'val/obj_loss' ve

‘val/cls_loss’ değerlerinde de düşüş gözlemlenmiştir. Bu durum, modelin doğrulama setinde iyi bir genelleme yapabildiğini işaret etmektedir.Şekil 10 ‘da Loss Function grafik değerleri verilmiştir.



Şekil 10.Loss Function grafik değerleri

Precision, Recall ve mAP Değerleri

Modelin ‘metrics/precision’, ‘metrics/recall’, ‘metrics/mAP_0.5’ ve ‘metrics/mAP_0.5:0.95’ değerleri epoch sayısı arttıkça artış göstermektedir. Son epochta, precision yaklaşık %86, recall %84, mAP_0.5 yaklaşık %94 ve mAP_0.5:0.95 yaklaşık %69 olarak ölçülmüştür. Bu değerler, modelin doğrulama setinde nesneleri yüksek doğrulukla tespit edebildiğini ve sınıflandırabildiğini göstermektedir.

Öğrenme Oranı (Learning Rate)

Eğitim sürecinde, ‘x/lr0’, ‘x/lr1’, ve ‘x/lr2’ değerleri zamanla azalmaktadır. Öğrenme oranının azaltılması, modelin eğitim sürecinin sonlarında daha iyi bir yerelleşme yapmasına yardımcı olabilir.

Sonuç

YOLOv5 Nano modeli ve hazırlanan veri seti ile yapılan örnek eğitim ve doğrulama görsellerindeki nesne tespiti doğrulukları incelenmiştir. Modellerin nesne tespit başarılarını belirten metrik verileri ve doğruluk tahmin oranları incelendiğinde, modelin eğitim sonucunun başarılı olduğu doğrulanmıştır. Fakat farklı büyüklükteki ve çeşitlilikteki veri kümeleri üzerinde çalışıldığında veya eğitim algoritmalarına bağlı hiperparametreler ve genel çalışma parametreleri üzerinde değişiklik yapıldığında veya nesne tespit başarısından ziyade hız performansı odaklı bir başarı sıralaması yapıldığında bu sonuçların değişebileceği göz önünde bulundurulmalıdır. İlk epochlar boyunca, eğitim ve doğrulama kayıpları hızlı bir şekilde azalmış ve metriklerde de belirgin bir gelişme görülmüştür. Precision, recall ve mAP değerleri daha yüksek seviyelerde başlamış ve sürekli olarak artmıştır. YOLOv5n iyi bir başlangıç performansı sergilediğini göstermektedir.Son epochlar boyunca, eğitim kaybı ve doğrulama kaybı sürekli olarak azalmış ve en düşük seviyelere ulaşmıştır. Metriklerdeki gelişme de devam etmiştir. Bu nedenle YOLOv5n araştırma için en iyi eğitim olduğu anlaşılmıştır.

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TÜRKİYE'NİN MUŞ İLİNDE YETİŞTİRİLEN TIBBİ ADAÇAYI (*Salvia officinalis* L.) VE ANADOLU ADAÇAYI (*Salvia fruticosa* MİLL.)'İN UÇUCU YAĞLARININ BİLEŞENLERİNİN BELİRLENMESİ

DETERMINATION OF THE ESSENTIAL OILS COMPOSITION OF MEDICINAL SAGE (*Salvia officinalis* L.) AND ANATOLIAN SAGE (*Salvia fruticosa* MILL.) CULTIVATED IN MUŞ PROVINCE OF TÜRKİYE

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ÖZET

Türkiye'nin Muş koşullarında 2019-2020 yıllarında yetiştirilen Tıbbi Adaçayı (*Salvia officinalis* L.) ve Anadolu Adaçayı (*Salvia fruticosa* Mill.)'in uçucu yağ bileşenlerinin belirlenmesi ve karşılaştırılması amacı ile yürütülen bu çalışmada ikinci yıl tam çiçeklenme döneminde hasat edilen bitkilerin kuru yapraklarında Clevenger hidrodistilasyon yöntemiyle uçucu yağlar elde edildi. Uçucu yağ verimleri *Salvia officinalis* L.'de %1.13, *Salvia fruticosa* Mill'de ise %1.33 ve olarak saptandı. Uçucu yağların ana bileşenleri *Salvia officinalis* L.'de epimanaol (% 38.65), veridoflorol (% 11.81), carvacrol (% 6.94), linalool (% 6.27), α-thujone (% 5.80), borneol (% 5.38) ve α-humulene (% 5.01) iken *Salvia fruticosa* Mill'de 1,8 cineole (% 33.81), bornanone (% 19.94), phenol (% 5.37), endo-borneol (% 5.06), β-caryophyllene (% 4.83), linalool (% 4.77), veridoflorol (% 4.26) olarak tespit edildi. Uçucu yağda bileşen sayısı tıbbi adaçayında 20, Anadolu adaçayında ise 21 olarak belirlendi.

Anahtar Kelimler: Adaçayı, *Salvia* sp., uçucu yağ bileşenleri, uçucu yağ verimi.

ABSTRACT

In this study carried out with the aim of determining and comparing the essential oil components of Medicinal Sage (*Salvia officinalis* L.) and Anatolian Sage (*Salvia fruticosa* Mill.) grown in Muş conditions of Türkiye in 2019-2020, essential oils were obtained by Clevenger hydrodistillation method from the dry leaves of the plants harvested during the full flowering period in the second year. Essential oil yields were determined as 1.13% and 1.33% in *Salvia officinalis* L. and *Salvia fruticosa* Mill, respectively. The main components of essential oil are determined as epimanaol (38.65%), veridofluorol (11.81%), carvacrol (6.94), linalool (6.27%), α-thujone (5.80%), borneol (5.38%) and α-

humulene (5.01%) in *Salvia officinalis* L., 1.8 cineole (33.81%), bornanone (19.94%), phenol (5.37%), endo-borneol (5.06%), β-caryophyllene (4.83), linalool (4.77%), and veridofluorol (4.26%) in *Salvia fruticosa* Mill. The number of components in the essential oil was found to be 20 in Medicinal Sage and 21 in Anatolian Sage.

Keywords: Sage, *Salvia* sp., essential oil components, essential oil rate.

GİRİŞ

Ülkemizde Adaçayı olarak bilinen *Salvia* sp.'nin dünyada yaklaşık 900 taksonu bulunmaktadır. *Salvia* cinsinin dünyada ticari değere sahip olan türleri başta *Salvia officinalis* L. ve *Salvia fruticosa* Mill. (Syn. *Salvia triloba* L.), olmak üzere *Salvia pomifera* L., *Salvia lavandulaefolia* Vahl. ve *Salvia sclarea* L. türleridir. Türkiye'de üretilen adaçaylarının tamamı *Salvia officinalis* ve *Salvia fruticosa* Mill.'dir. Dünyada ticareti yapılanlar genelde doğadan toplanan adaçaylarıdır. Tıbbi adaçayı ve Anadolu adaçayı için en önemli üretici ülkeler Arnavutluk ve Hırvatistan'dır (Anonim, 2020b).

Salvia cinsi Türkiye'de 51 tanesi endemik olmak üzere 97 tür (İpek ve Gürbüz, 2010; Şenkal ve ark., 2012), 4 alttür ve 8 varyete ile toplamda 109 taksona sahiptir. Bu taksonların çoğunluğu %59.7'si İran-Turan fitocoğrafik bölgesinde, %27.8'si Akdeniz, %5'i Avrupa-Sibirya bölgelerinde mevcut iken, %7'si tüm bölgelerde görülmektedir (Doğan ve ark., 2008; Davis,1982; İpek ve Gürbüz, 2010; Karayel, 2019; Nakipoğlu, 1993; Seçmen ve ark., 2000; Şenkal ve ark., 2012).

Adaçayının Türkiye'de 2020 yılında 1.750 ton ihracatı yapılmış olup bunun karşılığında 7.366.450 $ gelir elde edilmiştir. Söz konusu türde ithalatımız aynı yıl içerisinde 1.116 ton karşılığında 2.801.491 $ olarak kayıtlara geçmiştir (Anonim, 2020a). Türkiye'de 2022 yılında ise 12.781 dekar alanda 2356 ton adaçayı üretimi yapılmıştır. En fazla adaçayı üretimi yapılan iller sırası ile Denizli, Uşak, Antalya, Sakarya, Muğla, Burdur, Balıkesir ve Konya'dır (Anonim, 2023).

Adaçayı halk tıbbında gaz giderici, yatıştırıcı, iştah açıcı, diüretik, midevi, öksürük kesici, bronşit ve astıma karşı solunum yolu rahatsızlıklarında, ağrı kesici, soğuk algınlığı ve enfeksiyonlara karşı bağışıklık sitemini güçlendirici, antiseptik, ter kesici ve haricen yara iyileştirici olarak kullanılır (Arslan, 2014; Bayram, 2001; Küpeli ve ark., 2007). Adaçayı türlerinin ayrıca farmakolojide antibakteriyal, antiviral, antifungal, antiseptik, antioksidan, analjezik, astrenjan, antispazmodik, halusinojenik, antidepresan, antidiyabetik, tüberkülostatik, antisudorifik, kardiyovasküler, antikanser ve insektisit aktiviteler gibi çok çeşitli biyolojik etkilere sahip oldukları bildirilmektedir (Baytop, 1999; Ceylan, 1987; Şenkal ve ark., 2012).

Salvia officinalis yaprakları %0.5-2.5 arasında uçucu yağ içerir. Uçucu yağda ana bileşenler α-thuyon ve β-thujone, 1,8-sineol ve kamfor bileşenleridir. Uçucu yağda α-thujone %1-45, β-thujone %1-40 ve kamfor %0.4-44 arasında bulunur (Başyiğit ve Baydar, 2017; Giannouli ve Kintzios, 2000).

Uluslararası ISO 9909 (1997) kalite standartlarına göre *Salvia officinalis* L. uçucu yağının bileşenlerinde α-thujone %18.0-43.0, β- thujone %3.0-8.5, kamfor %4.5-24.5, 1,8-sineol %5.5- 13.0, kamfen %1.5-7.0, α-pinen %1.0-6.5, α-humulen %12.0, limonen %0.5-3.0, bornil asetat %2.5 ve linalol+linalil asetat %1.0 seviyelerinde olması gerektiği bildirilmiştir (Anonim, 1997).

Tıbbi adaçayı yaprakların gümüşi renge sahip olması, uçucu yağ oranının %1.5'ten fazla olması, uçucu yağda α-thuyon ve β-thujone oranlarının yüksek, kafur (kamfor) oranının düşük olması ticari değerini artırmaktadır (Putievski et al., 1986a; Putievski et al., 1986b). Tıbbi adaçayı uçucu yağında bulunan thuyon insanlarda toksik etkiye sahip olmakla birlikte (Höld et al., 2000) kaliteli bir tıbbi adaçayı yağında % 50'den fazla thuyon (α+β), %20'den daha az oranda kafur olması istenmektedir (Raal et al., 2007).

Tıbbi adaçayında farklı hasat zamanlarında yapılan bir çalışmada uçucu yağ kompozisyonunu oluşturan ana bileşenlerden α-thujone (%15.72-26.26), β-thujone (% 4.51-27.67), 1,8-sineol (%11,93-31.87), ve kamfor (% 3.65-23.02) seviyelerinde olduğunu, ilkbahar aylarında 1,8- sineol ve kamfor oranlarının düşük, α-β-thujone oranlarının daha yüksek olduğunu belirtmişlerdir (Başyiğit ve Baydar, 2017).

Tıbbi adaçayı bitkilerinden klon seleksiyonu ile geliştirilmiş örneklerde uçucu yağ içeriğini %0.60-2.53, uçucu yağ bileşenlerinden α-thujone (%0.8–53.2), β-thujone (%0.7–54.7), 1.8-sineol (%1.0–34.0) ve kafur (%0.4–29.2)'un arasında değişim gösterdiği belirlenmiştir (Karakuş ve ark., 2017).

Tıbbi adaçayı yaprağının uçucu yağında temel bileşenleri α-thujone (%31.82), 1.8-cineole (% 14.39), camphor (% 12.05) ve β-thujone (% 8.55) olarak belirtilmiştir. Türün uçucu yağ bileşenlerinin terpenler yönünden zengin olduğu belirlenmiştir. Bu bileşenlerden viridiflorol antienflamatuar, antioksidan etki gösterirken (Trevizan ve ark., 2016) thujone bileşeninin, antimutajenik, antibakteriyel etkiye sahip olduğu bildirilmiştir (Baydar, 2005). Bu bileşenlerin farmakolojik olarak eldesinde viridiflorol için bitki tohumu, thujone bileşeni için ise tıbbi adaçayının yapraklarının kullanılması gerektiği vurgulanmıştır (Karayel, 2019).

Türk Baydır ve ark., (2021) Afyonkarahisar'da yetiştirdikleri tıbbi adaçayında uçucu yağ ana bileşenlerini α-thujone (% 19.89), camphor (% 15.72), borneol), 1,8-cineole (% 12.06) olarak bildirmişlerdir.

Tıbbi Adaçayında Çukurova Bölgesi'nde yapılan bir çalışmada uçucu yağ verimi %1.73-4.80 arasında, yağdaki ana bileşenler cineol (% 12.67), campher (% 16.69) ve thujon (% 10.69) olarak belirlenmiştir (Kırıcı ve ark., 1995). Bu durum farklı çalışmalarda değişiklik göstermiştir. Yenikalaycı ve Özgüven (1999) yaptıkları çalışmada farklı lokasyonlardan toplanan *Salvia officinalis* L. türünün yapraklarındaki uçucu yağ veriminin %1-2.23, yağ bileşenlerinin ise thujon (%8.09-15.26), cineol (% 27.81-38.94), α-pinen (% 0-4.48), sabinen (%2.40-7.88), β-Pinen (%10.27-22.01), camphor (% 0-27.19), borneol (% 0-7.22), bornylacetat (% 0-13.20), β-caryophyllen (% 0-8.39) olarak saptamışlardır.

Girit Adası'nda 34 farklı *Salvia fruticosa* Mill.'in dağılımının incelendiği çalışmada; uçucu yağ oranları %1-5.5) arasında tespit edilmiş, uçucu yağ miktarının adanın doğusuna doğru gittikçe azaldığı, batı kısmındaki Samaria ve Sitia bölgelerin de ise arttığı saptanmıştır (Karousou ve Kokkini 1997).

Isparta yöresinde doğadan toplanan Anadolu adaçayının % 1.95 uçucu yağ oranına sahip olduğu olduğunu, uçucu yağda ana bileşenleri 1,8-cineole % 19.57, borneol % 12.59, β-selinene % 9.91, geranyl acetate % 7.79, β-cububene % 5.77, camphor % 6.44, α-pinene % 5.43, β-pinene % 3.94, thujone % 2.85 olarak bildirmişlerdir (Baydar ve ark. 1999).

Türkiye'de adaçayı türlerini uçucu yağlardaki esas bileşenlere göre sınıflandırdıkları çalışmalarında Anadolu adaçayının 1,8 cineole/camphor grubunda yer aldığını, uçucu yağ oranının % 0.9-2.8 arasında değiştiğini, uçucu yağın bileşenlerinin büyük bir kısmının1,8-cineole (% 35-51) ve camphor (% 7-13)'dan oluştuğunu belirtmişlerdir (Başer 2002; Başer ve Kırımer 2006).

Salvia fruticosa Mill.'de hasat yılı ve zamanına göre uçucu yağ oranının % 1.0 ile % 3.8 arasında değiştiğini ve esas bileşenin 1,8-cineole olduğu, camphor, thujone, ve β-caryophyllenenin bunu izlediğini belirtmişlerdir (Aşkun ve ark. 2010; Karakaya ve El 1999; Lu ve Leap 2002; Papageorgiou ve ark. 2008).

Salvia fruticosa'da farklı azot seviyesi (100, 150 ve 200 mg/L) ile hazırlanan besin çözeltisinde yapılan çalışmalarında toplam 79 bileşik tanımlandığını, tam çiçekleneme ve tohum oluşum dönemi sonunda alınan örneklerde 1,8-cineole (% 22-26), β - caryophyllene (% 0.25-13) ve viridiflorol (% 7-38)'un ana bileşen olduğu, 13-epimanoolun (% 4-25)'nun ise *Salvia* cinsinde ilk kez tanımlandığını bildirilmiştir (Karioti ve ark., 2003).

Marmara Bölgesi'nde bulunan *Salvia fruticosa* Mill. genotiplerinin verim ve kalitesi üzerine yaptıkları çalışmada uçucu yağ verimini % 2.53–4.34 arasında, uçucu yağdaki esas bileşenleri 1.8-cineole % 23.2-37.3, camphor % 8.1-29.1 ve β-caryophyllene % 2.8-14.8 seviyesinde bulmuşlardır (Karık ve Sağlam, 2017).

Tıbbi adaçayı ve Anadolu adaçayı türlerinin uçucu yağ analizlerinde iki türün ortak bileşenlerin α ve β-thujone (% 27.36), camphor (% 11.25), 1,8- cineole (% 6.72), 1-octen-3-ol (% 8.5) olduğunu tespit etmişlerdir (Radulescu ve ark. 2004).

Adaçayı uçucu yağının antimikrobiyal ve antioksidan etkisinin çok güçlü olması içerdiği 1,8-cineole, α-thujone, β-thujone ve kafur bileşenlerinden kaynaklanmaktadır (Baricevic and Bartol 2000). *Salvia officinalis* L. uçucu yağ oranlarının ve bileşenlerinin genetik ve çevre faktörlerine (Perry et al., 1999; Stefkov et al., 2011), yetiştirildiği yerin iklim ve yükseltisine (Kargiolaki et al., 1994), yetiştirilme koşulları, gelişme dönemi, biçim zamanı ve bitki kısımlarına (Putievski et al. 1986a, b; 1992), hasat zamanı, kurutma şekli ve uygulamalarına (Erbaş ve Baydar, 2007) göre değiştiği vurgulanmıştır. (Karakuş ve ark., 2017).

Salvia fruticosa Akdeniz iklimine sahip garig ya da maki ekosisteminde, yayılış gösterebilen, boyu 160 cm'ye kadar boylanabilen, ilkbaharda mart-mayıs aylarında çiçeklenen ve 0-1350 m arasındaki rakımlarda gelişen bir bitkidir (Papageorgiou ve ark., 2008; Elmas ve Elmas, 2021). *Salvia officinalis* L. ise 25-110 cm boyunda, yarı çalımsı, saçak köklü, çok yıllık bir bitkidir. Toprak üstü çok dallanır. Dalları dört köşelidir. Yaprak rengi beyazımsı griden gümüş rengine kadar değişmektedir. Yaprakların tüylü olması, bitkinin kurak bölgelere adapte olmasını sağlamaktadır. Çiçekler hermafrodittir. Çiçeklenme zamanı mayıs ve temmuz aylarıdır. Tohum rengi, koyu kahverengiden siyaha kadar değişip, küçük beyaz renkli hilum bulunmaktadır. (Ceylan, (1987). Adriyatik Denizi'nde ve Dalmaçya'da kayalık güneşli ve çorak yamaçlarda doğal olarak yetişir (Karaaslan, 1994; Koç, 2006).

Tıbbi Adaçayı (*Salvia officinalis* L.) ve Anadolu Adaçayı (*Salvia fruticosa* Mill.)'in farklı coğrafik bölgelere uyumu, uçucu yağ bileşenlerinin ve kalite özelliklerinin belirlenmesi yanında bu türlerin ticari olarak Muş ve çevresinde üretilebilme potansiyellerinin araştırılması amacı ile bu çalışma yapılmıştır.

MATERYAL VE YÖNTEM

Çalışmada kullanılan *Salvia officinalis* L. ve *Salvia fruticosa* Mill. tohumları Ege Tarımsal Araştırma Enstitüsü Müdürlüğü'nden temin edilmiştir.

Tohumlar 2019 yılı mart ayı içerisinde Muş Lalesi Uygulama ve Araştırma Merkezi Müdürlüğü serasına ekilmişlerdir. Yetiştirilen fideler 25 Mayıs tarihinde gözlem parsellerine dikilmiştir. Dekara 8 kg/da saf azot ve fosfor uygulaması yapılmıştır. Bitkiler 20x40 cm sıklıkta dikilmiştir. Bitkilerde ilk yıl çiçeklenme olmadığı için hasat yapılmamıştır. İkinci yıl haziran ayı içerisinde bitkiler tam çiçeklenme döneminde 15 cm yüksekten biçilmiştir. Bitkiler gölgede kurutulmuştur. Kurutulan yaprak örneklerinden su buharı distilasyonu (Clevenger Apareyi) yöntemi ile uçucu yağ oranları volumetrik olarak (ml/100 g) tayin edilmiştir.

Bitkilerin kuru yaprak örneklerinden elde edilen uçucu yağlarının bileşen analizi GC/MS (Gas chromatography/Mass spectrometry) cihazı ile tespit edilmiştir.

BULGULAR VE TARTIŞMA

Muş koşullarında 2019-2020 yıllarında yetiştirilen *Salvia officinalis* L. ve *Salvia fruticosa* Mill.'in uçucu yağlarının bileşenleri Tablo 1'de verilmiştir.

Tablo 1'de görüldüğü gibi *Salvia officinalis* L.'de kuru yaprakta uçucu yağ verimi % 1.13 seviyesinde bulunmuştur. Uçucu yağda ana bileşenler epimanaol % 38.65, veridoflorol % 11.81, carvacrol % 6.94, linalool % 6.27, α-thujone % 5,80, borneol % 5.38 ve α-humulene % 5.01 olarak tespit edilmiştir. Tıbbi adaçayında önemli olan α-β thujone oranı ISO 9909 (Anonim, 1997)'a göre düşük çıkmıştır. α-thujone bileşiğinde elde edilen değerler (Başyiğit ve Baydar, 2017; Giannouli ve Kintzios, 2000; Karakuş ve ark., 2017; Kırıcı ve ark., 1995; Yenikalaycı ve Özgüven, 1999) önceki çalışma bulguları ile uyumlu, bazı araştırıcıların (Baydar, 2005; Baydar ve ark., 2021; Trevizan ve ark., 2016) bulgularına göre düşük çıkmıştır. *Salvia officinalis* L.'de epimanool ana bileşen olarak tespit edilmesi pek rastlanılan bir durum değildir, bu durum çalışmada kullanılan *Salvia officinalis* L. bitkilerinin saf olmamasından kaynaklanabilir.

Tablo 1. *Salvia officinalis* L. ve *Salvia fruticosa* Mill.'in Uçucu Yağlarının Bileşenleri

	***Salvia officinalis* L.**			***Salvia fruticosa* Mill.**		
Sıra No	**RT**	**Bileşen adı**	**Miktarı (%)**	**RT**	**Bileşen adı**	**Miktarı (%)**
1	9.824	Dimethyl sulfone	2.87	8.205	Methane, sulfinylbis	3.40
2	12.387	α-Thujone	5.80	9.343	Dimethyl Sulfoxide	0.74
3	13.515	Linalool	6.27	9.481	1,8-Cineole	33.81
4	15.729	Borneol	5.38	12.113	α-Thujone	1.07
5	16.490	α-Terpineol	2.78	12.525	Linalol	4.77
6	16.702	Myrtenol	0.66	13.703	Bornanone	19.94
7	18.493	Geranıol	1.47	15.065	endo-Borneol	5.06
8	19.265	α-Fenchyl acetate	3.04	15.941	α-Terpineol	3.92
9	19.792	Thymol	0.91	16.175	Myrtenol	0.56
10	20.106	Carvacrol	6.94	17.978	Linalyl Acetate	2.58
11	23.076	Geranyl acetate	0.97	19.156	Bornyl acetate	2.35
12	24.501	β-Caryophyllene	2.93	19.912	Phenol,	5.37
13	25.817	α-Humulene	5.01	24.466	β-Caryophyllene	4.83
14	31.270	Veridiflorol	11.81	25.788	α-Humulene	2.69
15	31.945	Cryptone	1.51	30.858	Caryophyllene oxide	1.46
16	32.855	cis-Z-α-Bisabolene epoxide	1.06	31.224	Veridiflorol	4.26
17	33.833	β-Pinene	0.58	31.922	3-Cyclohexen-1-carboxaldehyde	0.86
18	34.365	1-Propanone	0.41	33.221	α-Guaiene	0.40
19	48.636	Epimanool	38.65	33.833	1-Propanone	0.58
20	49.603	Dimethoxy-1-naphthol	0.95	34.354	Vinyl 2-chloroethyl ether	0.70
21				48.533	Epimanool	0.64
30		**Toplam**	**100**		**Toplam**	**100**
31		**Uçucu yağ oranı (%)**	**1.13**		**Uçucu yağ oranı (%)**	**1.33**

Salvia fruticosa Mill.'in kuru yaprakta uçucu yağ verimi % 1.33 ve ana bileşenleri 1,8 cineole % 33.81, bornanone % 19.94, phenol % 5.37, endo-borneol % 5.06, β-caryophyllene % 4.83, linalool % 4.77, veridoflorol % 4.26 düzeyinde bulunmuştur. Anadolu adaçayının en önemli bileşenini oluşturan 1,8 cineole ile ilgili bulgularımız bazı araştırıcıların (Başer, 2002; Başer ve Kırımer, 2006; Karık ve Sağlam, 2017; Karık ve Sağlam, 2018) bulguları ile uyumlu, bazı araştırıcıların (Baydar ve ark., 1999; Karioti ve ark., 2003) bulgularına göre ise yüksek tespit edilmiştir. Aşkun ve ark., (2010)'nın bildirdiği değerlere göre ise düşük çıkmıştır.

Uçucu yağda bileşen sayısı tıbbi adaçayında 20, Anadolu adaçayında 21 olarak tespit edilmiştir.

Her iki türün tespit edilen uçucu yağ oranları bazı araştırıcıların belirttiği (Aşkun ve ark., 2010; Başer, 2002; Başer ve Kırımer, 2006; Başyiğit ve Baydar, 2017; Karakuş ve ark., 2017; Ceylan, 1996; Giannouli ve Kintzios, 2000; Karakaya ve El 1999; Karousou ve Kokkini, 1997; Lu ve Foo 2002; Papageorgiou ve ark. 2008) değerleri ile uyumlu, bazı araştırıcıların bulgularına göre ise (Aşkun ve ark., 2010; Baydar ve ark., 1999; Karık ve Sağlam, 2017; Karık ve Sağlam, 2018; Kırıcı ve Ark., 1995; Yenikalaycı ve Özgüven, 1999) bir miktar düşük çıkmıştır.

Adaçayında uçucu yağ bileşenleri sayısı ve oranları çok farklı değişkenler tarafından etkilenmektedir. Genetik ve çevre (Perry et al., 1999; Stefkov et al., 2011) iklim ve yükselti (Kargiolaki et al., 1994), (Kargiolaki et al., 1994), yetiştirme tekniği, gelişme dönemleri, kullanılan bitki organları ile biçim zamanları (Putievski et al. 1986a, b; 1992), hasat zamanı ve kurutma şekline (Erbaş ve Baydar, 2007) göre değiştiği araştırıcılar tarafından bildirilmiştir (Karakuş ve ark., 2017).

SONUÇ

Muş'ta yetiştirilen Tıbbi Adaçayı (*Salvia officinalis* L.) ve Anadolu Adaçayı (*Salvia fruticosa* Mill.)'in kuru yapraklarında uçucu yağ verimleri birbirine yakın bulunmuştur. Uçucu yağda ana bileşenler her iki türde de birbirinden çok farklı olmakla birlikte, uçucu yağdaki bileşen sayısı birbirine çok yakın olmuştur. *Salvia fruticosa* Mill.'in bazı bitkilerinde aşırı kış soğuklarından dolayı ikinci yıl kurumalar görülmüştür, Tıbbi adaçayında ise böyle bir durum gözlenmemiştir.

Muş koşullarında *Salvia officinalis* L.'de ilaç sanayinin istediği standartlarda uçucu yağ oranı %1,5 üzerinde, α/β-thujon oranları yüksek ve kafur (kamfor) oranı düşük ISO 9909 (Anonim, 1997)'a kalite standartlarına uygun bitki geliştirmek için farklı genetik kaynaklar getirilerek seleksiyon ıslahı ile uygun çeşitlerin geliştirilmesi ya da mevcut ıslah edilen saf hat ve çeşitlere yönelmek daha uygun olabilir.

Anadolu Adaçayı (*Salvia fruticosa* Mill.)'de Muş koşullarına sert kış şartlarına uygun çeşit ve hatlar getirilerek adaptasyon, verim ve ıslah çalışmaları ile ilaç sanayinin istediği kalitede ürün yetiştirilmesi mümkün olabilir.

Yazar Katkıları: Yazarlar eşit oranda katkı yapmışlardır.

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A SURVEY ON THE MACRO-ELEMENT CONTENTS OF HYLOCEREUS OCAMPONIS AND HYLOCEREUS POLYRHIZUS

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ABSTRACT

Dragon fruit (*Hylocereus* sp.), also known as pitaya, is a tropical fruit belonging to the Cactaceae family. The fruit skin is thick, red, pink or yellow in color, the flesh can vary from white to purple and contains small black seeds. In this study, the sodium (Na), calcium (Ca), potassium (K) and magnesium (Mg) contents of Valdivia Roja (*Hylocereus ocamponis*) and Bloody Mary (*Hylocereus polyrhizus*) varieties of dragon fruits obtained from a pitaya farm in Mersin were investigated and the obtained data were evaluated according to the varieties. The Na, Ca, K and Mg analyses were determined by the wet acid digestion methods after the fruit samples, which were properly obtained from the farm, were dried in an oven at 70 °C for 48 hours until they reached a constant weight. Macro element contents of dragon fruits were analyzed using ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometer Perkin Elmer Optima 7000 DV) instrument. Macro element contents were calculated, and statistical analysis of the data was performed using SPSS version 22 (IBM SPSS Statistics for Windows, Armonk, NY). The Na, Ca, K and Mg (ppm) contents of the dragon fruits showed statistically significant differences ($P < 0.01$). It was determined that the Na and Ca contents of Valdivia Roja were higher than those of Bloody Mary variety. It was determined that the K and Mg contents of Bloody Mary were higher than those of Valdivia Roja variety. The concentrations of the obtained elements are quite variable in the different varieties. In conclusion, it was determined that the macro element contents changed significantly in terms of varieties.

Keywords: Calcium, Sodium, Potassium, Magnesium, Dragon Fruit, Macro Elements.

OXIDATIVE STRESS INDEX IN CALVES WITH ASCARIDIOSIS (TOXOCARA VITULORUM)

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ABSTRACT

Ascaridiosis is a parasitic infection that occurs in the small intestines of all mammals except for sheep and goats. This disease, caused by *Toxocara vitulorum*, is primarily observed in cattle, particularly in young calves, and leads to significant economic losses. The objective of this study was to investigate the oxidative stress parameters [total oxidant capacity (TOC), total antioxidant capacity (TAC), and oxidative stress index (OSI)] in calves affected by ascaridiosis. For this purpose, a total of 30 Swiss Brown breed calves were used, including 10 clinically healthy calves (1-3 months of age) as the control group and 20 ascardiosis infected calves of different sexes. Blood samples were collected from the *V. jugularis*, to obtain serum for biochemical analyses. The results of the analyses revealed increased levels of TOC and OSI, while TAC levels showed a decrease in calves infected with ascaridiosis. As a result, it was concluded that antioxidant interventions may prove beneficial in mitigating oxidative stress in calves affected by ascaridiosis.

Keywords: Ascaridiosis, Calf, TOC, TAC, OSI

INTRODUCTION

Ascaridiosis is a parasitic infection that develops in the small intestines of all mammals except sheep and goats (Özcel 2013). This disease caused by *Toxocara vitulorum* is seen in cattle (especially young calves) and causes serious economic losses. Catarrhal enteritis, diarrhea, growth retardation are the main findings in this disease. Larvae migrate during the development of the parasite, causing local necrosis in the liver and lung, and inflammation and eosinophilia are seen in the regional lymph nodes. Diagnosis is based on clinical symptoms and microscopic findings. In addition, a large number of parasites are observed in the intestines in the necropsy performed on infected animals (Radostits 1994).

Under normal conditions, oxidants and antioxidants, which are in balance in the organism, deteriorate in favor of oxidants in cases such as inflammation, infection and stress, causing oxidative stress. Molecules that prevent cell damage by preventing the formation of free radicals that cause oxidative stress or scavenging existing radicals are defined as antioxidants (Karabulut and Gülay 2016). Studies have reported that total oxidant (TOC) and total antioxidant capacity (TAC) or oxidative stress index (OSI) can be changed in case of inflammation or infection and can be used as a marker (Celi and Gabai 2015). In the light of the above information, our aim in the study is to determine the oxidative stress parameters (TOC, TAC and OSI) in calves with ascaridiosis.

MATERIAL AND METHOD

In the study, 10 clinically healthy calves (1-3 months old), 20 different sexes and a total of 30 Swiss Brown breed calves with ascaridiosis were used as the control group. After routine clinical examination of the calves, general samples were taken from the rectum of the calves. Stool samples were brought to the laboratory on the same day and examined for *Toxocara vitulorum* eggs using the fulleborn flotation method. The control group was formed from animals with the same care and feeding conditions and no parasitic infections. Blood was collected from the *Vena jugularis* of the animals into tubes without anticoagulant. TOC and TAC levels were measured with commercial test kits (Rel Assay Diagnostics, Türkiye). It was calculated using the formula OSI (Arbitrary Unit) = [TOC (mmol Trolox equivalent/L) / 10xTAC (μmol H_2O_2 equivalent/L)] (Karababa et al. 2013).

FINDINGS AND DISCUSSION

As a result of the analyzes, it was determined that TOC and OSI values increased and TAC decreased in calves with ascaridiosis (Figure 1-3).

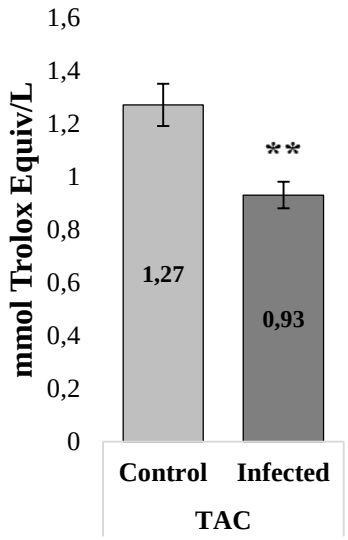

Figure 1. TAC levels in calves with ascaridiosis and healthy (P<0,01).

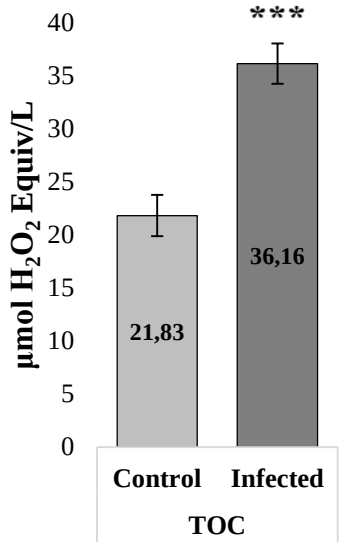

Figure 2. TOC levels in calves with ascaridiosis and healthy (P<0,001).

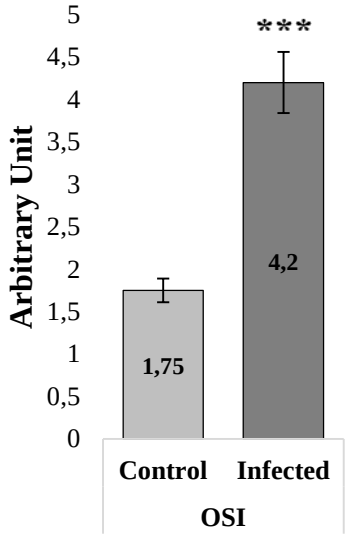

Figure 3. OSI levels in calves with ascaridiosis and healthy (P<0,001).

Under normal conditions, oxidants and antioxidants, which are in balance in the organism, deteriorate in favor of oxidants in cases such as inflammation, infection and stress, causing oxidative stress. Molecules that prevent cell damage by scavenging radicals that cause oxidative stress are defined as antioxidants (Karabulut and Gülay 2016). Although there are many methods for the determination of oxidative stress, these methods are complex and

expensive, requiring long time and effort, and measuring oxidant/antioxidant molecules one by one allows the evaluation of only the molecule being measured. For this reason, it has been reported that TAC and/or TOC measurement is more useful than measuring individual oxidants and/or antioxidants in order to determine the oxidant/antioxidant balance (Erel 2004; Erel 2005). Oxidative stress plays a role in the pathogenesis of many diseases and inflammatory conditions. Studies have reported that oxidative stress develops in various infectious diseases, while the oxidant level increases, while the antioxidant level decreases (Merhan et al. 2017a; Bozukluhan et al. 2017; Merhan et al. 2017b; Bozukluhan et al. 2018). Bozukluhan et al. (2017) reported a statistically significant increase in MDA level and a statistically significant decrease in GSH level in their study in calves infested with *Toxocara vitulorum.* In another study (Sarma 2012), it was reported that oxidative stress occurred and the level of antioxidants decreased in calves infected with *Toxocara vitulorum*. In the study, it was determined that TOC and OSI values increased and TAC values decreased in calves with ascaridiosis. It is thought that the reason is probably due to the increase in free radicals in the host cells in parasitic infections.

RESULTS

It is thought that the obtained findings will shed light on the studies to be carried out to clarify the pathogenesis and diagnosis of ascaridiosis infection in calves.

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THE EFFECT OF GIRDLING AND CLUSTER TIPPING ON NUTRIENT CONTENT OF SUPERIOR SEEDLESS (VITIS VINIFERA L.) GRAPE VARIETY

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ABSTRACT

The positive effect of cultural practices on yield and quality criteria in cultivated plants can be explained by their positive effect on the nutrient contents of that plant species. The qualitative and quantitative increases in yield of Superior Seedless (*Vitis vinifera L.*) grape cultivar by Girdling (G), Cluster Tipping (CT) and Girdling + Cluster Tipping (G + CT) treatments are associated with adequate levels of nutrient contents.

Girdling treatment was applied when the grape berries were 3-5 mm in diameter (berry set) by cutting the bark with a diameter of 4 mm from the top of the vine stem; Cluster tipping was performed by cutting about 30 percent of the cluster from the tip of the cluster at the same period; G + CT was applied together. No treatment was done to the control vines.

The experiment was carried out in the producer vineyard under farmer conditions on Superior Seedless table grape variety. It was set up to the randomized block design with 4 treatments and 3 replications.

The aim of this study was to determine the effects of Girdling, Cluster tipping, and G + CT treatments on the nutrient contents (macro and micro) in the leaves of Superior Seedless grape variety. For this purpose, samples taken as leaf blade and petiole at veraison were analyzed.

As a result, the correlation coefficients (r) and regression equations between the nutrient contents in the petioles and the amounts of these elements in the leaves were determined.

It was found that there were positive and statistically significant ($p<0.01$) relationships between the nutrient contents in the petioles and their contents in the leaf blade and the most significant effect was found in the combination of G + CT.

Keywords: Grapevine, Superior Seedless, girdling, cluster tipping

INTRODUCTION

Viticulture in Türkiye, which has an important place in the world viticulture, is one of the important agricultural branches in terms of the income it provides to the country's economy. There has a very rich genetic potential because it is the gene center of the grapevine and it is most commonly made in the Aegean region, which is located in the west of Türkiye (Anonymous, 2023). In recent years, the cultivation of Superior Seedless *(Vitis vinifera L)* an early and seedless variety, has been increasing in area and amount in the region. Today, it has increased the use of many hormones and chemical preparations to increase the berry size and quality of the variety. This has led to problems such as residues in foreign markets over the years and recently, table grapes cultural and technical practices that increase quality have gained importance. On the other hand, it is known that nutritional status is an important factor on the cultivation of quality grapes, as well as many factors (Winkler et al. 1974; Robinson, 1982; Christensen, 1984; Abu-Zahra, T. R & Naseri, M. 2012). Positive improvements in yield in terms of quality and quantity in all cultural plants are associated with adequate nutrient content.

In this context, the positive effect of each cultural practice on yield and quality criteria can be explained by the positive effect on the nutrient content of that plant species. In some studies, the positive effect of the nutrients in the plant on the quality criteria of the equilibrium state has been determined (Kovancı & Atalay, 1975; Atalay, 1977; Robinson, 1992). On the other hand, numerous studies have been conducted to reveal the effects of applications such as Girdling and Cluster tipping on the nutrient content of the leaves, which directly affect the quality of grapes (Jensen et al. 1981; Shulman et al., 1986; Zabadal, 1992; Bahar et al. 1998; Abu-Zehra, 2010). They emphasized that it is important to reveal the effect of the nutrient content of the grape varieties in which these technical applications are made by leaf analyses (Kök, 2011, Müftüoğlu et al. 2014; Soltekin et al. 2015).

The aim of this study was to determine the effects of Girdling, Cluster tipping, and Girdling + Cluster Tipping (G + CT) treatments on the nutrient contents (macro and micro) in the leaves of Superior Seedless grape variety. For this purpose, samples taken as leaf blade and petiole at veraison were analyzed.

MATERIAL AND METHODS

The experiment was carried out in the producer vineyard under farmer conditions in a 14-year-old on Superior Seedless table grape variety in Ahmetli/Manisa (Aegean region). It was set up to the randomized block design with 4 treatments and 3 replications. The vineyards are 2 m between rows and 3 m between rows and are shaped with the big 'T' training system. Equal load was applied to each vineyard included in the experiment, and it was carried out in accordance with the technique of cultural operations such as plant protection, fertilization, and tillage. Some physical and physical properties of the soil belonging to the trial vineyard. Some chemical and physical properties are given in Table 1.

Girdling (G) treatment was applied when the grape berries were 3-5 mm in diameter (berry set) by cutting the bark with a diameter of 4 mm from the top of the vine stem; Cluster tipping (CT) was performed by cutting about 30 percent of the cluster from the tip of the cluster at the same period; Girdling + Cluster tipping (G + CT) were applied together. No treatment was done to the control vines.

Table 1. Some chemical and physical properties of the experiment soils

Depth (cm)	pH	Salt ($\mu S\ cm^{-1}$)	$CaCO_3$ (%)	Organic Matter (%)	Texture	Total N (%)
0-30	7.35	321	< 0,03	1.04	Sandy-loamy	0,07
30-60	7.43	344	< 0,03	0.84	Sandy-loamy	0.08
			Available (mg kg^{-1})			
Depth	P	K	Ca	Mg	Fe	Zn
0-30	5.4	395	3350	402	2.80	4.24
30-60	4.1	310	3345	393	2.69	3.01

Samples (Leaf) were taken from the grapevines during at veraison (Levy, 1968; Fregoni, 1984, Failla et al. 1990; Jones et al. 1991) as leaf blade (Beyers, 1962) and petiole (Christensen, 1984). These samples were subjected to cleaning, drying and grinding procedures and prepared for analyses. Total N in leaf samples was analyzed by modified Kjehldahl method. In plant extracts prepared by wet combustion method, P was analyzed colorimetric, K, Ca and Na were determined by flame photometry, and magnesium (Mg), iron (Fe), zinc (Zn), manganese (Mn), and copper (Cu) were measured using Atomic Absorption Spectrometry (AAS) (Kacar, 1972;2014).

The Tarist package software was used in the evaluation of the obtained results and correlation coefficients of the binary relationships were determined (Yurtsever, 1984; Açıkgöz et al. 1993).

RESULTS AND DISCUSSION

The effects of cultural and technical applications on the quality and yield of plants are possible only if the nutrient amounts they contain are at an adequate level and guided by them. Therefore, the relationship between these applications and nutrients is important.

The nutrient content values of petiole and leaf blade of the plant samples taken during at veraison period of the vines to which cultural practices were applied are given in Tables 2 and 3.

Nitrogen (N): Leaf blade values were between 2.84-2.89% in all cultural treatments and 2.66% in the control. When compared with the limit value (2.25%) recommended by Levy (1968) for at veraison period, it is noteworthy that all cultural treatments, including the control, were above the limit value, but the cultural treatments were superior to the control.

The average nitrogen values were determined as 0.74% in girdling, 0.80% in cluster tipping, 0.85% in combination of girdling + cluster tipping and 0.52% in control. According to this,

considering the 0.5% nitrogen critical value given by Atalay (1977) for at veraison period and the 0.44% value given by Weaver (1976), it was determined that all cultural practices had a more positive effect than the control and the nitrogen values were above the limit values.

Phosphorus (P): In the cultivated treatments, the values of the leaf blade were between 1.05-1.15 % and 0.90 % in the control. When the limit values given by Loue (1981) (0.61-1.94%) of the leaf blade samples at veraison period were taken as basis, it was determined that all of the samples were within these limit values.

The average petiole values were between 1.62-2.44% in cultural treatments and 1.90% in control. When the limit values suggested by Winkler et al. (1974) (1.50-2.50 %); Weaver (1976) (>1.50); Robinson et al. (1982) (1.50-4.00) are compared, it is seen that all treatments including the control are within the limit values.

The noteworthy finding is that petiole potassium content values were generally higher than the leaf blade potassium values.

Calcium (Ca): Leaf blade values were between 1.66-2.13% in the treatments and 1.52% in the control. In the cultural treatments, petioles calcium values were between 1.23-1.45% and 1.00% in the control. Calcium contents of the petiole samples during at veraison period were between 1.0-1.80% limit value given by Cahoon (1970) and it was determined that all of the samples contained sufficient calcium.

Magnesium (Mg): When analyzed in terms of magnesium, the leaf blade values were between 0.31-0.45% and 0.33% in the control. Based on the limit values given by Winkler et al. (1974) (0.50-0.80%) and Weaver (1976) (0.50-0.80%), it was observed that there was not enough magnesium in the samples taken from all cultural treatments including the control. However, in the combination of Girdling and Cluster tipping, values close to the lower limit value were obtained.

Petiole values were between 0.81-1.26% in cultural treatments and 0.92% in the control. When compared with the limit values of 0.5-1.0% given by Etourneaud & Loue (1984), it was observed that all cultural treatments including the control were between the limit values and even the Mg content in the combination of Girdling and Cluster tipping was above the given limit value.

Iron (Fe): In all treatments, iron values in the leaf blade were between 195-263 ppm and in the control it was 199 ppm.

Petiole iron values were between 121-164 ppm in cultural treatments and 101 ppm in the control. When compared with the limit value (31-150 ppm) recommended by Sullivan (1971), it is seen that all treatments including the control are generally between the limit values. The highest level of Fe content (164 ppm) was obtained in the combination of Girdling and Cluster tipping.

Manganese (Mn): Leaf blade manganese values were found between 43-83 ppm and 38 ppm in the control. The manganese contents of the leaf blade were generally higher than those of the petiole and the highest value was obtained in the combination of Girdling and Cluster tipping.

The petioles values were between 30-42 ppm with the cultural practices during at veraison period and 21 ppm in the control. When compared with the limit value (31-150 ppm) recommended by Sullivan (1971), it is seen that it is close to the lower limit value (30 ppm) in

the Girdling application and between the limit value in other applications. In the control, manganese content was below the limit value (21 ppm).

Zinc (Zn): In terms of zinc, leaf blade values were between 54-85 ppm and 81 ppm in the control. Petiole Zn values with cultural treatments were between 50-62 ppm and 27 ppm in the control. When compared with the limit value (31-50 ppm) suggested by Sullivan (1971), it is seen that all cultural treatments are generally between the limit values. The control was below the limit value and the Zn content of the Cluster tipping treatment gave the highest Zn value (62 ppm). When compared with the limit value of 26 ppm recommended by Christensen et al. (1978) for petiole samples, it was found that all cultural practices including the control were within the limit value.

Table 2. Leaf blade's mineral element contents of plant samples taken at veraison

G: Girdling, CT: Cluster Tipping, G+CT: Girdling + Cluster Tipping

		%					ppm			
Treatments		N	P	K	Ca	Mg	Fe	Mn	Zn	Cu
G	Minimum	2,41	0,14	0,80	1,18	0,25	132	29	25	16
	Maximum	3,33	0,20	1,30	2,08	0,37	258	67	100	58
	Average	2,87	0,17	1,05	2,13	0,31	195	43	72,5	32
CT	Minimum	2,35	0,15	0,90	1,44	0,32	190	35	33	16
	Maximum	3,32	0,23	1,20	1,86	0,58	234	86	76	104
	Average	2,83	0,17	1,05	1,66	0,45	210	65	54	60
G+CT	Minimum	2,27	0,15	1,00	1,54	0,39	220	37	31	28
	Maximum	3,51	0,18	1,30	2,08	0,50	307	140	140	116
	Average	2,89	0,16	1,15	1,81	0,44	263	83	85	72
Control	Minimum	2,39	0,12	0,80	1,28	0,26	181	28	42	55
	Maximum	2,94	0,20	1.00	1,76	0,41	216	50	120	71
	Average	2,66	0,16	0,90	1,52	0,33	199	38	81	63

Table 3. Leaf petiole's mineral element contents of plant samples taken at veraison

G: Girdling, CT: Cluster Tipping, G+CT: Girdling + Cluster Tipping

		%					ppm			
Treatments		N	P	K	Ca	Mg	Fe	Mn	Zn	Cu
G	Minimum	0,61	0,10	1,20	0,86	0,79	109	21	32	10
	Maximum	0,84	0,17	2,00	1,62	0,83	178	32	61	85
	Average	0,74	0,14	1,62	1,23	0,81	144	31	50	50
CT	Minimum	0,67	0,10	1,80	0,90	0,69	104	31	44	18
	Maximum	0,92	0,18	3,00	2,00	1,25	136	42	80	44
	Average	0,80	0,13	2,44	1,43	0,97	120	36	62	31
G+CT	Minimum	0,77	0,14	1,80	0,90	0,78	120	33	28	24
	Maximum	0,90	0,23	3,60	1,56	1,64	208	50	84	141
	Average	0,85	0,18	2,21	1,23	1,21	164	42	51	83
Control	Minimum	0,22	0,10	1,80	0,90	0,82	98	21	22	10
	Maximum	0,80	0,14	2,10	1,10	1,03	104	21	32	48
	Average	0,54	0,12	1,90	1,00	0,92	101	21	27	29

Copper (Cu): When all treatments were analyzed, leaf blade Cu values were between 32-72 ppm and 63 ppm in the control. The average petiole Cu values with cultural treatments were between 50-83 ppm and 29 ppm in the control. When the limit value (11-15 ppm) suggested by Sullivan (1971) is compared, it is seen that all treatments including the control are above the limit value. The highest Cu content (83 ppm) was obtained in the combination of Girdling and Cluster tipping.

Copper contents of the samples were generally found at high levels. This may be due to the excessive use of copper preparations in the control of diseases in the local vineyards.

The correlation coefficients (r) between the nutrient contents in the petioles and the amounts of these elements in the leaf blade and their regression equations are given in Table 4.

As can be seen in the table, there are positive and significant ($p<0.01$) correlations between the nutrient contents in the petiole and the contents in the leaf blade.

Table 4. The correlation coefficient (r) and regression equations for relationships being significant among nutrient contents of leaf petiole and leaf blade samples at veraison

x	y	r	Regression Equations
Leaf petiole	Leaf blade		
N	N	0,784**	y= 0,14+0,48x
P	P	0,526**	y= 0,16+0,46x
Ca	Ca	0,748**	y= 0,44+0,55x
Mg	Mg	0,432**	y= 0,01+0,21x
Fe	Fe	0,815**	y= 12,9+0,78x
Zn	Zn	0,792**	y= 17,1+1,87x
Mn	Mn	0,834**	y= 13,2+0,11x
Cu	Cu	0,932**	y= 24,3+1,00x

**:Significant at the 0.01 levels

In this study, different cultural practices (girdling, cluster tipping, girdling + cluster tipping combination) were applied to Superior Seedless grape variety. Petiole and leaf blade samples taken during the veraison period were analyzed to determine the effects of different cultural treatments on macro and micronutrient contents.

As a result, it was determined that the cultural practices applied to Superior Seedless grape variety had a positive effect on nutrient contents at different levels. The most significant effect was found to be in the combination of girdling + cluster tipping. Also, in organic grape growing, it is recommended to use these technical practices to obtain high quality grapes

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UNRESOLVED MATTERS WITHIN THE DISCUSSION ON RURAL LANDSCAPES

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The rural landscape has enormous potential related to the environmental values it holds and the contribution these can make both to the construction of sustainable development and to the quality of urban systems. The rural landscape is a reservoir of resources, forms, and meanings worth bringing back to the center of reasoning about space for the benefit of the community.

Multiple viewpoints have been adopted and various aspects explored in research on rural landscapes. However, some issues have not been resolved and are still much debated. We have assessed some of the literature and traced these issues to three main aspects in order to provide a framework in thinking about rural landscapes: the conceptual aspect, the regulatory normative aspect, and the design aspect.

From a conceptual perspective, it is evident that although the concept of rural may seem simple and intuitive, providing a rigorous definition of what is rural and what is not is not a straightforward task. This is because it is a cross-cutting, mutable, and relative term (Nelson et al. 2023, Nelson et al. 2021, Beynon et al. 2016). Over time, various theoretical and applied models have been developed to define and classify rural landscapes. These models include those based on exploring the physical attributes of the landscape and soil, which are among the prevailing approaches, as well as models relying on techniques involving subjective evaluations of the landscape by individuals or groups (Simensen et al. 2018, Mucher et al. 2010, Balestrieri 2015, Xie et al. 2022). However, there is still a lack of an established set of indicators to refer to, and little has yet been done to analyze the differences between classifications, which may result from the use of different attribute data and classification techniques (Balestrieri 2015). The application of different methods leads, in fact, to obtaining different maps of the same territory, generating uncertainty about the results. However, the problem of defining rurality in recent years has become more pressing, especially in the European context (Antrop and Van Eetvelde, 2017). In the perspective of community policies, the problem of defining and measuring rural areas for the purpose of resource allocation, structuring appropriate intervention measures and evaluating their effectiveness has become crucial.

From a regulatory perspective, the problem can be traced back to the preservation of the landscape and the limits of its transformability. In fact, if on the one hand it has become indispensable to contain those processes that negatively affect rural landscapes by jeopardizing their very survival, erasing their meaning, and compromising some of their strategic functions such as those related to the garrisoning of territories, risk management therefore, and security on the other hand it is unthinkable to have an approach based from untouchability, on crystallization, on museification. (Fairclough et al. 2018; Hazeu et al. 2011; Council of Europe 2000). First of all, the landscape is the outcome of continuous remodeling due to the incessant work of man of the link between activities populations and places leading to the organization of space, which, however, occurred until a certain time according to a certain balance respectful of environmental characters and then became much more invasive and destructive (Plieninger, et al. 2016, Agnoletti 2012, Meeus et al. 1990). However, the issue is less obvious than it may appear. Many divergent interests, many different needs

gravitate around the transformability of the landscape (Pinto-Correia et al. 2018; Sayer et al. 2013). In fact, conflicts are often and frequently detected with regard to instruments and regulation. For example, in the case where technological evolution and changes in production methods compared to the past impose a transformation of certain landscapes that instead because of their historical value one would like to protect.
From a design perspective the role of landscape and its potential in social economic and environmental terms have long been ignored and underestimated. Today, however, landscape is being looked at in a different way: no longer just as an accompanying element of the land but as a key element from which to start again. This approach has kindled attention to ways through which to enjoy the landscape in a way that combines its protection with the possibility of economic development based on its enhancement (Agnoletti 2013, Torquati et al. 2017). Within this framework, the increase in demand toward the environmental dimension and the search for alternative destinations to urban destinations and mass tourism has led to thinking about starting again from the landscape in order to build a spatial project based on environmental (Ge et al. 2023, Ivona et al. 2022, Schaller et al. 2018, Candia et al. 2021, Balestrieri and Congiu 2017, Domond 2011). Rural landscapes can become sites of experimentation for the construction and application of an idea of progress based on the recognition of the value of environmental quality as the building block of an economy focused on people rather than goods. With this in mind, it becomes crucial not only to try to measure the environmental credit that various rural landscapes can claim in relation to the rest of the territory, but also to find ways to bring out the bargaining power that this credit can give. This requires a totally different approach from the current one, which in defining spatial centralities and distributions of resources and services, interesting and useful in this regard is research to quantify ecosystem services and also give an economic value.

Keywords: Rural landscape, conceptual problems, regulatory problems, design problems.

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INVESTIGATION OF SOME THERAPEUTIC COMPONENTS OF OLIVE OILS OBTAINED FROM DIFFERENT REGIONS

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ABSTRACT

Olive oil has been consumed with admiration for many years in different cuisines of the world, especially in Mediterranean countries, due to its chemical profile and unique aroma-flavor components. Turkey is among the leading countries in the world in terms of annual average olive oil production and consumption. In recent epidemiological studies, low mortality rates in coronary heart diseases, some of cancer types (prostate, breast and colon cancer) and some chronic diseases have been associated with the intake of antioxidant-containing vegetables and fruits. In particular, it is stated that olive oil, which is widely used in diets in some Mediterranean countries, has an important role in the relatively longer life expectancy. The beneficial effects of olive oil on health are attributed to its high oleic acid content and high vitamin and non-vitamin antioxidant components. In this study, quality studies were carried out on Edremit (Balıkesir), Memecik (Aydın) and Halhalı (Mardin) olive oils. The fatty acid compositions by Gas Chromatography-Flame Ionization Detector (GC-FID), the volatile component contents by Gas Chromatography-Mass Spectrometry (GC-MS), the phenolic compounds by High-Performance Liquid Chromatography (HPLC) of olive oils was determined. Total phenolic content and DPPH (2,2-Diphenyl-1-picrylhydrazil) radical capture activity of olive oils were read with Ultra Violet (UV) spectrophotometer device. In addition to these, quality parameters (peroxide value, acidity level, specific absorption values and sensory properties) were also determined. The analysis results for the quality criteria of the samples showed that all three olive oils were in the Extra Virgin Olive Oil class according to the Turkish Food Codex-Communique on Olive Oil and Olive Pomace Oil. Among the major phenolic compounds, the highest values were found in Halhali olive oil with hydroxytyrosol 6.57 mg/kg and oleuropein 7.40 mg/kg, and the lowest values were found in Memecik olive oil with 0.75 mg/kg and 0.87 mg/kg, respectively. It was calculated by using the IC50 formula that the total phenolic contents were between 348.31-483.09 mg.GAE/kg in three olive oils. Dpph radical removal activities were found, that the lowest in Memecik olive oil (29.35 mg.TE/kg) and the highest in Halhali olive oil (269.26 mg.TE/kg), by calculating with absorbance values. As the main fatty acid, oleic acid levels ranged from 65.86% (Halhali) to 71.30% (Edremit). As a result of the study data, the investigated olive oils were characterized and determined to have therapeutically important properties.

Keywords: Olive oil, GC-FID, HPLC, UV, fatty acids, phenolic substances

CORRELATION BETWEEN PHENOLIC COMPOUNDS CONTENT AND ANTIOXIDANT ACTIVITY OF HONEY FROM DIFFERENT BOTANICAL ORIGINS

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ABSTRACT

Honey is a highly complex biological compound produced by bees from flower nectar. Honey has been used by humans for thousands of years as a natural sweetener and for medicinal purposes. It contains a range of vitamins, minerals, and antioxidants, and possesses antibacterial and anti-inflammatory properties. The active ingredient composition of honey can vary depending on the type of flowers the bees collected the nectar from. The aim of our study is to conduct a phytochemical analysis of three commercial honey types (*Mentha pulegium*, *Arbutus unedo*, and *Ziziphus spina-christi*) and their botanical origins in Algeria. The study of phytochemical parameters, including total polyphenol content, flavonoid content, and antioxidant activity using three tests DPPH, ABTS, and FRAP, aims to determine the correlation between anti-radical activity and phenolic antioxidant content in the three honey types and their botanical origins. Antioxidant quantification shows that the variation in antioxidant content in honey samples or plant extracts according to the botanical origin is very remarkable. These variations are generally positively correlated with antioxidant activity. These results confirm that honey's phenolic compounds contribute significantly to its antioxidant power, and the amount of these compounds varies widely depending on the botanical origin of the honey. These research results on honey quality can be valuable for beekeepers to improve the quality of the honey produced by planting specific types of flowers to provide honey rich in specific antioxidants, which can help to alleviate diseases due to its natural therapeutic properties.

Keywords: Honey, Botanical origin, Polyphenols, Flavonoids, Antioxidant activity.

DETERMINATION OF MYCORRHIZA INFECTION RATES IN SOME *PRUNUS* ROOTSTOCKS UNDER DROUGHT STRESS

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ABSTRACT

This research was carried out in Alata Horticultural Research Institute (Alata-Mersin) in 2019-2021 to determine the most effective mycorrhiza species on *Prunus* rootstocks (Rootpac 40, Rootpac R, GF 677 and Garnem) and to measure the effectiveness of mycorrhizal inoculation on drought stress under glass greenhouse conditions. In the preliminary trial that was conducted in 2019, *Glomus mosseae*, *Glomus etunicatum* and *Glomus clarium* mycorrhiza species used to termine the most active species. Mycorrhizal colonization was significantly affected by mycorrhizal inoculations. Mycorrhizal colonization percentages ranged from 33% to 73%, and the highest colonization was obtained from the application of *G. mosseae* mycorrhiza species to Rootpac R rootstock. In the 2021 trial, limited water application was made by inoculating efficient *G. mosseae* mycorrhiza species to nectarine-grafted and non-grafted plantlets. Root infection rates varied between 80% and 57%, and the highest infection (80%) occurred in Rootpac R rootstock at K_{55} irrigation level.

KEY WORDS: Stone fruits rootstocks, mycorrhiza species, root colonization, plant growth

INTRODUCTION

Mycorrhiza, literally root fungus, was first introduced by Frank in 1885. Mycorrhiza is a word originating from Greek, meaning root, while *myco* fungus *rhiza* is a root word. Mycorrhiza is also defined as the mutual life style between plant roots and certain fungal species. Within the framework of this cooperation, the plant provides carbon to the mycorrhizal fungus; it also provides nutrients and water to the plant in mycorrhizal fungi (Ortaş, 2017).

Since mycorrhizal plants sweat more, the amount of water taken per unit root and accordingly the water flow to the root zone per unit time is approximately two times higher than the plants that are not infected with mycorrhiza (Auge, 2001).

Since it is not yet possible to produce mycorrhizal fungi, which maintain a symbiotic life with more than 96% of plant species in nature, it is still a necessity to produce spores through the roots of host plants. It is also important to determine the mycorrhiza species that provide the most effective infection to be used in researches related to mycorrhiza and the most suitable host plant to propagate them. The quality of the material to be used as the plant growth medium is also important in order for the plant roots to be infected at the maximum level and to reproduce the spores in the appropriate amount (Ortaş et al., 1999).

In the research which were carried out to determine the effective mycorrhiza species for rapid and abundant production of mycorrhizal spores, the selection of the host plant species or variety that are well infected with mycorrhiza, and to determine the appropriate mortar medium to be used as a plant growth medium, different plant species inoculated *with Vesicular Arbuscular mycorrhiza* species and different mortars were used.

In the experimental findings, it was determined that the maize plant as a host plant provided a more effective infection. Among the mycorrhizal species, *Glomus etunicatum*, *Glomus mosseae*, and *Glomus caledonium* and *Glomus darum* species were observed to produce the most spores, respectively. Burnt animal manure: soil: sand mixture in the ratio of 1 - .3:6 was determined as the most suitable mortar medium (Ortaş, 1999). Mycorrhizal fungi directly increases the root surface area by producing a large amount of hyphae and can provide nutrients in regions far from the root through these hyphae (Ortaş, 2012).

Revillini et al (2016) reported that plant roots and rhizosphere create a habitable environment for mycorrhizal fungi and bacteria. Researchers stated that the reason why plants provide a common habitat for fungi and bacteria is the delivery of nutrients and water to the plant. On the other hand, plants provide carbon (energy) for microorganisms (Smith and Read, 2010). They reported that mycorrhizal fungi continue their lives by settling in plant root surface, root tissues, cells and intercellular spaces.

Calvet et al. (2004) examined the effects of Spanish, French and Italian peach-almond hybrids, peach, plum and cherry rootstocks on their dependence on mycorrhiza in their study, including GF 677 and Garnem rootstocks. *G. etunicatum, G. intraradices* and *G. mosseae* mycorrhiza species were used in the experiment conducted under greenhouse conditions. Seeds were kept in a greenhouse environment at 25±5 °C to promote germination. As the growing medium, a growing mortar in a sandy loam structure was used. It was reported that seedlings treated with *G. intraradices* mycorrhiza species had the highest mycorrhizal colonization rate in most of the rootstocks evaluated.

Hutter et al. (2007), in their study of the effects of mycorrhiza application on viability and growth of 36 *Prunus avium* clones grown in vitro, stated that the tested clones showed viability in the range of 26%. Losses were observed in control plants that were not treated with mycorrhiza. It has been observed that mycorrhizal inoculation has positive effects on plant growth and vigor. It was also determined that weak clones benefited more from mycorrhiza. Colonization rate varied between 13% and 46%.

Comlekcioglu et al. (2008), in their study of the effects of mycorrhiza application on plant growth and nutrient uptake, on the 01-IN-06 fig genotype grown in vitro under greenhouse conditions, it was stated that *G. caledonium* and *G. margarita* mycorrhiza species provided the highest improvement in plant growth. Mycorrhizal inoculation increased the shoot length and root dry weight of the fig plant, as well as the zinc and phosphorus uptake in the plant tissues.

Aka-Kacar et al., (2010) and Yılmaz et al. (2020) investigated the effect of mycorrhizal fungi on the environmental adaptation phase of Edabriz and Gisela 5 cherry rootstocks obtained by tissue culture and grown for 16 weeks in a greenhouse environment. Experiments have shown that mycorrhiza treated cherry rootstocks are healthier and have higher Zn and P content than controls. *G. mosseae* has been noted as one of the most productive AMF species.

Abbaspour et al (2012) investigated the effect of mycorrhiza application of *Glomus etunicatum* species on 3-month-old pistachio seedlings in pot culture on drought stress. Two different water applications were made in the experiment. The seedlings with mycorrhiza application showed good development regardless of water applications. Mycorrhiza application increased root weight, leaf area and total chlorophyll amount in well-watered plants compared to water-restricted plants. In both water treatments, the amount of soluble sugar, protein, flavonoid and proline and peroxidase enzyme activity increased in the plants treated with mycorrhiza. While K, Zn and Cu contents were higher in mycorrhiza treated plants, Mg content was not affected. As a result, the researchers stated that mycorrhizal inoculation increased osmotic regulation, nutrient and antioxidant enzyme activities and drought resistance of pistachio seedlings.

Zhu and Song (2012) investigated the effects of mycorrhizal inoculation on the growth, chlorophyll concentration and water content of maize (*Zea mays* L.) plants under drought stress. Drought stress significantly reduced mycorrhizal colonization. While mycorrhiza colonization was 41.7% in plants not subjected to drought stress, it was determined as 33% in plants subjected to drought stress. Mycorrhizal symbiosis increased the net photosynthetic rate and transpiration rate, but decreased intercellular CO_2. They were found to have higher stomatal conductivity and chlorophyll concentrations. Mycorrhizal plants were found to have higher RWC than non-mycorrhizal plants under drought stress, but no difference was found between non-mycorrhizal and mycorrhizal plants in well-watered plants. There was no difference in plant height, shoot dry weight, root dry weight and total dry weight values between mycorrhiza treated and untreated plants.

Incesu et al. (2015) applied 5 different mycorrhiza species to two commonly used rootstocks of persimmon rootstock, with 1000 spores/plant per plant. Plants were grown in a climate room at a temperature range of 30-35°C at a humidity of 70-85% in 16 hours of daylight and 8 hours of darkness. Root colonization rates ranged from 28-40%. In this study, it was determined that mycorrhiza applications increased the number of plant leaves, plant fresh and dry root weight, and the highest chlorophyll density was found in the leaves of *G. caledonium* species mycorrhiza applied plant leaves. Plants inoculated with *G. etunicatum* showed the highest total plant dry weight.

Guissou et al. (2016) grafted *G. aggregatum* mycorrhiza to African carob bean (*Parkia biglobosa*), tamarind (*Tamarindus indica*) and jujube (*Ziziphus jujuba Mill.*) fruit seedlings, which they obtained from 5 different regions in their study in South Sudan. The growing medium used was sieved and sterilized at 121°C for 1 hour. 6 months after mycorrhiza inoculation, the plants were removed and shoot length, dry weight, root/shoot ratio and nutrient content were determined. Tamarind and jujube plants were found to have greater shoot length and dry weight. Mycorrhiza application positively affected N, P, K contents.

Ortas (2017), investigated the effect of mycorrhizal fungi on growth and nutrient uptake during micro-propagation and plant formation of cherry, grapevine, fig and banana rootstocks. Various species of mycorrhizal fungi have been used. Mycorrhizal inoculated plants have higher shoot and root dry weight and higher nutrient uptake than non-mycorrhizal plantlets. The effect of various mycorrhiza species on orange, tangerine and lemon trees under field conditions has been successfully demonstrated. Mycorrhizal inoculation also significantly increased P and Zn uptake. It has been determined that many plants, including citrus, pistachio, cherry, banana and

grapevine rootstocks, are dependent on mycorrhiza for P nutrition. It was concluded that the use of mycorrhizal fungi can make a beneficial contribution to horticultural growth, nutrient uptake, as well as fruit quality.

Çalışkan et al. (2017), in their study to determine the effect of restricted water and mycorrhiza applications on young plants of the Blunt-thorn lemon variety, cocktail mycorrhizae were used as three different levels and 1000 spores/plant per plant as mycorrhizal fungus. Mycorrhizal and normal growing mortar was prepared for each irrigation level. Carbohydrate content increased as water was restricted. In terms of plant nutrient content, differences were found between applications in nitrogen, applications and water levels in phosphorus, and water levels in potassium. In general, they stated that drought resistance increased when water was restricted, but showed the longest resistance to drought with 16 days in mycorrhiza application at 50% water level.

Bozkurt (2018), conducted a study in which the effects of arbuscular mycorrhizal fungus applications on drought stress in American grapevine rootstocks were determined. One month after the stress, the trial was terminated. It was determined that mycorrhiza application had positive effects on root length, root number and rooting percentage parameters in terms of root development in grapevine rootstocks. In particular, the relative water content of leaves was found to be higher in 20 g/L mycorrhiza application in both arid and irrigated plants in 110 R rootstock. It is noteworthy that the positive effect of mycorrhiza applications was observed in terms of the average number of leaves per shoot. Chlorophyll levels were high in plants inoculated under arid conditions, while low levels were determined in non-mycorrhizal plants.

Mısraklı et al (2019), investigated the effects of different types of mycorrhiza and microbial fertilizers on seedling growth in Meyer lemons grafted on citrus rootstock. They aimed to produce strong, root-free and rooted seedlings that can compete with the soil by applying specially formulated soilless plant nutrition applications on seedlings with air pruning. As mycorrhiza mixture, 50 g of mycorrhiza mixture per plant was applied, corresponding to 500 spore/plant doses of *Glomus spp*.: *G. mosseae, G. etunicatium, G. clarium, G. intraradices, G. caledonium, G. macrocarpium, G. margarita, G. fasciculatum* species. In the study, it was aimed to determine shoot length, rootstock-scion diameter, leaf area, mycorrhizal count in the root zone (number), mycorrhizal root infection rate (%), total bacteria number in the soil and root infections. The results showed that mycorrhiza and microbial fertilizer applications were not effective on rootstock and scion diameter and plant growth, but on chlorophyll and leaf area indices.

Akpınar and Ortaş (2020), determined the effects of grafting different arbuscular mycorrhiza species on banana plant grown in tissue culture medium on plant growth and nutrient uptake by biotechnological methods. As a breeding medium in the experiment; Andesitic tuff + soil + Compost (6:3:1 v:v); G. *caledonius*, G. *mosseae*, G *clarus*, G. *intraradices* and cocktail (mixture of the specified species) were used as mycorrhiza species. According to the research findings, mycorrhiza inoculation significantly increased the root and root dry matter production of the banana plant, as well as the P and Zn uptake compared to the control. G. *caledonius* and G. *mosseae* stand out as the most effective mycorrhizal species. It has been stated that mycorrhiza inoculation is an important factor in the health and quality of plants in increasing banana cultivation.

Hamedani et al (2022), investigated the yield, irrigation water efficiency and nutrient uptake of mycorrhiza inoculated sesame under drought stress conditions. The highest colonization rate was determined in plants inoculated with G. *mosseae.* The largest percentage of P was seen in leaves and seeds of grafted plants. They emphasized that mycorrhizal inoculation provides higher grain

yield and seed oil and the importance of using this microorganism in sesame cultivation in semi-arid and arid conditions where water is the main factor in determining yield.

Qiuhong et al. (2022) investigated the effect of mycorrhiza inoculation on two-year-old *Vitis vinifera* L. plants under water stress on chlorophyll changes and photosynthesis. Mycorrhizal colonization was determined as 89.2%. Water stress application did not affect the colonization rate. The weight of shoots and roots was determined higher in mycorrhizal plants independent of water stress applications. The relative water content in the leaves was found to be lower in plants subjected to water stress. Mycorrhiza inoculation increased the significantly increased the net photosynthetic rate, stomatal conductivity and transpiration rate, and decreased the intercellular CO2 concentration of grapevine leaves under water stress.

In this study, it was aimed to determine the most suitable mycorrhiza species for *Prunus* rootstocks and to measure the effectiveness of applied mycorrhiza under drought condition.

MATERIALS AND METHODS

This study was carried out at Alata Horticultural Research Institute (Alata-Mersin) between 2019-2021. Rootpac 40, Rootpac R, GF 677 and Garnem rootstocks, which are widely used for stone fruits today, were used as material. The dependence of these rootstocks on mycorrhiza was investigated in nectarine grafted and ungrafted plants in glass greenhouse conditions that can be shaded and ventilated. During the stress applications, the irrigation interval was 3 days. The greenhouse where the experiment was carried out is at latitude 36°37'49" N, longitude 34°20'37" E and is 4 m above sea level. In addition to the level of nutrients in the growing medium used, the texture was determined. In the experiment, in accordance with the 1:2:1 v/v/v volume calculation, the 14 liter plastic pots with known weights, litter and holes in the bottom: 1 part sandy soil, 2 parts garden soil and 1 part peat mixture 12 kg each. has been placed. The growing medium used in the experiments was sterilized by autoclaving at 121°C for 90 minutes. The purpose of the sterilization process is to eliminate the natural mycorrhizal fungi that may be present in the growing medium. In addition, to reduce the direct effect of spores on plant growth by eliminating other harmful pathogens or living things from the environment. The autoclaved growing medium is kept for a while to restore the biological balance of the soil (Ortaş et al., 1998).

The mycorrhiza species used in the experiment were reproduced from 3:6:1 v/v/v soil Ürgüp tuff and animal manure medium under sorghum host plant in Çukurova University Faculty of Agriculture Soil Department Rhizosphere Laboratory and research greenhouses (Ortaş et al., 1999). The produced inoculum was kept in a cold environment at +4 °C until the experiment time.

Mycorrhiza species used in the trial

G. mosseae: It's color ranges from light yellow to dark orange brown. It is generally spherical, hemispherical, sometimes irregular. Spore sizes are 100-260 μm, with an average of 195 μm (INVAM, 2022).

G. etunicatum: Available in different colors from orange to dark brown. It takes spherical and semi-spherical shapes. Its size is 60-160 μm, with an average of 129 μm (INVAM, 2022).

G. clarium: Its color ranges from white to yellow-brown, pale yellow and pale yellow brown. It is found in spherical-hemispherical, sometimes ellipsoid and sometimes rectangular irregular shapes. Its size is 100-260 μm, with an average of 182 μm (INVAM, 2022).

Establishing the experiment

In the preliminary trial conducted in 2019, the most effective species was tried to be determined by using three different mycorrhiza species. The preliminary experiment was carried out on ungrafted plants under glass greenhouse conditions with shading and ventilation. Mycorrhiza inoculation was carried out to the growing medium, with 1000 spores/plants during the transplanting of the plants into the pots. *G. mosseae*, *G. etunicatum* and *G. clarium* mycorrhiza species were applied to Rootpac 40, Rootpac R, GF 677 and Garnem rootstocks. The same amount of mycorrhizal inoculum was applied to the control seeds without mycorrhizae. Plants were harvested 8 months after the mycorrhiza application, plant root infection rates were determined and the results were evaluated as a whole.

Figure 1.General view of the pre-trial plants inoculated with three different mycorrhiza under greenhouse conditions.

In the 2021 trial, it was carried out in glass greenhouse conditions that can be shaded and ventilated by using new seedlings with the same characteristics. 4 rootstocks, 1 cultivar, 3 irrigation doses were carried out as mycorrhizal (M+) and mycorrhizal (M-), grafted and non-grafted applications. Rootpac 40, Rootpac R, GF 677, Garnem rootstocks were grafted onto *Glomus mosseae* microrhiza type plants, which were the most infectious, and the dependence of these plants on mycorrhiza was determined under limited water conditions. Half of the rootstocks were grafted with Carolina nectarine variety. Mycorrhizal and non-mycorrhizal treatments were included in each drought dose. Half of the plants were inoculated with 1000 spores/plant of *G. mosseae* mycorrhiza during crossing. Mycorrhizal bee inoculum was applied to the control plants, which were not inoculated with mycorrhiza, in the amount applied to the mycorrhizal plant roots. Drought trials were started 6 months after the mycorrhiza application. The plants of the control subject (K_{100}) were irrigated to 100% of the field capacity water level. For K_{55}, water was given at the level of 55% of K_{100}, and for K_{40}, at the level of 40% of K_{100}. Between July 12, 2021 and August 10, 2021, 10 restricted water applications lasting 30 days were made.


Figure 2. Appearances in the trial area for 2021

Mycorrhiza application and establishment of the trial

The sterilized mortar was filled into the pots from the bottom up to 1/3 of the way up. Then, mycorrhiza doses per plant corresponding to 1000 spore/plant doses were added to the pots. The root parts of the seedlings were planted to the part where mycorrhiza was added. The remaining 2/3 of the pot was filled with sterilized mortar and mycorrhiza application and planting were carried out. The same amount of sterile growing medium free from mycorrhiza was added to the pot medium that could not be inoculated with mycorrhiza.

Harvest and post-harvest measurements

At harvest, plant roots were cut 0.5 cm above the surface and the stem and root were separated from each other. After the roots were removed and separated from the soil, they were washed first with plenty of tap water and then with pure water. After the roots were thoroughly washed and the dead roots were removed, the roots were protected by treating them with pure alcohol in storage boxes. Alcohol allows both the softening of plant roots and their long-term storage without degeneration. The cleaning and dyeing processes of the plant roots obtained as a result of the experiment were carried out according to Koske and Gemma (1989). When the diagnosis of mycorrhiza was desired, the plant roots taken from the storage boxes were divided into segments of 1 cm length and transferred to test tubes. In order to soften the roots, 10% KOH solution was placed in the tubes in an amount to exceed the roots and they were kept in an oven at 65°C for 1 hour. Then, KOH was removed from the medium and 10% HCl was added to the roots to neutralize the KOH and left for 1 hour. Then, acidified glycerol trypan blue solution was added to cover the roots and kept in an oven at 65°C for 20-25 minutes. The trypan blue in the tubes was poured and lactic acid was added. Then the plant roots were emptied into the petri dish. The dyed plant roots were cut in 1 cm length and arranged on the slide with 10 roots. 10 of the roots were taken with the help of forceps, cut 1 cm in length, arranged on the slide and covered with a coverslip. A total of 30 rootlets were prepared from 3x10 samples and analyzed under a light microscope. Roots were examined under a microscope at 40-100 magnification (Giovanetti and Mosse, 1980). The total number of mycorrhizal roots in 30 samples was taken into account in the evaluation. Infection percentages were calculated by multiplying the number of roots with hyphae, arbuscules and vesicles representing mycorrhiza formation by 10.

The % root infection was calculated with the following formula:

% infection = 100*total mycorrhizal roots / total number of roots.

RESULTS AND DISCUSSION

In the preliminary trial initiated in 2019, the most effective mycorrhiza species was determined by using three different mycorrhiza species. The experiment was established with three replications and one seedling in each replication using ungrafted plants. In order to find the amount of mycorrhiza to be applied per plant, the number of mycorrhizae in 10 grams of inoculum was determined and mycorrhizal inoculum inoculation was carried out at 1000 spores/plant per plant (Table 1).

Table 1.The amount of mycorrhiza species used in the preliminary experiment

Mycorrhiza type	Number of spores in 10 grams inoculum	Mycorrhiza(g inoculum) applied per plant
Glomus mosseae	65	154
Glomus etunicatum	70	143
Glomus clarium	56	179

Root infection rates of trial plants were examined in the laboratory environment, and the results were realized as seen in Table 2. According to the research findings, the rate of mycorrhizal infection differed significantly with mycorrhizal applications. Mycorrhizal infection percentages ranged from 33.3% to 73.3%, and the highest root colonization was obtained from the application of *G. mosseae* mycorrhiza to Rootpac R rootstock. Based on the average data, *G. mosseae* was determined as the species that performed the highest colonization rate of 64.1%. When the previous studies (Ortas, 2012, 2017) were examined, it was seen that the infection rates changed according to the plant species.

Infection rates are between 30.0% and 96.7% in pistachio rootstocks (Akgün, 2003), between 47% and 64% in American grapevine rootstocks (Bayram, 2000), between 3.3% and 66.7% in orange seedlings (Üstüner, 2001), 83% and 83% in maize. It has been reported that between 53% and 77% in alfalfa (Akpınar, 2004), between 13.3% and 53.3% in grafted vine saplings (Kavak, 2006).

Table 2. The effect of mycorrhiza applications on the infection rate (%)

Rootstock Name/Mycorrhiza Type	Control	*G. mosseae*	*G. etunicatum*	*G. clarium*	Average (except control)
Rootpac 40	3.3	66.6	43.3	46.6	52.2
Rootpac R	6.6	73.3	66.6	63.3	67.7
Garnem	10.0	53.3	43.3	43.3	46.6
GF 677	6.6	63.3	33.3	36.6	44.4
Average	6.6	64.1	46.6	47.5	

Figure 3. Root and root views of uprooted plants for the determination of mycorrhiza infection (Rootpac-40, Rootpac-R, GF-677 and Garnem rootstocks)

In the second trial in 2021, a trial was established by inoculating *G. mosseae* microrhiza type plants, which caused the most infection, and the dependence of the plants on mycorrhiza in limited water conditions was determined. The experiment was established with three replications and two plants in each replication. Grafted and ungrafted plants were evaluated separately. In order to find the amount of *G. mosseae* mycorrhizae to be applied per plant, inoculum inoculation containing 111 g of mycorrhizal spores was applied to each pot, as 1000 spores/plant per plant, based on the number of spores in the inoculum.

The effect of water and mycorrhiza applications given at different levels on the infected root rate in plants is as seen in Table 3, and the percentage of root infection was higher than the control plants. Root infection rates varied between 80.00% and 56.7%, and the highest infection (80.0%) occurred in Rootpac R rootstock at K_{55} irrigation level. It can be said that the *G. mosseae* mycorrhiza species used in the study was effective for the plants included in the experiment. While mycorrhiza colonization was 70.0% in ungrafted plants without drought stress, it was determined as 71.6% in grafted plants. While mycorrhizal colonization rate was 70.0% in ungrafted and grafted plants in K_{55} application, it was determined as 65.8% in ungrafted plants and 67.5% in grafted plants in K_{40} application.

Ortaş (2017) determined in the study that many fruit trees, including citrus, pistachio, cherry, banana and grapevine rootstocks, were dependent on mycorrhiza for P nutrition. Ortas (2012) determined that mycorrhizal inoculation significantly affected root colonization on pepper plants, and 3-10% colonization in control plant roots, 41-72% in *G. etunicatum* grafted plants and 30-75% in *G. mosseae* grafted plants. Zhu and Song (2012) found that while mycorrhiza colonization was 41.7% in plants not subjected to drought stress, it was 33% in plants subjected to drought stress. Research indicate that drought stress reduces mycorrhizal colonization.

Table 3.The effect of mycorrhiza and restricted water applications on the infected root rate (%)

Water levels	Ungrafted rootstocks				Grafted plants			
	Rootstock name	Control	*Glomus mosseae*	Average (excluding control)	Rootstock name	Control	*Glomus mosseae*	Average (excluding control)
% 100	R 40	3.3	73.3	70.0	R 40	6.7	73.3	71.6
	R R	6.7	73.0		R R	3.3	73.3	
	GF 677	6.7	63.3		GF 677	3.3	66.7	
	Garnem	3.3	73.3		Garnem	6.7	73.3	
% 55	R 40	10.0	73.3	70.0	R 40	10.0	73.3	70.0
	R R	6.7	80.0		R R	6.7	76.7	
	GF 677	6.7	63.3		GF 677	6.7	66.7	
	Garnem	3.3	63.3		Garnem	6.7	63.3	
% 40	R 40	3.3	66.7	65.8	R 40	3.3	70.0	67.5
	R R	6.7	73.3		R R	3.3	73.3	
	GF 677	3.3	56.7		GF 677	3.3	63.3	
	Garnem	3.3	66.7		Garnem	6.7	63.3	

Mean of three replicates

The effect of mycorrhiza and restricted water applications on the degrees of damage

Plants were classified according to the 1-4 scale, which was created to reveal the degree of damage caused by water stress. The scale value of the plants included in the K_{100} application was accepted as 1. In K_{40} application, the least damage levels are in R 40 and R R rootstocks; the highest degree of damage was observed in GF 677 and Garnem rootstocks. Mycorrhizal fungi can promote plant root growth in marginally poor soils and under environmental stress. Mycorrhizal fungi can promote plant root growth in marginally poor soils and under environmental stress. Mycorrhizal inoculated plants have higher shoot and root dry weight and higher nutrient uptake than non-mycorrhizal plantlets (Ortaş, 2017). Increases in leaf senescence were observed as restricted water application negatively affected cell size and cell membrane integrity. In the study conducted by Gür and Şan (2017), they reported that the degree of damage increased with stress in wild pear seedlings, BA 29, Farold 40, OHxF 333 and Fox 11 rootstocks used in pear cultivation.

Çerçi (2012) stated that drought stress increased wilting status of 6 different citrus rootstocks with water restriction.

Among the plants included in the current study, it was determined that the plants that were inoculated under water stress showed lower scale values than the plants that were not inoculated with mycorrhiza (Table 4).

Table 4. The effect of mycorrhiza and limited water applications on the degree of damage to plants.

Water application	Grafted and mycorrhizal plants			
	Rootstocks			
	R 40	**R R**	**GF 677**	**Garnem**
K_{100}	1	1	1	1
K_{55}	1	1	2	2
K_{40}	2	2	2	3
Water application	Grafted and non-mycorrhizal plants			
	Rootstocks			
	R 40	**R R**	**GF 677**	**Garnem**
K_{100}	1	1	1	1
K_{55}	1	1	3	2
K_{40}	2	2	3	3
Water application	Ungrafted and mycorrhiza treated plants			
	Rootstocks			
	R 40	**R R**	**GF 677**	**Garnem**
K_{100}	1	1	1	1
K_{55}	1	1	2	2
K_{40}	2	2	2	3
Water application	Ungrafted and non-mycorrhizal plants			
	Rootstocks			
	R 40	**R R**	**GF 677**	**Garnem**
K_{100}	1	1	1	1
K_{55}	1	2	3	3
K_{40}	2	2	3	4

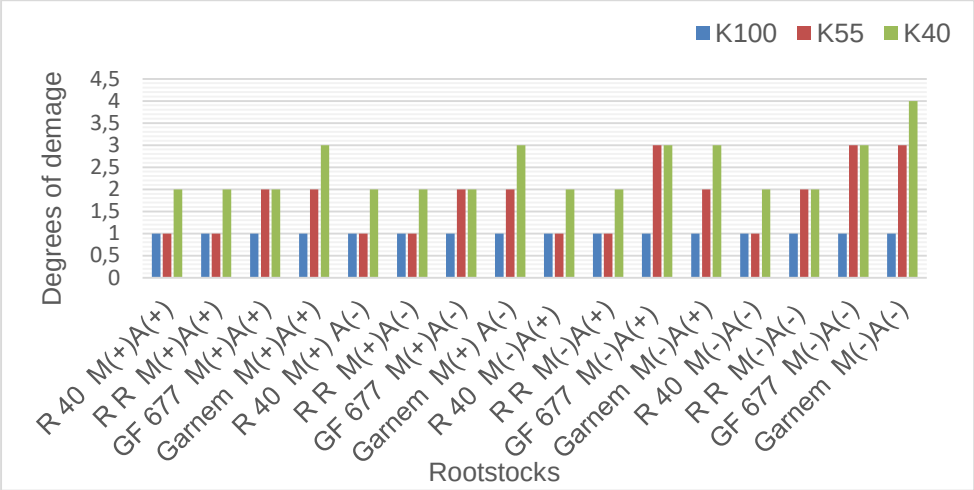

Figure 4. The effect of mycorrhiza and restricted water applications on the degree of damage

The consumption of chemical fertilizers, which aim to increase plant growth and yield, is high in arable agricultural lands. The most accurate way to reach the food production needed by the increasing population in the coming years is to increase soil fertility with environmentally friendly practices. For this purpose, in sustainable agriculture, mycorrhizae improve plant growth, increase yield and positively affect the nutritive quality of fruits and vegetables. As a result of stress applications, it was observed that the damage degrees of mycorrhizal plants increased more than the mycorrhizal plants. Despite the lower colonization rate during drought stress in our study, symbiotic benefits were evident in host plant growth.

CONCLUSION

Pot experiments were conducted in 2019 and 2021, it was determined that mycorrhizal fungi increased the rate of root infection of *Prunus* Rootpac 40, Rootpac R, GF 677 and Garnem rootstocks. Rootpac R rootstock inoculated with *G. mosseae* was determined to have the highest root infection. Rootpac R rootstocks were determined to be least damaged under K40 restricted water conditions. In addition, exceeding mycorrhiza reduced the drought scale values compared to the mycorrhizal ones. The results indicate that mycorrhizal fungi will minimize the drought effect of *Prunus* rootstocks under limited water conditions.

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AGRO INPUTS DISTRIBUTOR AS A KEY CONTRIBUTOR TO THE AGRICULTURAL DYNAMICS IN THE REGION OF ELOUED SOUF

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Abstract

Since 1995, El Oued Souf region has witnessed a qualitative leap in the agricultural sector with the advent of the homemade pivot spraying method, which has has led to a strong expansion of irrigated areas. El Oued Souf has become a major supplier of vegetables onthe national market and a very attractive area for agro inputs distributors. Accordingly, the field study included 120 farms distributed over five municipalities, the first in terms of production. We relied on the descriptive analytical method by interviewingthe farmers using an interview form. The results show that agro inputs distributorshave become a key actorand in this sector by serving as the primary advisor with respect to the use ofthe variousagricultural inputs such as seeds, fertilizers..etc. Among the study's most important recommendations is the need to activate technical institutes and research centers specialized in agricultural and desert agriculture to assist farmers. Making professional associations and organizations more active is another leverage that can be used for that purpose. In addition, a control system on the import of agricultural input was enforcedto ensure quality.

Keywords: Actor, Agricutural output , Agro inputs distributors, Agricultural dynamics ,agricultural input

Introduction

In recent years, we have witnessed an unprecedented agricultural dynamicsin the Souf region, with more than 30,000 farmers and 90,000 Ha of Utilised Agricultural Area (UAA)[1].This wilaya (province)has become an essential agricultural hubin terms of non-food production. This concerns not only dates but market gardening too[2].Undoubtedly, the implementation of the program for access to agricultural land ownership (APFA 1983) [3]as well as the various aids granted to farmers within the framework of the National Agricultural Development Plan(PNDA) are not the only precursors of this agricultural change[4].The agricultural dynamics is also due to the fact that the Sufifarmer differs from other Algerian farmers by his

ability to adapt to the hostile environment where he lives [5], as well as to his ability to innovate constantly. This capacity for adaptation and innovationhave allowed him to live forhundreds of years in an environment which at first glance seems very hostile to any form ofhuman life[6].The Ghouts (Oases) made in the desert constitute a formal proof of the Sufi'sinsight in confronting nature and the climate and transforming the sand dunes into verdant gardens[7]. Currently, the wilaya of Souf ambitionsto become the El Dorado of Saharan agriculture since, in view of the results achieved[8], the wilaya can legitimately contend for either the first or the positionat the national level in terms of production of potatoes, peanuts, dates, tomatoes, olives, etc. And yet, the means are lacking in all farms[9], despite the fact that suchagricultural dynamics can only benefit the national economy and generate significant economic benefits for farmers[10]. However,in terms of sustainability, the intensive use of natural resources such as soil and groundwater can pose long-term environmental issues[11]: Almost skeletal soils (sandy texture) and poor in nutrients, require a large quantity of fertilizer and significant irrigation, for a crop cycle that does not exceed three years[12].In the face of this major concern, our research project should bring solutionsthrough interviews carried out in the wilaya of Souf in a concerted effortwith the various actors in agriculture and water supply [2].We should bear in mindthat the objective of the interviews is to uncoverthe real causes that have favored this agricultural dynamics while emphasizing the actors and their variousroles. And among these actors,theagro inputs distributorsarethehub in Oued Souf, with almost the majority of farmers taking loans from themto cover their needs in phytosanitary products during an agricultural campaign. The transaction is informal, with nothing more thana verbal agreeement you can borrow everything from an agro inputs distributor in Oued Souf and repay all the loans aftermarketing the first harvests. When thedistributorknows hiscustomers well,the loan is grantedautomatically, but if this is not the case, another person must act as guarantor for the customer. So, with regard tothe question on the role of the agro inputs distributorin the agricultural dynamics of Souf, the "MISSION REPORT, PASA" the agro inputs distributor"is considered an actor in the potato value chain in the region of El Oued, located at the MICRO level as an input supply segment[13].But the question arises about their strategies to expand their customer base[14], including the provision of free agricultural advice.

Presentation of the wilaya

The Wilaya of El-Oued, with a large territory of 35,752 km² (1.5% of country's surface area), is part of the vast and rich South-East region, of which El-Oued is also one of the most important citiesin the country.

Historical overview

The Wilaya of El-Oued experienced the settlementof the first human groups during the prehistoric period. It is characterized by the Souf region to the east of the Wilaya in the middle of the eastern Erg. In the Souf region, Ibn-Khaldoun quotes without precision the origin of the tribes populating this region as being the Zenatas. The presence of the Romans and Phoenicians is indicated by the existence of Roman Ruins in several places, the best known of which is El Ogla in the Daïra of Robbah. However, it should be notedthat the region only flourished with the arrival of Muslims under the command of Hassan Ben Nooman who saw the emergence of two tribes in the region: The "Troude" and the "Adouan" who dominated this region until the arrival of the French in 1872.

The natural elements

The Physical Setting

The wilaya of El-Oued is located in the North-East region of the Northern Sahara. The topography is distinguished by a significant drop from sea level on the El-Oued El-Meghaier axis (chotts area), from 75m to 6m. The large geographical units that mark the natural territory of the wilaya are divided into two regions:

The Chotts and depressions

In the North: This region extends around the Melghir and Merouane chotts, it is known mainly for date palm farming in the north and agropastoralism in the north and west.

The Eastern Erg in the South

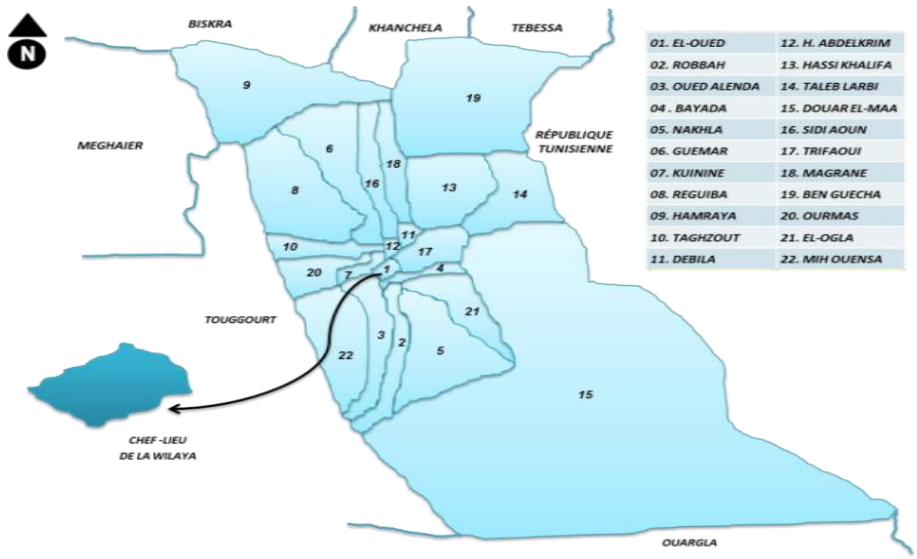
It is a region of phoenicicultural tradition where the proximity of the superficial water table has allowed the cultivation of the palm tree without organized irrigation. In recent years, the region has experienced significant development of irrigated market gardening, peanuts, tomatoes and potatoes in particular.

Geographical overview

Plio-Quaternary deposits constitute almost all of the outcrops encountered throughout the wilaya. Aeolian and Cretaceous outcrops meet to the east.All these deposits are part of the immense Saharan basin. From a tectonic point of view, the wilaya is located in a stable region, where the seismic risk is very low or even zero. In addition, the main rocks encountered throughout the territory of the wilaya and representing the outcrops are rocks of sedimentary to chemical origin: current alluvium, gypso-saline crusts, aeolian sands. **(Monograph of the wilaya of El-Oued 2021).**

Administrative Limits and Divisions:

Formerly attached to the former wilaya of Oasis before the territorial reorganization of 1974, the wilaya of El-Oued was part of the Wilaya of Biskra. After this date and until it became a Wilaya in its own right thanks to administrative division of 1984 with 30 municipalities and 12 daïras. It is currently made up of 22 municipalities and 10 daïras after the last administrative division in 2020. The wilaya covers an area of 35,752 km² with an estimated population at the end of 2021 of 716,905 inhabitants (i.e. a density rate of 20.05 People per sq km). The wilayaof El-Oued is located in the south-east of the country and is limited: to the north by the wilaya of Khenchela;to the North-East by the wilaya of Tebessa;to the northwest by the wilaya of El-Meghaier;to the west by the wilaya of Touggourt;to the south-west by the wilaya of Ouargla andto the east by Tunisia (260 km of border).



LIMITES GÉOGRAPHIQUE ET DÉCOUPAGE ADMINISTRATIF DE LA WILAYA D'EL-OUED

Hydrogeology and hydrography:

The wilaya of El-Oued includes some hydrogeological units which have significant groundwater potential contained in several aquifers, from the so-called free surface aquifer to the deepest which is the Albian. Groundwaterswhich arethe main water resources of the wilaya,fall under three major aquifers, from top to bottom: (i)the ground water also called the sand aquifer;(ii) the limestone aquifer or Senonian aquifer, an aquifer of medium depth, whichhas good characteristics;(iii)the continental intercalary aquifer or the Albian aquifer, a deep aquifer (1000 to 1900 m), whichconstitutes the main aquifer reserve of the region. Surface water resources in the territory of the wilaya of El-Oued are very limited. The north is part of the endorheic basin of Chott Melghir.

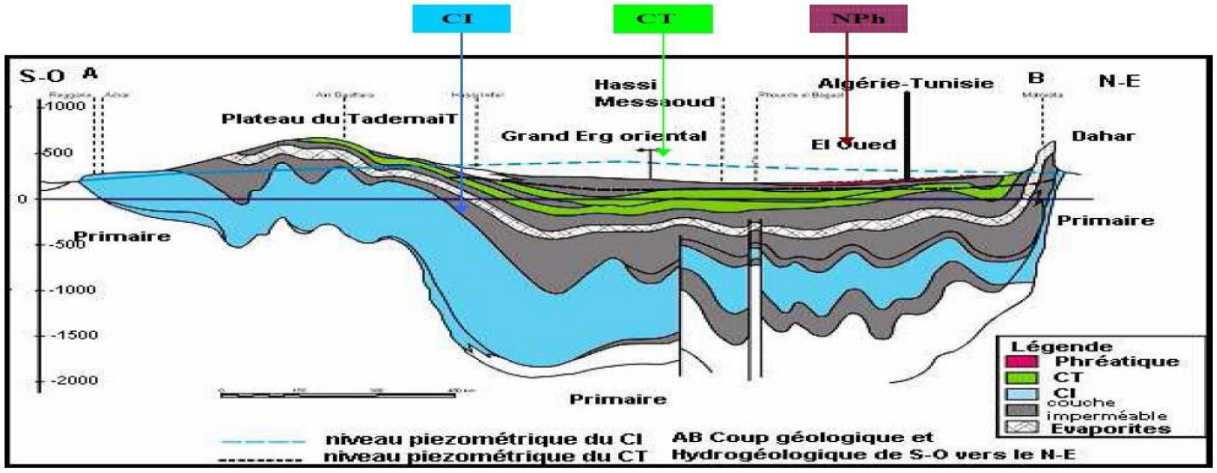
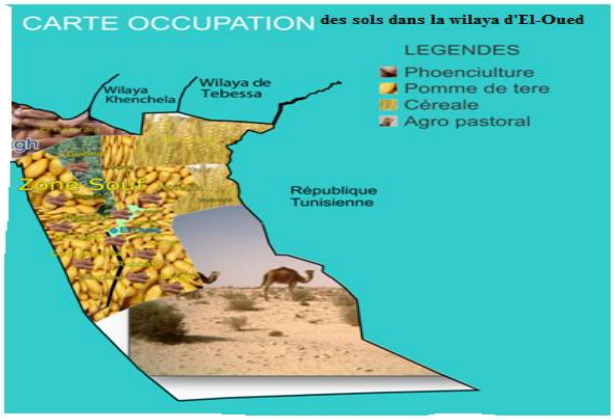


Figure () : Synthetic hydro-geological section of the Northern Sahara (UNESCO, 1972)

Plant cover

The plant cover is scare;it depends on the nature of the soil and the hydrography. Herbaceous and shrubby vegetation is found in the beds of wadis, valleys and the immediate surroundings of the gueltas (pools of water). At the level of the great eastern erg, the drinn: (aristida pungens) is the main plant. It is often associated with shrubby vegetation (Retam, Ephedra Alata, Genista Saharae and Calligonum azel) and with some herbaceous plants (cyperus conglomeratus and moltkiz ciliata). The palm groves are in fact the only place where lush and varied vegetation develops.

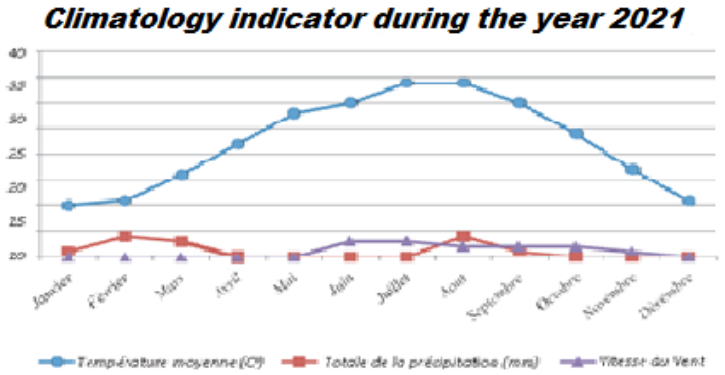


wildlife :

In a desert environment, wildlife is rare. Insectivorous mammals (hedgehog, trunk rat), carnivores (fennec, jackal), rodents (gerbils, mice, jerboas, hares), as well as ungulates (gazelles) are found in the region. Bird species are few. There are also reptiles and arachnids (scorpions, etc.). Insects are the most varied and numerous animal population. In the wetlands (Chotts, Sebkhas, Lakes, etc.) the fauna is more abundant and more diversified. We meet therebirds species: Tailed Godwit, Falcon, Buzzard, Eagle etc… Mammals: Fennec, Jackal, Hyena, Boar etc… Reptiles: Viper, Snake, lizard, etc…

Climatology

The **climate** of the wilaya of El-Oued is of the Saharan type.The monthly average humidityis 42.25%,with January being the wettest month with 60% while June and July are the driest with only 29% air **humidity**. The region has low**precipitation**, with 45.9 mm of rain per year can be considered as little watered. With 13.9 mm of rain, January is the wettest month while March, July and August receive zero (0) mm of rain.**Temperatures** are mild in winter (12° monthly average temperature in December) and very hot in summer (34.5° average in August) where the thermometer often exceeds 40° in the shade. With an average**wind speed of**2.67m/s, the wilaya of El-Oued remains a very windy region (Sirocco, Vent de Sable, Chehili), February beingthe windiest month.



Socio-cultural and economic vocations

The economy of the wilaya of El-Oued is essentially agro-pastoral with 1,055,027 heads of all livestock species combined and a total Utilised Agricultural Area(UAA)of 86,270 Ha (CA 2020-2021), let us quote for example the productions following: Phoeniciculture: 1,216,669 Q of dates over an area of 15,374 Ha. Market gardening: a total production of 19,257,425 Q, including Potato 12,938,925 Q, and Tomato 3,292,230 Q in agricultural campaign (2020-2021).

Agricultural production in ElOued Souf

Agriculture in Souf is currently very diversified as a whole, almost everything is found and although the date palm constitutes the essential element of the oasis ecosystem and a significant source of financial income for the inhabitants, the Sufi inhabitants have knownhow to take advantage of all their natural assets to develop alongside date palms, fruit arboriculture (with stones and seeds) and strategic market gardening crops such as potatoes, tomatoes and garlic, condiments,fodder crops and also cereals.

Répartition des terres agricole : C.Agricole (2020-2021)

Municipalities	Total Agricultural Area (Ha)	U.A.A Totale (Ha)	U.A.A Irrigated (Ha)	Area Phœniciculture in Ha	SAU/ SAT	Irrigated/ U.A.A Totale
El-Oued	2 600	1 409	1 123	576	54,19%	79,70%
Kouinine	2 900	694	611	223	23,93%	88,04%
Reguiba	40 900	10 269	8 438	1542	25,11%	82,17%
Hamraia	60 500	1 126	1 039	910	1,86 %	92,27%
Guemar	22 000	5 423	4 673	1027	24,65%	86,17%
Taghzout	6 400	3 736	3 365	785	58,38%	90,07%
Ourmas	14 300	7 445	6 576	678	52,06%	88,33%
Debila	4 300	2 309	2 138	844	53,70%	92,59%
H. A. Krim	3 700	1 464	1 329	594	39,57%	90,78%
Hassi Khalifa	90 000	10 566	9 435	1885	11,74%	89,30%
Trifaoui	22 300	7 887	6 997	863	35,37%	88,72%
Magrane	14 900	7 078	6 292	910	47,50%	88,90%
Sidi Aoun	10 700	3 948	3 258	810	36,90%	82,52%
Robbah	23 200	1 902	1 681	179	8,20 %	88,38%

Nakhla	25 000	2 288	2 028	241	9,15 %	88,64%
El-Ogla	51 800	906	819	213	1,75 %	90,40%
Bayada	6 100	1 398	1 239	91	22,92%	88,63%
Taleb Larbi	110 300	820	790	577	0,74 %	96,34%
Ben Guecha	193 800	10 658	9 382	474	5,50 %	88,03%
Douar El-Maa	262 400	468	466	386	0,18 %	99,57%
Mih Ouensa	43 200	2 425	2 236	855	5,61 %	92,21%
O. El-Alanda	36 600	2 051	1 885	715	5,60 %	91,91%
Total	**1 047 900**	**86 270**	**75 800**	**1537 4**	**8,23 %**	**87,86 %**
Source: DSA W.El-Oued2022						

Materials and Methods

It's worth noting that my study focused on a specific aspect or subset of the broader project, utilizing only a portion of the questionnaire and data collected for the multidisciplinary overall project. titled "Agricultural dynamism in the SOUF region: what sustainability?"

Choice of intervention areas

With regard to identifying new emerging production systems in the Souf such as market gardening and in particular potato production which has recently experienced unprecedented dynamics, we will try to explore through our surveys the farms potentially potato producer, given that they increasingly specialize in this sector and immediately became the main suppliers of this product for the country. To this end, it is useful to point out that the area devoted to potatoes in the Souf has increased dramatically from 801 Ha in 2000 to 33000 Ha in 2015, i.e. an average increase of 2000 Ha/year. However, 70% of the total production is provided by five main municipalities, namely Hassi Khelifa, Trifaoui, Ouermes, Reguiba and Taghzout and the remaining 30% is produced in the other municipalities of the wilaya of Souf.

Preparing the questionnaire

To carry out our field surveys, we developed a closed questionnaire of 255 questions on 24 pages. This questionnaire comprises six series of questions structured as follows: Information relating to the head of the farm and his family (13 Questions), Land (30 Questions), Wage work (12 Questions), Agricultural production Intermediate consumption and financial resources (2020) (60 Questions), Irrigation Management (45 Questions); Sustainability indicators (95 Questions). This questionnaire hadalready been tested on a dozen farms in

Hassi Khelifa and Trifaoui, with the aim of detecting imperfections in the compilationof the questionnaire and also to complete the missing information.

Sample size

Our survey was spread over three Daïras and five potential potato-producing municipalities and affected a total of 120 farms.

Conduct of investigations

Three outings were carried out in the field with the farmers: The first field visit was carried out from 24/12/2021to 04/01/2021 and lasted 11 days. On the other hand, the second was carried out from 01/28/2021 to 02/07/2021 and also lasted 11 days. And the third field visitwas made from 2021-09-11 to 2021-09-22 and lasted 12 days. It should be noted that almost all farmers do not live on their farms and only travel to their farms to carry out agricultural work or to operate their irrigation pivots. Concerning the winter period, the work at farm begins at 7 am and ends at 2 pm. On the other hand, in the summer period, the work at farm lasts 6 hours (from 4 a.m. to 10 a.m.). Beyond these times, the farms are completely empty until the following day. There are also difficulties in accessing some farms whose access tracksare constantly silted up. In addition, many farm managers do not attach importance to this kind of survey which, in our opinion, bothers them during agricultural work;the farm manager is constantly busywith field work at the same level as the other workers and therefore it is difficult to identify him among the other workers. It should be noted that our work in the field with farmers is not only limited to investigating the different aspects of agricultural production, but we also try to make the farmer interested in our research work by educating him on some basics of the agricultural production based on the failures observed on-site. The Sufi farmer (thirsty for knowledge),seeking to improve his agricultural production, welcomes our recommendations.

Awareness-raising effortstowards farmers touched on the following points: - The advantages of cropping plans and crop rotations; - Disadvantages of monoculture (Potato); - How to improve crop rotation by introducing new crops such as legumes; - The advantages of drip irrigation; - The disadvantages of sprinkler irrigation (Pivot) in an arid environment; - Maintenance of drip irrigation networks to improve the uniformity of watering; - Raising awareness onthe dangers of phytosanitary products on health without any protection; - Identification of some phytosanitary product that are very dangerous for human health; - Physical control against some soil parasites such as the nematode; - How to keep adequate accounts of the various farm expenses for the agricultural campaigns.

For this purpose, we tasked ourselves with developingsheets relating to the various expenses incurred for agricultural work and also the purchase of products, which can be used later by all farmers (regardless of their level of education). These sheets will aim to help the farmer soon to account for his expenses to better manage these finances and on the other hand will constitute a very valuable database for researchers to evaluate the cost of production of different crops as well as the relative agricultural income of thedifferent farms. It should be noted that the section of our survey relating to the various farm expenses takes a lot of time with the farmers, given that the latter are not used to recording their expenses in a register and constantly call on their memories to recall the purchase prices of the various products acquired on the market.

Identification of the operator

The analysis of the results of the survey made it possible to distinguish differences between the producers. The criteria that differentiate are the following:

Age of farmers:

In figure (A), we can see that 49% of farmers are aged between 31-41 years and over with 11% being over 53 years old. The category of operators aged between 42-52 years represents

approximately 30% of our sample. The figure below shows the distribution of operators surveyed according to their age.

Level of education:

Figure (B) , shows that 3.33% of farms are illiterate, 59% have a primary school level, 17.5% have a secondary school, and 15% have a University level. Also, 4% producers have a Koranic school level (religious schooling).

Experience of farmers:

According to this figure(C), we see that more than 20% of farmers have a seniority exceeding 21 years. While only 26% have experience of less than 10 years and 53% have seniority between 11-20 years

Remunerated activity other than agriculture:

The figure(D)&(E) below clearly shows that 77% of farmers only practice agriculture and have no other sources of income, and 23% of farmers perform other functions (34% liberalprofessions, 23% Civil service, 19% for trade and likewise for transport, and the rest 3% other activities).

Identification of ownership

It is recalled that our survey covered120 farms spread over 05 municipalities. These farms use the local pivot irrigation system

Legal status:

The legal status of farms is presented as follows in figure (F), which shows that 47.5% of all farms have a State legal status, 35% are within the framework of the APFA access to agricultural land ownership law of 1983), 12.5% are concessions and 52.5% are private sector operations.

Farm size:

The size of the farm is an essential criterion for the adoption of a given production system, combined with the location, the climate and the availability of irrigation water. Size determines the technical and economic choices of farmers. According to the survey results, farmers use almost all the agricultural land. The figure(G), below shows that 58.5% of all farms have an area of less than 20 hectares. In addition, it should be noted that the remaining farms have an area greater than 20 hectares, which represents 41.5% of the total.

Supply oforganic manure:

The region of El-Oued has a sandy-textured soil poor in organic matter and characterized by high water permeability. All the farmers involved in our survey use poultry manure (chickens) 35%, followed by often mixed manure (sheep and poultry) 18.49%, and cattle manure 18.49%. Mixed manure (cattle and poultry) 16.81 %. as an organic manure for potato cultivation; with an estimated quantity of about 30 tons in one hectare.

Mineral manure:

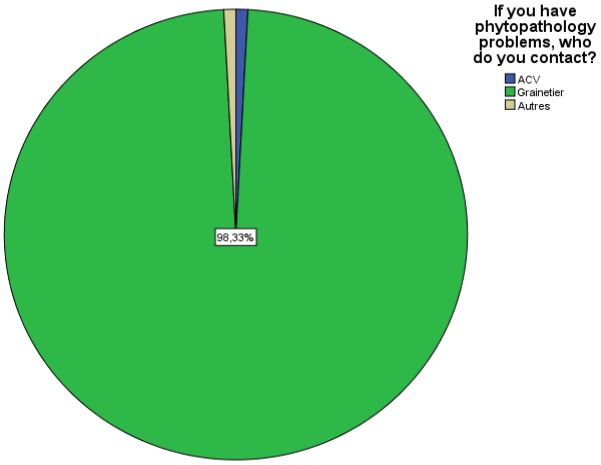
We noticed during our survey that farmers in all the regions resort to fertilizersdue to their essential role in increasing yields. Almost 73% of farmers use NPK (15-15-15) with a dose of 03 Q/ha, often mixed with 01 Q of 46% urea during plant emergence. According to the survey results, farmers use NPK (20-20-20). The dose of this type of fertilizer is 10 Kg/ha. It is performedon two fractions throughout the vegetative cycle. Phosphorus PO5 with a dose of 02 L/ha is used by farmers. For the amino acid, the dose is02 L / ha. The same dose (02L/ha) is used for Master: PK (45-55) PK (45-55) .

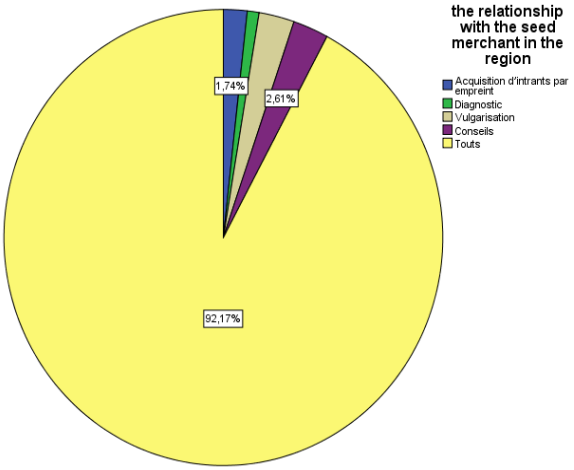
Phytosanitary treatment

We noticed during our survey that farmers in the study areas practice phytosanitary treatments using chemicals to fight diseases and parasites. The quantity supplied and the cost of each product (insecticides, fungicides and herbicides)is practically the same for all the farms surveyed. Most of the farmers use the following products(Table 1),(table2)&(table3).

The Report with the agro inputs distributor of the region

According to the survey, the **agro inputs distributor** operating in the area of our survey, these distributors constitute the hub at Oued Souf (Acquisition of inputs, making the diagnosis, Popularizing and providing advice to their customers and information on the use of agricultural inputs at the time of purchase). They are relatively young (31 years on average) with a degree in agricultural engineering. Almost the majority of farmers use a loan from the inputs distributor to cover their phytosanitary product needs during an agricultural campaign. The distributor sells all types of agricultural inputs, mainly those intended for market gardening (seeds, fertilizers, phytosanitary products, small agricultural equipment and various hardware products). Automatically, on the other hand the farmers that he does not know, another person must act as guarantor for them so that they can benefit from these loans.





Conclusions and Recommendations

The investigation regarding the role of the agro inputs distributor as a major player in the agricultural dynamism in the Souf region reveal several lessons about the rules, the actors, and the mechanisms of the agricultural dynamism that are not apparent and that do not appear at first glance. The first of these lessons is that the role of the agro input distributor is not limited to the process of selling agricultural inputs and phytosanitary products, but rather plays several roles. However, one should question whether the advice provided by the agro

input distributors is sustainable and takes into account environmental, social and economic issues and risks? And also, whether it takes take administrative, financial and economic considerations for the farmer? Indeed, directing the producers towards excessive use, high quantities, "chemicalization" of agriculture and increasing the use of imported seeds can lead to health and environmental problems. As the survey reveals, due to the lack of information among the producers, the latter seek advice from the agro inputs distributor whose main drive is primarily to increase his sales. He can advise on using some products that can be dangerous when used on a large scale or recommending pesticides at quantities that may be harmful for the farmer. These distributors are constantly introducing new Agricultural inputs to the market, and are marketing these inputs as more up-to-date, , efficient, and usually more affordable to the peasants. But this makes us question again whether these les grènetiers distributors have the necessary knowledge about plant diseases and the extent of the impact of all agricultural input products and phytosanitary products. Hence, the necessity of activating the technical institutes and research centers specialized in the field of agricultural and desert agriculture to provide support and counseling to the farmers, given that these institutions already exist as is the case of the ITDAS, ITAF, ITCMI, INPV, INRA, INCID, which can carry out research that can greatly help farmers. Furthermore, there is a need to intensify extension activities for farmers and to carry out information and awareness days and providing guidance over radio channels.. Additionally, it would greatly help to organize field visits to agricultural farms to find out about the problems facing farmers, especially information about the various plant diseases that negatively affect production yield. There is also the need to activate the role of professional associations and organizations. Moreover, it is necessary to implement an effective control system on the import of agricultural inputs to ensure quality. To conclude, there is an urgent need today for concerted efforts and coordinated action among all partners and stakeholders in the field of agricultural development. These efforts can only contribute to achieving the desired goal, which is to contribute effectively to improving the food security of the country and to reducing economic dependence.

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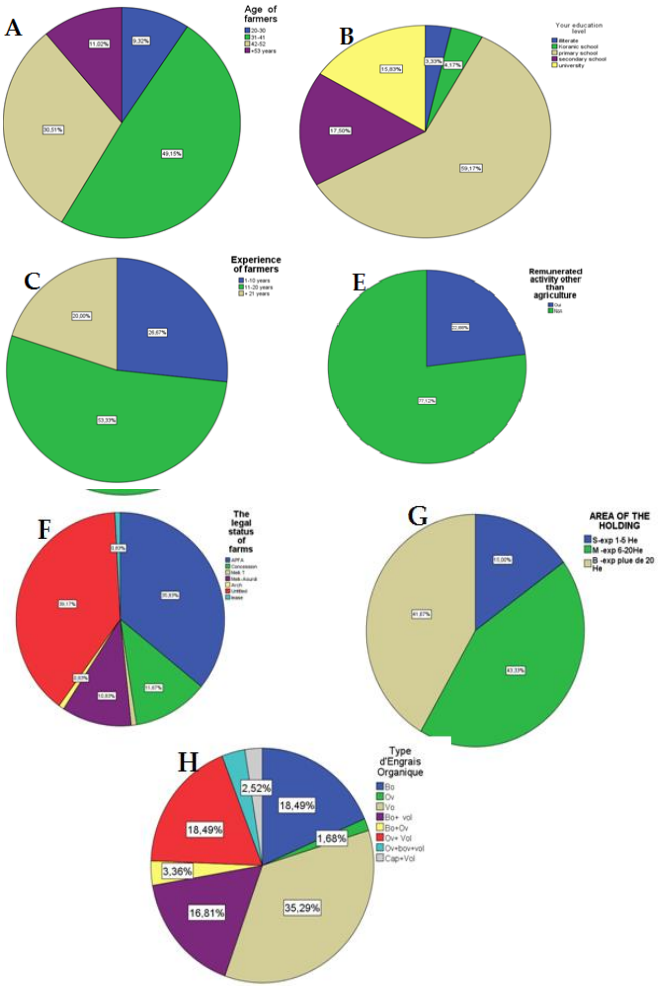
Supplements



Insecticide products(Table 1)

Insecticides used	Quantity use
Ampligo 150	01 ou 2 litre
Zinad	01 ou 2 litre
Karateka	01 ou 2 litre
Aster-extrim (Pucerons)	01 ou 2 litre
Aceplan	01 ou 2 litre
Confidor	01 ou 2 litre
Massai	01 ou 2 litre
Amistar top	01 ou 2 litre
Score	01 ou 2 litre
Rezonate	01 ou 2 litre
Mondiale	01 ou 2 litre
Ampligo 150	01 ou 2 litre
Zinad	01 ou 2 litre

Fungicides Products (Table 2)

Most used fungicides	Quantity used or Dose/1 Ha
Previcur	250 ml ou 500ml
Terazole	250 ml ou 500ml
Procure	250 ml ou 500ml
Tachigazol	250 ml ou 500ml
Aliette flash	250 ml ou 500ml
Propinebe	250 ml ou 500ml
Valette	250 ml ou 500ml
Foliette	250 ml ou 500ml

Herbicide products (table3).

Most utilised herbicides (N'jam, Dis,...)	Quantity used or Dose/1 Ha
Metricam	0.5kg ou 1 kg
Goal	0.5kg ou 1 kg
Mandor	0.5kg ou 1 kg
Tribuzine	0.5kg ou 1 kg
Mitrixone	0.5kg ou 1 kg
Sencorate	0.5kg ou 1 kg
vapcore	0.5kg ou 1 kg
Metriphar	0.5kg ou 1 kg
Basagran	0.5kg ou 1 kg

CHEMICAL METHODS USED IN MEAT PROTECTION

ET KORUMADA KULLANILAN KİMYASAL YÖNTEMLER

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ABSTRACT:

Meat is the protein source of animal origin that most consumers prefer. Meat consumption is increasing worldwide. For this reason, it is very important to prepare meat, prepare them for consumption and store them for a long time. As a result of spoilage of meat, the color and texture change, it becomes sticky and bad smell and taste are observed.

The methods used can be divided into three parts: physical, chemical and biological. The salt method used to preserve meat is an alchemical method that has been used since ancient times. Other chemicals considered as food additives are also used to preserve meat. In this review, the chemical methods used in meat preservation are explained.

Keywords: chemical protection, meat, permanent storage

ÖZET:

Et, çoğu tüketicinin tercih ettiği hayvansal protein kaynağıdır. Et tüketimi dünya çapında artmaktadır. Bu nedenle etlerin hazırlanması, tüketime hazır hale getirilmesi ve uzun süre saklanması oldukça önemlidir. Etin bozulması sonucunda rengi ve dokusu değişir, yapışkan hale gelir, kötü koku ve tat görülür.

Kullanılan yöntemler üç bölüme ayrılabilir: fiziksel, kimyasal ve biyolojik. Eti muhafaza etmek için kullanılan tuz yöntemi eski çağlardan beri kullanılan simyasal bir yöntemdir. Gıda katkı maddesi olarak kabul edilen diğer kimyasallar da eti korumak için kullanılır. Bu derlemede et muhafazasında kullanılan kimyasal yöntemler anlatılmaktadır.

Anahtar kelimeler: kimyasal koruma, et, kalıcı depolama

ECOLOGICAL NICHE MODELING OF AN AGRICULTURAL INTEREST SPECIES BY USING BIOCLIMATIC AND NON-BIOCLIMATIC VARIABLES

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ABSTRACT

The pomegranate (Punica granatum L.) is considered a plant of agronomic interest because of its tolerance to drought and its ability to survive and produce fruit even during periods of low rainfall. These characterizations make it an attractive variety to grow in regions where water is limited or drought conditions are frequent. Determining its potential range under current climatic conditions is an essential step in planning and ensuring its distribution. We modeled the distribution of the potential area in Morocco using the "MaxEnt" maximum entropy approach. The values of the area under the curve (AUC) for the implementation of the MaxEnt model and for its test are 0.962 and 0.959, respectively. The most significant variables affecting the distribution of pomegranates under current climatic conditions are rainfall in the coldest quarter, rainfall seasonality (coefficient of variation), rainfall in the wettest quarter, and elevation. The model developed has made it possible to draw up the first map of the potential area of suitable zones for Moroccan pomegranates. The results obtained will guide agronomy managers in identifying favorable sites for pomegranate distribution.

Keywords: Punica granatum L; drought; MaxEnt; modeling; Morocco.

PLANTS UNDER STRESS: THE IMPACTS OF QUARRIES DUST

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ABSTRACT

The quarrying is a vast domain repose essentially on exploitation of rocks like : aggregates, phosphates iron in open pit mines and many other minerals. Unfortunately, this important sector have a significant impacts against the fauna and flora. Quarry dust, a byproduct of stone crushing, has been found to have negative effects on plant growth and development. When quarry dust is present in the soil, it can alter the soil's physical and chemical properties, leading to reduced water retention and nutrient availability. This can cause stress to plants, which may result in stunted growth or even damage.

Additionally, quarry dust can also impact plant health through its effects on air quality. When quarry dust is present in the air, Plants can inhale it, damaging their leaves and respiratory systems. This can exacerbate the stress plants suffer from exposure to quarry dust.

Plants are complex organisms that rely on various physiological processes to survive and thrive. One such process is photosynthesis. So Understanding plant physiology is crucial for effective plant protection. Plants have complex systems that allow them to absorb nutrients, water, and sunlight, and convert them into energy through photosynthesis. dust can clog their stomata and interfere with their ability to perform these critical functions.

Dust impacts can have a range of adverse effects on plants, including reduced growth and yield, increased susceptibility to pests and diseases, and even death in severe cases. To protect plants from dust impacts, it is important to implement measures such as regular irrigation, mulching, and using windbreaks to minimize the amount of dust that reaches plants.

Keywords: Plant Physiology; Plant Protection; Quarrying; Dust Impacts.

FEMINISATION OF AGRICULTURE: A CASE STUDY OF INDIA

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Abstract

According to the 2011 census, approximately 33.7% of rural males have been migrated in search of jobs for better economic condition or opportunities and this sitution is leading towords the feminization of the agriculture sector. National Sample Survey Office (NSSO, 68th round) in 2011-12, also indicates that the total percentage workers engaged in agriculture was 48.9% and percentage of women engaged in agriculture sector was 62.8%. 75% of all rural female workers are engaged in the agricultural sector. So here first question emersed that who we actually consider as farmers? Women are not even considered as farmers, though they constitute the majority of the Indian agro industry. Reason behind this is that land is an important factor which lies in the ownership of men only because of the patriarchal structure of society. Even if we look to the payment of labour, we can witness a significant difference in wages between men and women. in such condition, this article discuss how India's natural farming policy should recognize women's new role. It talks about the feminization of agriculture in India, issues concerning the women in this sector and Indian Government Policy Initiatives towards the issues. This article also analysis what needs to be done in order to understand the various problems prevalent in the sector and what kind of policy intervention can be undertaken for Feminization of Labour vs. Feminization of Empowerment in Agriculture

Keywords: Feminization, Agriculture, Rural Transformation, Development, Gender, Government Policy Initiatives

Introduction

Generally, the term feminization is used to refer for the increasing women's participation in a particular activity or services. When we use this term regarding an employment, the term can be used to signify feminization of that particular sector or industry where growing participation of women could be noticed; for example, in agriculture, or politics or the garment industry or Defiance. The definition of agriculture sector's feminization, given by Deere (Deere, 2005); Increase in participation rates in the agricultural sector and the share of the agricultural labour force of female; that can be resulted in higher rate of female activity and/or can decrease the participation rate of male in agriculture and women, who have always been accounted as unpaid family labour, resulted into their greater visibility as agrarian paid workers or self-steam farmers in recent years.

Although, women constitute a major part of the agriculture sector in the country and the term feminization of agriculture is not a new in India (This phenomenon earlier acknowledged by Duvvury, 1989 and Chowdhry, 1993), but the term 'feminization of agriculture' was first tabled in Indian Parliament by the Shri Arun Jaitley, then Union Minister for Finance and Corporate Affairs (Economic Survey 2017-18). Which described the pattern of increasing role of women workforce in agricultural sector and its allied services. However, in the present context it has gained massive importance, with a decreasing growth of income and downfall of employment in this sector.

Is Agriculture Sector in Indian Undergoing Through Feminization?

According to the 2011 census, approximately 33.7% of rural males have been migrated for jobs search and to find a better economic opportunities (Census, 2011). National Sample Survey Office (NSSO, 68th round) in 2011-12, also indicates that the total percentage workers engaged in agriculture was 48.9% and percentage of women engaged in agriculture sector was 62.8%. 75% of all rural female workers are engaged in the agricultural sector. So the 2011 Census indicates two trends:

(a) There is a 24% increase in engagement of female as agricultural labourers from 49.5 million in 2001 to 61.6 million in 2011;
(b) There is decline in female cultivators; that indicates, in 2011 women's access to cultivable agricultural land has increased from 41.9 million in 2001 to 36 million.

These conditions is leading them to increase their active and constructive participation in agriculture, mostly as cultivators or entrepreneurs or labourers (Domination of Dalit women could be seen in this role). The agriculture sector employs 33% women as agriculture labourers and 48% as self-employed farmers out of 80% of all women workforce in India and these figures support this phenomenon that the agriculture sector in Indian is undergoing through feminization.

Reason Behind the Feminization of Agriculture Sector in Indian

Because of shrinking employment opportunities in agriculture, men started trying to find the opportunity in non-farm sectors in urban areas, and the migration emerged as a key strategy for their livelihood. But we couldn't find women predominantly in any of these trends. So increasing migration rate of rural men, is also increasing demands and creating opportunity for women workforce in this sector because it is also believed that women are easily available for low-paying irregular employments, who can easily hired and fired as an unfree labour. Although for supplementing the family's income women generally work as agricultural or domestic laborers, but the concept of a "breadwinner" has always been associated with men from the ages. COVID-19 pandemic brough a different scenario in this regard, when men lost their jobs due to the pandemic and return back to the villages and in such situation large number of women in rural India took charge of farming, playing a key role in providing economic support and food security to their households.

Feminization of Labour vs. Feminization of Empowerment: Facts

The increasing number of women in agriculture has been attributed to the increasing out migration of male members which is basically distress migration's nature. While men are moving out of agriculture, women have to continue to take care of the land, either as managers or as helpers, although a women's operational land holding remains at 12.79%. Furthermore, in the NABARD report 2016-17, The gender distribution of household heads was studied to estimate the proportion of female headed households. Taking all households

combined, 11.8% households reported females as their heads. When analysed by the type of household, some disparity was observed with only 9% of agricultural households reporting to have female heads as compared to 14% female heads in non-agricultural households. (The NABARD report 2016-17) The Economic Survey 2017-18 further mentions the concentration of women's operational holdings (25.7 per cent) in the small and marginal holdings categories. (The Economic Survey 2017-18)

Table 1 : Percentage of operational holdings owned by women

Size Group	2000-01	2005-06	2010-11
Marginal (Below 1.00 ha.)	11.8	12.6	**13.6**
Small (1.00-2.00 ha.)	10.3	11.1	**12.2**
Semi-Medium (2.00-4.00 ha.)	8.7	9.6	10.5
Medium (4.00-10.00 ha.)	6.9	7.8	8.5
Large (Above10.00 ha.)	5.2	6.0	6.8
All Size Groups	10.8	11.7	**12.8**

(Agricultural census, 2010-11)

Therefore, the analysis for Feminization of Labour vs. Feminization of Empowerment in Agriculture needs to be done in order to understand the various problems prevalent in the sector and the policy intervention that can be undertaken.

Issues concerning the sector

- **Lack of Visibility, Recognition and Support as Farmers**

This denies them various entitlements and support systems that are due to them since the status of "farmer" is usually conferred to land owners. Since, land ownership is definitionally a part of being a farmer, it restricts the access of women to various Government Schemes and policies. This also acts as a deterrent, limiting female participation in agriculture training programmes.

As per census 2011 figures list only 32.8 per cent women formally as primary workers in the agricultural sector, in contrast to 81.1 per cent men (Census 2011). The latest data regarding the number of workers employed in agriculture during PLFS years, million (Niti Aayog Discussion Paper, March 2022):

Year	Sex	Rural
2017–18	Male	135.2
2018–19	Male	130.3
2019–20	Male	141.5
2017–18	Female	58.0
2018–19	Female	61.1
2019–20	Female	83.4
2017–18	Person	193.2
2018–19	Person	191.3
2019–20	Person	224.8

The undeniable fact remains that India's agricultural industry, which employs 80 to 100 million women and these numbers strongly indicates that India's agricultural industry cannot survive without their labour.

- **Lower Wages**

It has also been seen that women often get wages lower than stipulated wages when compared to men. A large number of women are dropping out of the labor force. One of the reasons why this is happening is due to mechanization of agriculture, which makes it all the more difficult for them to continue with farming as an occupation.

According to a study conducted by the Center for Study of Developing Societies (CSDS), 76% of the farmers in Indian wish to quit farming, if given an option. The report says that benefits of government schemes and policies are being mostly given to big farmers having landholding of 10 acres (4.05 hectare) and above. Only 10 per cent of poor and small farmers with average land holding of 1-4 acres (0.4 to 1.6 ha) have benefited from government schemes and subsidies. The farmers blamed the state and Central governments for their present condition as 74 per cent of those interviewed alleged they do not get any farming-related information from officials of the agriculture department. Women respondents comprised of 16.7 per cent of the sample. (The CSDS study report, 2014)

- **Equal Share in the Property**

By law most women in this country have an equal share in the property but in practice this is not followed. Also, there is no clear and accurate picture available on women land ownership since there is no disaggregated information maintained on the same. The number varies in each estimated survey done by different agencies. for example, as per the agricultural census

of 2015-16 only 13.9% of women own land holdings (Agricultural Census of 2015-16), But as per the National Family Health Survey, in 2015-'16, women's own around 28.3% land, independent or otherwise. (Choudhury, March11, 2021)

- **Farm Suicides**

K Nagaraj's paper in 2008 based on 2001 census data points out that farms suicide rates were higher than general suicide rate in the population, both for males and females. Farmer suicides have seen a steep rise from 11,772 in 2013 to 12,602 in 2015. He acknowledges that there could be an undercounting of female farms suicide since identification as a farmer is linked to land title. (Nagaraj, 2008) What is often overlooked in this debate is the fate of the family member, especially the widows who are left to bear the burden of running the agri-enterprise as well as deal with debt burden that the deceased leaves behind.

The Government of India's National Policy for Farmers, 2007 recommended to extend maternity benefits and other social security measures such as unemployment insurance to women in the agriculture sector. This has acquired greater significance in view of the increasing incidence of farmer suicides in the country. But, its implementation still lags behind. (The National Policy for Farmers, 2007)

According to the data of the National Crime Records Bureau (NCRB) mentioned as Accidental Deaths and Suicides in India 2021, people who are engaged in the farming sector accounted for about 6.6 per cent of the total number of suicides reported in India. the report mentioned that during 2021 total suicides victims were 1,64,033 in the country, out of that 10,881 persons (accounting for 6.6%) were from the agrarian sector (including 5,318 farmers or cultivators and 5,563 agro labourers). Out of 5,318 farmer/cultivator, a total of 5,107 were men and 211 were women, who committed suicide". (NSRB, 2021)

Policy Initiatives and measures taken by the Indian government

The gap between men and women, regarding the access to resources like land, wages, credit, water, skills, seeds and markets, which is need to be addressed. Government constantly implementing various schemes to support, aware and trained the women farmer, which is aimed to be advantageous in building the bridge to cover the existed policy gaps in the sector. The following initiative have been taken to ensure women could come further and be in the mainstream of agriculture sector:

- For the women beneficiaries in all ongoing schemes or programmes and development activities, Govt has earmarked at least 30% of the total budget allocation. This was started in 2005-06 along with Gender Budgeting.
- Government has initiated women centric activities so that benefits of various beneficiary-oriented programs/schemes could reach them.
- Government has focused on women self-help group (SHG), so that they can be connected to micro-credit through capacity building activities and providing them information, so that their representation in different decision-making bodies can be ensured.
- In 2016 the Ministry of Agriculture and Farmers Welfare, Government of India declared 15th October of every year will be celebrated as Women Farmer's Day, so the critical role of women in agrarian sector can be recognized. Women predominant at all levels- production, pre-harvest, post-harvest processing, packaging, marketing-

of the agricultural value chain will help to increase the productivity in agrarian sector and imperative to adopt gender specific interventions. An 'inclusive transformative policy in agrarian sector' need to aim at gender-specific interventions so that productivity raise of small farm holdings, women's involvement as active agents in the transformation of rural area, and engagement of men and women in extension services with gender expertise, can be done.

- Pradhan Mantri Fasal Bima Yojna

  According to agriculture ministry's figures, insurance companies received a gross premium of Rs 22,180 crore in 2016-17 - Rs 4,383 crore from farmers and Rs 17,796 crore from Centre and state governments as subsidy. Out of the gross premium, the insurance companies paid out Rs 12,949 crore as claims to the 1.2 crore farmers. The average crop insurance claim to farmers for 2016-17 was Rs 10,790.83.

  In last five years the gross premium collected by the insurance companies is around Rs 40,000 crore under the PMFBY, its inception in 2016-17 to Kharif (summer crop) 2021-22.
  The Agriculture Minister of GOI told the Rajya Sabha that the claims of Rs 1,19,314 crore paid by the companies to the farmers, against the premium of Rs 1,59,132 crore, collected by the insurance companies.(Mohan, 2022)

  In beginning year (2016-17) of its implementation, farmers very well received this scheme and that time the coverage reached 30% of Gross Cropped Area (GCA), but later on popularity of this scheme declined GCA decreased to 27% in 2018-19 and 25% in 2019-2020. (Mohan, 2022)

  The much talked about PMFBY, has no provisions for women farmers. The operational guidelines read,

  "Special efforts to ensure the maximum coverage for the SC/ ST/ Women farmers under the scheme, shall be made. Budget allocation and utilization under these segments should be in proportion of land holding of SC/ ST/ General along with Women in the respective state/ cluster." (Ministry ofAgriculture & Farmers Welfare, GOI. *Operational Guidelines: Pradha Mantri Fasal Bima Yojna.)*

  There is no mention of what special efforts would be taken and how these efforts would help women farmers. According to a report by the Center for Science and Development, at the state level, its vision is diluted. At the district level, its implementation is seriously compromised. PMFBY is a classic case of poor implementation of a great scheme.

- To meet the specific needs of women farmers, the Department of Rural Development is implementing a programme 'Mahila Kisan Sashaktikaran Pariyojana (MKSP), which is a segment of National Rural Livelihood Mission (NRLM)- predominantly small and marginal farmers and achieve their socio economic and technical empowerment so as to enable them to manage and sustain their activities. The primary objective of "Mahila Kisan Sashaktikaran Pariyojana (MKSP)" implemented by Ministry of Rural Development is to empower women in agrarian sector by making systematic investments to enhance their participation and productivity, also to create and sustain their livelihoods. Under the Pariyojana, projects are conceived in such a manner that the skill base of the women in agriculture is enhanced to enable them to

pursue their livelihoods on a sustainable basis. (National Livelihood Rural Mission, Government of India)

- In line with the National Policy on Farmers (2007), the Department is promoting 'Mainstreaming of women in Agriculture' with participation of both men and women in formation of Self Help Groups/Farmers Interest Groups. The Indian Council of Agricultural Research (ICAR) has established a network of 642 Krishi Vigyan Kendras (KVKs) in the country aiming at assessment and demonstration of technologies/products and its dissemination through number of extension programmes including training of farmers to update their knowledge and skills. During the year 2015-16, KVKs have worked with 2708 women SHGs involving 37,920 women members in different activities.

Conclusion

Feminization provides public sphere to women, which gives visibility to their labour and acknowledge for (sometime, not always), and can potentially to lead women to build & develop their skills & confidence. It also provide them an opportunity to enhance their bargaining power. Pro-women farmer policies has also been acknowledged by the government and appropriate policies can bring better wellbeing and empowered outcomes for rural women by making them economically independent. Kudumbashree—a scheme by the Kerala Govt for poverty eradication and women empowerment, is one good example of that.

The role of civil society is also very important role in mobilizing agrarian women, aware them about their rights, creating bridge between agrarian women an Govt, and training them. Work of Deccan Development Society in Telangana, Musahar Manch and ActionAid of eastern Uttar Pradesh (in some districts) can be seen as example of that. Even Govt also running programme for this, like Mahila Biotech-KISAN fellowships- a training programme for agrarian women which unable them adopt best practices in the agriculture sector, Community Managed Sustainable Agriculture (CMSA), Non-Pesticide Management (NPM), Zero Budget Natural Farming, Pashu-Sakhi model for doorstep animal care services etc.

Finally it's a high time to address one of the long-standing gender issues. To ensure the removal of patriarchal structures from the society in an efficient way, rural women's economic empowerment must be the priority of Govt.

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FIRST REPORT OF CRATAERINA PALLIDA (OLIVIER IN LATREILLE, 1811) IN APUS APUS BIRDS IN TÜRKİYE: A CASE SERIES

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ABSTRACT

Louse flies (Diptera: Hippoboscidae) are obligatory blood-sucking ectoparasites that infest mammals and birds. Among this group, *Crataerina pallida* (Olivier in Latreille, 1811), is a non-flying, highly mobile, extremely agile, and monoxenous parasite. It parasitizes swifts (*Apus apus* Linnaeus, 1758), which are migratory birds commonly seen in the European continent between May and September. Swifts predominantly perform their usual activities (feeding, sleeping, social interaction, etc.) while flying. Infection with vector-borne parasites (mosquitoes, houseflies, etc.) is of a low probability since they spend a limited period of time (breeding, bad weather conditions, etc.) on land. However, *Crataerina pallida*, which deposits its pupae in bird nests and rapidly infests them, stand out as the most important ectoparasite affecting these birds.

Five swift birds brought to Wildlife Conservation, Rescue, Rehabilitation Application and Research Center of Kafkas University in May 2023, constituting the study material. Four of the birds were brought to the center from the Central district of Kars province, and one from the central district of the Erzurum province by citizens. After species and age identification of

the birds, ectoparasite screening was performed. The collected fly samples were preserved in 70% alcohol, and later species were identified under a stereo microscope with the help of the literature.

The species of four fly specimens collected from two young birds were identified to be *Crataerina pallida*. Three of the *C. pallida* flies obtained from swift birds were determined to be male, and one was female. The female *C. pallida* was found to had fed on blood.

In conclusion, due to the limited knowledge available on the biology of *Crataerina pallida* species, this study is considered a preliminary investigation to explain the host-parasite relationship and determine their vectorial characteristics. The occurance of *Crataerina pallida*, commonly observed in swift birds, is reported for the first time in Türkiye and it is beleived to contribute to the existing literature. This study was supported by the Scientific Research Projects Coordination Unit of Kafkas University (Project number: 2023-TS-32).

Keywords: *Apus apus*, Swifts, *Crataerina pallida*, wildlife, hippoboscidae

EXPLORING CASEIN-SPECIFIC PROTEASE: PURIFICATION, PROPERTIES AND MILK CURDLING CONFIRMATION

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Abstract

Proteases are a diverse group of enzymes widely utilized in various industries. In the production of dairy products, proteases play a crucial role, particularly in cheese-making processes where they are used for coagulating milk.

This study focused on exploring an enzyme preparation derived from a microbial source, which exhibited a different enzymatic effect on milk compared to other proteases. Revealed that the protease preparation curdled the milk instead of coagulation. This novel enzymatic effect piqued our interest, leading to further investigation of this enzyme.

Through ion exchange chromatography on DEAE-cellulose, the above-mentioned enzyme was successfully obtained in pure form. Optimal pH and temperature conditions were determined, and the enzyme's proteolytic activity was assessed using various measurement methods. Electromobility was employed to characterize the enzyme, and its homogeneity was evaluated via electrophoresis under denaturing conditions.

Additionally, the purified enzyme was utilized to repeat the process of milk curdling, revealing that the action of the enzyme led to the formation of a curd mass resembling the texture and taste of cottage cheese. Importantly, the resulting product obtained from the purified enzyme differed structurally from those derived from other enzymes. Both the

enzyme and the resultant product require further investigation to establish quality indicators, necessitating additional studies.

Keywords: enzyme, proteolytic activity, milk curdling, Proteases, cottage cheese.

INTRODUCTION

Milk-clotting enzymes, obtained from animal, plant, and microbial sources have been used since antiquity for the manufacture of cheese and other foods. Milk coagulation is a basic step in cheese manufacturing, which is usually accomplished through the action of a milk-clotting enzyme. There are many sources of enzymes, ranging from plants, fungi, and microbial sources, that will substitute animal rennet. They are easy to generate and purify and do not rely on the availability of animal material. One-third of the rennet used at present for cheese making worldwide is from microbial sources, Microbial rennets from different sources differ in their molecular weights, isoelectric points, specific activity, amino acid composition, and glycoprotein nature (Ruchi, 2010; Bernardinelli et al. 1983; Kumar et al. 1999; Singh et al., 2016.

This study presents the study of a protease enzyme isolated from *Penicillium candidum 5-1* and the confirmation of its unique property of curdling milk.

METHODOLOGY

Partial purification of protease

Fractionation with ammonium sulphate For the initial purification step, the supernatant was subjected to fractionation by increasing the concentration of ammonium sulphate(Green, et.al 1955). The ammonium sulphate was added to the supernatant to give a saturation concentration of 20%. The precipitate was removed by centrifugation (for 15 min at 4 C). The ammonium sulphate concentration was increased stepwise, where at every additional 20% of ammonium sulphate, precipitates were collected by centrifugation (20,200g for 15 min at 4 C). Fractions obtained with 20%, 40%, 60%, 80%. The precipitates collected by centrifugation were dissolved in 2 ml of phosphate buffer 0.1 M (pH 6.0). The enzyme solution was dialyzed against the same buffer for 24 h with several changes to remove the salt. The proteolytic and milk-clotting activity of each protein fraction was determined (Green, et. al 1955).

Assay for milk clotting activity

Milk clotting activity was determined according to the method of Arima (Arima et al. 1970) and expressed in terms of Soxhlet units (SU). One SU is defined as the amount of enzyme which clots 1ml of a solution containing 0.1 g skim milk powder and 0.00111 g calcium chlorides in 40 min at 35°C. In brief, 0.5 ml of tested materials were added to a test tube containing 5 ml of reconstituted skim milk solution (10g dry skim milk/100 ml, 0.01 M CaCl2) pre-incubated at 35°C for 5 min. The mixture was mixed well and the clotting time T (sec), the time period starting from the addition of test material to the first appearance of clots of milk solution, was recorded and the clotting activity was calculated using the following formula: SU= 2400x5xD/Tx0.5; T= clotting time (sec); D=Dilution of a test material. The test materials include a liquid solution of a crude enzyme and commercial chymosin.

Purification of protease using ion-exchange chromatography

Ion exchange chromatography is commonly used for protein purification, which is based on the isoelectric point (pI). DEAE-Cellulose was used as the matrix in this study since the pH of the buffer selected was considered as a factor that influence the selection matrix in any purification steps. The column was equilibrated with potassium phosphate buffer (50 mM; pH 8.0; 250 ml), and crude enzyme (200 ml) was then loaded into the column. The column was rinsed with potassium phosphate buffer (50 mM; pH 8.0; 100 ml) and a fraction was collected until the protein content of the eluted solution was below the detection limit of the Bradford protein assay. The adsorbed enzyme was then eluted with 100 ml of the same buffer containing sodium chloride (1.0 M) and fractions were collected continuously using a fraction collector (Siegel, et al. 1997).

Protein separation using gel electrophoresis

In this study, sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) was used to separate proteins. The molecular weight of protease was visualized in SDS-PAGE under denaturing conditions. separation is carried out through stacking and separating gel systems. The resolving gel (10%) consisted of Tris-HCl (1.5 M; pH 8.8; 2.5 ml), deionized water (4.17 ml), acrylamide: bis (3.3 ml; 29.2:0.8) SDS (10%; 0.1 ml) ammonium persulphate (APS) (10%; 50 µl) and N, N,N', N'-tetramethylethylenediamine (TEMED) (20 µl) added in this sequence. The stacking gel consisted of Tris-HCl (1.5 M; pH 8.8; 2.5 ml), deionized water (6.1 ml), acrylamide: bis (1.3 ml; 29.2:0.8), SDS (10%; 0.1 ml), APS (10%; 50 µl) and TEMED (20 µl) added in this sequence. Stock sample buffer was prepared by mixing deionized water (6.8 ml), Tris-HCl (0.5 M; pH 6.8; 1.2 ml), glycerol (1.0 ml), SDS (10%; 2.0 ml) and bromophenol blue (0.5%; 0.5 ml) and mercaptoethanol. protease was mixed with sample buffer in the ratio of 5:1 in a microcentrifuge tube before being heated in a water bath for 10 min at 90 ^{0}C. Samples were allowed to cool to room temperature before being loaded onto the polyacrylamide gradient gel. After the run, the gels were stained using Coomassie brilliant blue R-250 (Laemmli, et. al 1970).

Determination of activity proteolytic by gel-diffusion method

The proteolytic activity was determined by the gel-diffusion method using casein or skimmed milk powder, this method allows to determination the proteolytic activity in different types of biologically active compounds. In the initial volume of the enzyme and in the peaks obtained after ion exchange chromatography, the proteins were measured and the activity of the proteolytic enzymes was checked by the gel-diffusion method at the initial stage. For this, 1% casein and skimmed milk powder were taken as substrates, these substrates were polymerized in 1% agarose gel (in Petri dishes). After gel solidification, rings with a diameter of 3 mm were cut and 10 µl of test solutions were added. Petri dishes were incubated at 37°C for 18 hours (Zhang, et. al 2021).

RESULTS

Partial purification of protease was carried out by fractional precipitation with ammonium sulphate, and a total of four fractions were obtained. the fraction with 80% yielded the most milk-clotting activity, the value being equivalent to 15 SU/ ml. The fraction with 60% yielded the most proteolytic activity, the value being equivalent to 50 U (table 1).

After Milk-clotting activity partial purification of protease exhibited a different enzymatic effect on milk compared to other proteases. Revealed that the protease preparation curdled the milk instead of coagulation (Fig. 1).

Table 1. Milk-clotting activity and proteolytic activity of precipitation fractions of enzyme produced by *penicillium candidum 5-1*

Precipitation step	Total protein (mg)	Milk-clotting activity (SU/ ml)	Proteolytic activity (U/ml)
20%	0.1	3.2	6
40%	0.15	3.0	40
60%	0.3	12	50
80%	0.4	15	30

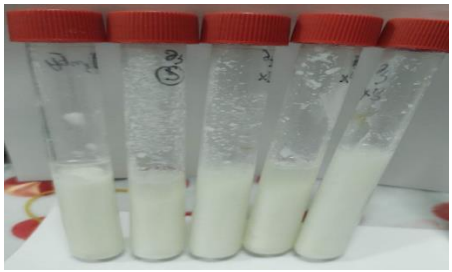

Figure 1. Milk-clotting activity of protease produced by *penicillium candidum 5-1*

The partially purified enzyme, obtained after precipitation, underwent further purification using ion exchange chromatography with a DEAE-cellulose column. Protein concentration and proteolytic activity were analyzed for all eluted fractions. The specific proteolytic activity of each fraction was calculated and compared. The purification results revealed that fraction number 1 exhibited the highest specific proteolytic activity (Figure 2).

To confirm the enzymatic activity, the peak fractions were subjected to the gel-diffusion method, and proteolytic activity was determined. The first peak fraction showed the highest activity (Figure 3).

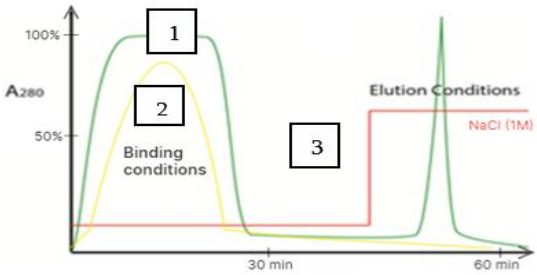

Figure 2. Partial purification extract chromatography on DEAE-cellulose column (11 · 1 cm) equilibrated with 50 mM phosphate buffer pH 8.0, and eluted with a discontinuous gradient: the same buffer containing 1 M sodium chloride during the first and secondstep, respectively. Flow rate was 0.1 ml/min. Two-milliliter fractions were collected. Absorbance at 280 nm and proteolytic activity of the fractions were measured.

1- Absorbance, 2- proteolytic activity of the fraction were mesuered, 3- eluted fraction with 1M NaCL.

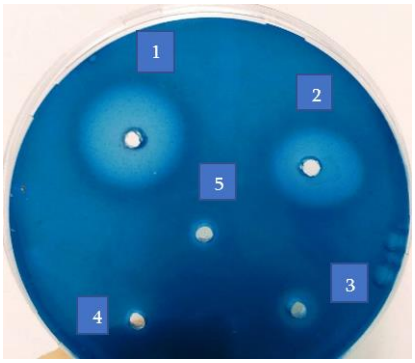

Figure 3. Gel-diffusion method of purified fractions of enzymes produced by penicillium candidum 5-1

1. curdle enzyme. Diameter 10 mm 2. The first fraction 3. Second peak diameter (2mm) 4. Third peak diameter (1mm) 5. Control (PBS) diameter 1 mm

The homogeneity of the purified enzyme was checked by denaturing polyacrylamide gel electrophoresis. the presence of a single band indicates that the target protease had been successfully isolated and other impurities or unwanted proteins had been removed (Figure 4).

Figure 4. Denaturing polyacrylamide gel electrophoresis (SDS-PAGE) of purified protease

SDS-PAGE electrophoretogram of purified enzyme . Line A protein markers. Line B purified extract on size-exclusion after precipitation;

The use of a highly pH-sensitive rennet can lead to reduced yields and defective cheese due to soft coagulum at cutting (Harboe and Budtz, 1999). The enzyme produced by *penicillium candidum 5-1* was active in a not wide range of pH, the assay was carried out range of pH 4-pH 9, purified protease exhibited a maximum activity at pH 6.5. After pH 6.5, a decrease in protease activity was observed (Figure 5).

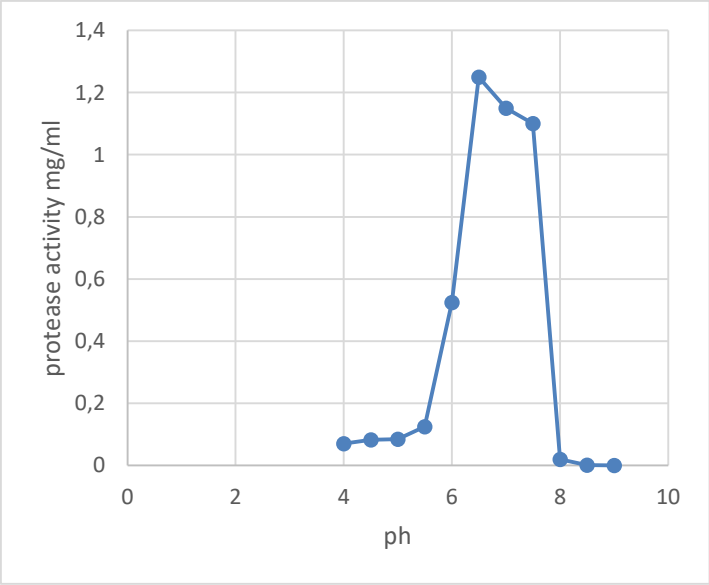

Figure 5. Effect of pH on the proteolytic activity of the purified extract.

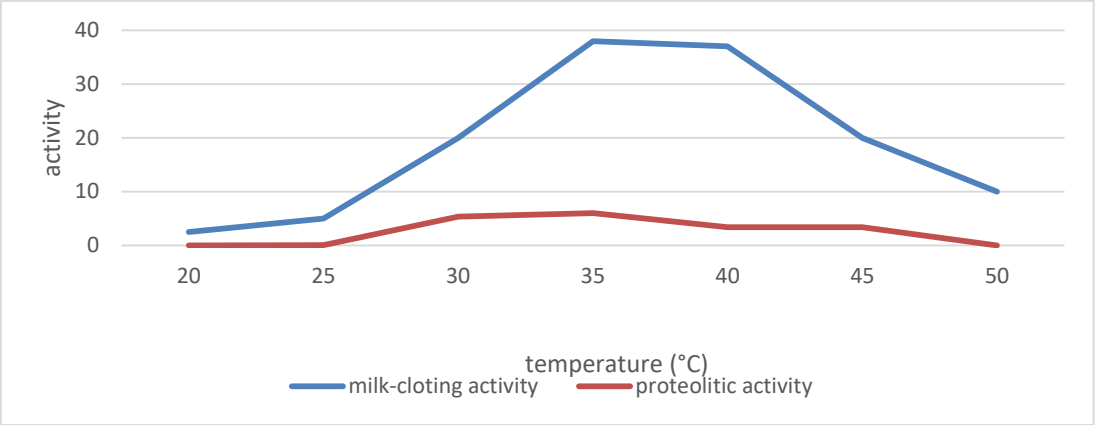

Figure 6. Effect of temperature on proteolytic activity and milk-clotting activity of the purified enzyme.

The optimal temperature for milk-clotting activity was found to be 35-40°C. An increase in activity is observed from 25°C to 35°C, with the enzyme exhibiting the highest proteolytic activity between 35°C and 40°C. However, a significant decrease in activity is observed beyond 40°C. The optimal temperature range for proteolytic activity was determined to be 30-40°C (Fig. 6).

DISCUSSION

By subjecting the precipitation process to various fractions of ammonium sulfate, we obtained partially purified protease fractions. These fractions were then assessed for their proteolytic activity and milk coagulant activity, yielding distinct results. Specifically, the fraction precipitated with 80% ammonium sulfate exhibited the highest milk coagulant activity, whereas the fraction precipitated with 60% ammonium sulfate showed the highest total protease activity. Consequently, the enzyme isolated from these fractions was selected for further investigations.

Following the partial purification of the protease through milk-clotting activity, it became evident that this particular enzyme had a different enzymatic effect on milk in comparison to other proteases. Notably, the protease preparation caused the milk to curdle instead of undergoing coagulation.

The purified enzyme was used to repeat the process of milk curdling, which revealed that the enzyme's action resulted in the formation of a curd mass with a texture and taste resembling cottage cheese. Importantly, the resulting product obtained from the purified enzyme exhibited a different structure compared to products derived from other enzymes. This finding indicates the presence of a distinct type of protease, synthesized under conditions close to natural conditions in the nutrient media.

Both the enzyme and the resultant product require further investigation to establish quality indicators, necessitating additional studies.

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DETERMINATION OF BUD FERTILITY AND PRUNING LEVELS IN EARLY SWEET GRAPE VARIETY

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ABSTRACT

The winter buds, which are located on one-year-old branches, are the winter buds of the vine and is therefore closely related to the grape yield of the vineyard. Dormant buds because they contain inflorescences and leaf outlines together are of mixed buds type. Cultivated grapevine winter buds have 3 shoot drafts. May inflorescences of the amount of beginning to form inside the winter buds is precisely determined at the end of the vegetation period (Ağaoğlu, 2002).

The research was carried out in Early Sweet (*Vitis vinifera L.*) grape variety. This variety is early, seedless, yellowish-green colored, elliptical-round shaped and weighs 5-6 g. This trial was carried out in the Early Sweet grower vineyard in Alaşehir locality of Manisa province in 2021 and 2022 years. In this study, it was aimed to determine the winter bud fertility of Early Sweet grape variety and to determine the optimum pruning levels accordingly. In winter pruning, 5 one-year old cane were left on a vine and pruned over 3^{rd}, 5^{th}, 8^{th}, 12^{th}, 15^{th} bud.

The experiment was planned according to the randomized block design with 4 replicates and 3 vines in each replicate. The bud fertility of the cultivars (number of ınflorescence/bud) was determined through counting inflorescences over the summer shoots after the shooting of the dormant buds on the annual branches.

As a result, it was determined that the bottom buds were very fertility, the middle buds were less fertility and the tip buds were fertility. According to these results, it was determined that the pruning of Early Sweet grape variety is suitable for semi-long and mixed pruning system.

Keywords: Early sweet, bud fertility, grape, pruning level, dormant bud

INTRODUCTION

Manisa ranks first in Turkiye with 28% of total vineyard area and 45% of grape production, while Alaşehir is the most important district in table grape production and exports. Alaşehir has 11,590 hectares of vineyard area and produces 125,415 tons of fresh grapes. In the region, Yuvarlak Çekirdeksiz, Red Globe, Michele Palier, Mevlana, Antep Karası are the grape varieties that mature in the middle season. In order to increase the income of the producers in the region, they are in search for early grape cultivation. Therefore, producers have chosen to establish vineyards with Early Sweet grape variety. However, they cannot get the desired quality and quantity of yield from the variety with different pruning practices. The most important rule for correct pruning is to know the fertility of the bud of the grape varieties. In this respect, in modern viticulture, it is important to determine the bud fertility of grape varieties in the regions where they are grown.

Buds are the small part of the vine that rest between the vine's stem and the petiole. Buds fertility reproductive vine is the main factor determining its performance (Ağaoğlu & Kara, 1993; Meneguzzi et al 2022; Zinni et al. 2023). Winter buds are used in the next vegetation period carries within it the inflorescences that will be formed (Çelik, 1999; Dry, 2000; Akın et al. 2011).

Grape yield depends on the fact that the winter buds at the nodes of the annual branches contain inflorescences of number. The bud fertility of the variety varies greatly depending on the growing region, rootstock, cultural practices and environmental conditions. Winter buds are mixed because they contain shoots, leaves and inflorescences and they have three buds: primary, secondary and tertiary. Although not all primary buds of annual branches are productive, the nodes with maximum fertility are different among grape varieties (Kara et al. 2017; Bonoda et al. 2020; Collins et al. 2020). These characteristics determine the technical and cultural practices to be applied to the vine. In this context, many researchers in the world and in Turkey have carried out studies on the practices affecting the bud fertility of grape varieties (Dardeniz & Kısmalı, 2005; Karataş & Ağaoğlu, 2005; Önder & Dardeniz, 2015; De Lorenzo & Pisciotta, 2019). According to the results of the researches while determining their fertility status according to their positions also made suggestions for the type of pruning to be applied.

Çelik & Kök (1998), in his study on the effect of different levels of one-year cane on the fertility of winter buds of Yapıncak grape variety, found that the winter buds between the 5th and 16th nodes had the highest fertility values.

Çelik (1999), conducted a study on the determination of bud fertility (number of clusters /bud) in grape varieties grown in Amasya; 2.4 in the 3rd node bud in Tilki kuyruğu grape variety, 1.9 in the 2nd node bud in Ak grape-I, Ak grape-II and Bursa grape, 1.9 in the 4th node bud in Asılasma, 1.9 in the 3rd node bud in Horoz yüreği, 1.9 in the 3rd node bud in Amasya Çavuşu and Kızıl sirke grape variety. In Antep grape, it was found to be the highest in the 2nd node with 1.4.

Akın et al. (2011), in a study conducted on some grape varieties grown in Konya and Kayseri, determined that according to the highest cluster/bud number, Bogazkere, Italy, Kalecik Karasi and Çavuş varieties should be pruned medium long over the 4th-5th bud levels, Chardonnay, Buludu and Şam varieties should be pruned short over the 3rd-4th bud levels, and Karagevrek variety should be pruned long over the 8th-9th bud levels.

In the research conducted by Dardeniz & Kısmalı (2005), to determine the winter bud fertility in some table grape varieties and to determine the optimum pruning levels accordingly, it was determined that Ata Sarısı and Cardinal grape varieties should be pruned short over 2 bud, Yalova İncisi, Amasya, Italia grape varieties should be pruned short over 2-3 buds and Uslu grape variety should be pruned medium length over 3-5 buds levels.

In a study carried out to determine the winter bud fertility up to 10th node in 37 grape varieties grown in Tokat region, maximum fertility values were reached between 3rd-10th nodes. The highest number of cluster was determined at the 7th node (3.40 pieces) of Izabella grape variety, while the lowest number of cluster was determined at the 4th-5th nodes (1.00 pieces) of Şam white grape variety. Mixed pruning was recommended for all of the varieties examined (Çelik, 1999).

The aim of this study was to determine the fertility of the winter buds of the Early Sweet grape variety grown in Alaşehir district of Manisa province according to the level of the buds under cultivation conditions and to determine the number of buds to be left on the vine during winter pruning and the type of pruning.

MATERIAL AND METHOD

The research was carried out in Early Sweet (*Vitis vinifera L.*) grape variety. This variety is early, seedless, yellowish-green colored, elliptical-round shaped and weighs 5-6 g. This trial was carried out in the Early Sweet grower vineyard in Alaşehir locality of Manisa province in

2021 and 2022 years. Early Sweet planted on its own roots, ten-years old. The planting distances were 3.0 m between the rows and 2.0 m on the rows and trained onto a T-trellis system. A drip irrigation system was used, and the soil structure of these vineyards are the loamy alluvial soil, and the routine cultural processing such as soil management, fertilizers.

In Early Sweet grape variety, 5 canes (one-year-old) were left per vine during winter pruning (mid-February) and pruned over 3rd, 5th, 8th, 12th, 15th buds. The bud fertility of Early Sweet (number of cluster/bud) was determined through counting inflorescences over the summer shoots after the shooting of the dormant buds on the annual branches. Some climatic data of the research region are given in Table 1.

The experiment was planned according to the randomized block design with 4 replicates and 6 vines in each replicate. The data were subjected to analysis of variance analyses and multiple comparison tests were done by JMP statistical package program (version 13.0; SAS Institute, Cary, NC, USA).

Table 1. Some climaticl data of 2021 and 2022 in Alaşehir*

Months	2021				2022			
	Mean temp. °C	Mean hum. (%)	Mean prec. mm	Total sun. (h)	Mean temp. °C	Mean hum. (%)	Mean prec.mm	Total sun. (h)
January	6.6	85.6	76.4	101.2	5.6	76.3	63.8	55.1
February	7.3	86.1	95.3	49.0	5.8	74.3	44.8	113.5
March	9.8	85.8	76.8	92.0	9.3	70.8	30.2	210.9
April	14.0	76.4	10.6	240.3	11.6	71.9	42.9	177.7
May	18.5	79.2	27.5	183.7	17.9	70.5	31.2	191.7
June	24.3	72.6	75.4	199.1	24.1	54.8	2.5	237.1
July	27.1	69.5	82.7	259.5	29.9	45.0	0.0	278.9
August	31.0	43.1	0.0	228.4	27.3	62.7	20.3	279.9
September	24.8	67.8	18.7	132.8	21.6	65.1	9.6	209.8
October	16.7	76.0	48.2	125.8	17.5	73.3	46.2	175.0
November	12.1	76.7	52.5	15.5	75.7	17.4	48.2	123.0

December	6.2	76.3	115.2	9.2	75.5	22.3	59.9	71.1

* https://mgm.gov.tr/tahmin/il-ve-ilceler.aspx?il=MANISA&ilce=ALASEHIR

RESULTS AND DISCUSSION

In this study, it was aimed to determine the winter bud fertility (number of cluster bud^{-1}) of Early Sweet grape variety and to determine the optimum pruning level accordingly. According to this Variance of the means of the two-year fertility values obtained according to the level on the shoots of the continuing buds on one-year branches pruned at different levels.

The effects of the levels of the winter buds on the one-year canes of the Early Sweet grape variety on the buds fertility of the years and the fertility of the winter buds on the one-year canes according to different pruning levels are given in Table 2.

When the obtained data (Table 2) were evaluated by years, it was determined that the level of winter buds on the one-year branch (cane) had different effects on bud fertility and formed statistically different groups.

Different pruning of winter buds on one-year branch fertility according to their levels gives different results. Accordingly, in the case of pruning over the 3rd bud level obtained in the research, the highest fertility value was 1st in bud (1.55, ab) in 2021. Following this, in pruning over the 5th bud, the highest bud fertility was found in the 4th bud (1.88, a). In pruning over the 8th, 12th and 15th buds, the highest bud fertility were observed in the 1st bud (1.66, a), 4th bud (1.69, ab) and 8th (1.60, ab), respectively.

In 2022, In pruning over the 3rd, 5th, 8th, 12th and 15th buds, the highest bud fertility were determined in the 2rd bud (1.66, a), 3rd bud (1.56, a), 2rd bud (1.36, c), 5th (1.97, a) and 5th (1.87, ab), i.e.

Considering the averages obtained, as a result of the changes in the annual maintenance conditions, and climatic factors, etc., the bud fertility values on one-year branch also change over the years. These results are in parallel with the findings of Dardeniz and Kısmalı (2005).

In Early Sweet grape variety, the highest was found at the 1st bud level (node) (1.486) in 2021. These were followed by the 8th (1.443), 4th (1.385), 2nd (1.1882) and 3rd (1.182) bud levels, respectively. The lowest bud fertility were observed 9th-15th (<0.625). On the other hand, according to the results of the research in 2022, the highest bud fertility values was determined at the 2nd bud level (1.446). These were followed by the 5th (1.410), 1st (1.374), 8th

(1290), and 3rd (1.224) bud levels, respectively. The lowest bud fertility were found the 11th-15th (<0.75).

Uyak and Doğan (2018), determined bud fertility at rates ranging from 0.14 to 1.96 in their study to determine the bud fertility of local grape cultivars in Şemdinli region. The bud fertility values they found is largely similar to the values obtained in our study. They also reported similarly with our studies that there were differences between the cultivars and the position of the buds (Şen and Atak, 2020).

Table 2. Fertility values of winter buds on the 1-year branch and according to the pruning level.

2021															
	Bud Fertility (number of cluster bud^{-1})														
Pruning Levels	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
3. rd	1.55 ab	1.13 b	1.06 cb	-	-	-	-	-	-	-	-	-	-	-	-
5.th	1.33 c	1.05 c	0.96 c	1.88 a	0.84 b	-	-	-	-	-	-	-	-	-	-
8. th	1.66 a	1.11 b	1.06 b	0.83 a	0.94 a	1.26 a	0.94 a	1.70 a	-	-	-	-	-	-	-
12. th	1.30 c	1.33 a	1.41 a	1.69 ab	0.80 b	0.96 c	0.83 b	1.03 b	0.56 b	0.71 a	0.66 b	0.34 a	-	-	-
15. th	1.59 b	1.32 a	1.42 a	1.14 b	0.87 ab	1.15 b	0.60 c	1.60 ab	0.67 a	0.34 b	0.74 a	0.31 ab	0.23	028	0.23
Means	1.486	1.188	1.182	1.385	0.862	1.123	0.790	1.443	0.615	0.525	0.70	0.325	-	-	-
2022															
	Bud Fertility (number of cluster bud^{-1})														
Pruning	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th

Levels															
3. rd	1.52 a*	1.66 a	1.16 b	-	-	-	-	-	-	-	-	-	-	-	-
5.th	1.35 b	1.43 b	1.10 bc	1.00 c	0.86 c	-	-	-	-	-	-	-	-	-	-
8. th	1.11 c	1.36 c	1.56 a	0.92 c	0.94 c	1.14 b	0.88 b	1.96 a	-	-	-	-	-	-	-
12. th	1.53 a	1.30 c	1.43 b	1.57 a	1.97 a	0.96 bc	0.86 b	1.12 b	0.56 b	0.88 a	0.57 a	0.56 b	-	-	-
15. th	1.34 b	1.46 b	1.42 b	1.34 b	1.87 ab	1.40 a	0.98 a	0.79 c	0.63 a	0.40 b	0.43 a	0.67 a	0.30	0.12	0.10
Means	1.374	1.446	1.224	1.210	1.410	1.166	0.900	1.290	0.59	0.64	0.50	0.61	-	-	-

*Means followed by different superscripts within the columns of each cultivar are significantly different at α = 0.05

Leão et al. (2016) studied to determine the fertility index of 11 cultivars over five production cycles. As a result of their studies, they reported that cultivars had bud fertility average values ranging from 0.24 to 0.95, as very similar to our study. Also they reported that bud fertility was strongly determined by genetic and environmental factors, identifying genotypes of high. As a result, it was determined that semi-long pruning (pruning over 8-10 buds) and mixed pruning (pruning over 2-3 buds, as replacement) methods are suitable as winter pruning in Early Sweet grape variety under regional conditions

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IMPACT AND VARIABILITY OF CLIMATIC FACTORS ON THE YIELD OF TOMATOES IN NIGERIA

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ABSTRACT

Climatic factor is one of the vital issues facing farming in Nigeria. It is very challenging for the farmer when the climatic condition is not favorable to their product. So, this paper used correlation to shows the degree of association between the climatic factors for year 2019 and 2021. For year 2019, the correlation analysis indicates that, the correlation between the climatic factor positively influence the production of tomatoes in Nigeria except the correlation climatic factor RAIN and any other climatic factor, which do not really have influence on the performance (yield) of tomatoes in Nigeria. For year 2021, the correlation analysis indicates that, the correlation between the climatic factor positively influence the production (yield) of tomatoes in Nigeria except the correlation between TMEAN&RH and TMAX&RH, which influence the production of tomatoes negatively. The analysis of variance (ANOVA) shows the variability in the four (4) varieties of tomatoes that, the varieties of tomatoes significantly contribute to the growth of tomatoes which can influence the yield of tomatoes in Nigeria positively.

Keywords: Climate factor, Significantly,Tomatoes,Variability-analysis, Negatively, Association, Correlation.

INTRODUCTION

A momentous change in climate on a universal scale will impact agriculture and accordingly affect the world's food supply. Climate change intrinsically is not necessarily harmful but the problems arise from events that are difficult to predict. The records of inconsistent rainfall patterns and unpredictable high temperature spells consequently reduce crop productivity in the tropics. Latitudinal and altitudinal shifts in ecological and agro-economic zones, land degradation, extreme geophysical events, reduced water availability, the rise in sea level and salinization are suggested, unless prompt decision are undertaken to mitigate the effects of climate change, food security in developing countries will be under threat. In the humid tropics, the rainy (wet) and late (dry) sowing seasons are associated with changes in climatic attributes which to a great extent influence the productivity of agricultural food (vegetable crops). Vegetables are the best means of overcoming micronutrient deficiencies and provide peasant farmers with sustenance income and more jobs per hectare than staple crops. Broadly, vegetable crops are sensitive to environmental condition, high temperatures and excessive soil moisture (rainfall), which are the major causes of low yields in the tropics and this can be further exaggerated by other climatic factors such as radiation and cloud cover. Tomato, cabbage, onion, hot pepper and eggplant are among few important vegetables consumed and or processed for utilization in Asia and Sub-Saharan Africa region. Tomato (Lycopersicon esculentum Mill.), an important horticultural crop grown worldwide is a fruit vegetable belongs to the Solanaceae. Developing countries' agricultural systems are vulnerable to climate change because they tend to be less capital and technology intensive and because they tend to be in climate zones that are already too hot and will probably get hotter (14). Many countriesin tropical regions are expected to be more vulnerable to warming because additional warming will affect their marginal water balance.. In the southern African regions, the effect of climate change could be exacerbated further due to its high risk cropping environment and the marked intra-seasonal and inter-annual variability of rainfall (6). The aim of this paper is to determine how climate change may influence the production of tomatoes (Lycopersicon esculentum) in Nigeria, while the objectives were; to determine the monthly mean weather recorded from the meteorological unit for year 2019 and 2021,to

evaluate the correlation between the weather parameters on monthly records for year 2019 and 2021and to analyze the impact of climate variability based on different varieties of tomatoes with their respective weights on tomatoes production in Nigeria using ANOVA.. Nigeria has a spatial variation of tomato production and climate change or variability. This research used Federal University of Technology, Akure (FUTA) tomato farm climatic change dataset on tomato production. During rainy seasons in Nigeria, flooding may occur in over extensive areas within Akure. The potential for climate change in Akure as induced by global warming is therefore an issue of great importance in Nigeria.

2.1 RELATED STUDY

An increment of this magnitude is expected to affect global agriculture significantly (4). In addition, such changes in climatic conditions could profoundly affect the population dynamics and the distribution of crop pests as reported in (24). These effects could either be direct, through the influence that weather may have on the insects' physiology and behavior (9);(10); (2);(21);(19);(15), or may be mediated by host plants, competitors or natural enemies (9);(2). In temperate regions, most insects have their growth period during the warmer part of the year (2). In the first case, the general prediction is that if global temperatures increase, the species will shift their geographical ranges closer to the poles or to higher elevations, and increase their population size (23; 9; 2; 21). In agreement with this prediction, many examples may be found in the literature (8; 18; 16).

Species distributions are expected to change dramatically in response to future

rapid climate warming (1), and generally climate change modelling predicts that the risks of species loss will increase (17). Therefore, improving our understanding of the factors controlling potential species distributions under future global warming scenarios has become a central goal in ecology today (7).Prediction of known occurrences of global warming constitutes an important technique in analytical biology, with applications in conservation modeling of species' geographic distributions based on the environmental conditions of sites and reserve planning, ecology, evolution, epidemiology, invasive species management and other fields (20;22). Global warming poses a significant threat to future economic activities and the wellbeing of a significant number of human beings (11). Among all economic sectors, the agricultural sector appears to be the most sensitive and vulnerable (3). Plant production is influenced by climate factors such as temperature and rainfall. Each crop has optimal

conditions for growth. Therefore, any change in the climate can have a serious impact on the crop production sector. It has been shown that at global level, the impacts will be small since production reduction in some areas is balanced by gains in others (12).

Overall, climatic changes will affect agriculture either negatively or positively depending on the location. There is wide concern that the agricultural sector in Africa will be especially sensitive to future climate change and variability (14). In this paper, the tomato crop was used. The tomato (Lycopersicon esculentum) belongs to the family of Solanaceae. It is commercially important globally, for both the fresh fruit market and the processed food industriesThe Tomato originated in the dry west coast of tropical South America. The growing season in this region has temperatures that are moderate with an average minimum night temperature of 15°C and average maximum day temperature of 19°C (5). The plant thrives in temperatures between 10°C and 30°C and is tolerant of neither frost nor waterlogged conditions (13).

3. METHODOLOGY

This paper was carried out at the Research Farm of the Federal University of Technology, Akure, (lat 7.17°N, long 5.8°E), a tropical rainforest zone of southern Nigeria The climate of the area was characterized by heavy rainfall during the months from April to July and August to November. The sandy loam soil at the site of study is an alf isol classified as clayey skeletal oxic-paleustalf (USDA Soil Survey Staff, 2009). The nutrient status of surface soil for 0-15cm at the experimental site before planting are: pH 6.8; N (0.19 mg/kg); P (7.69mg/kg); K, Ca and Mg (1.75, 0.84, 4.39 cmol/kg soil respectively); organic matter (2.42 g/kg), bulk density (1.28 mg/m3). The field site was manually cleared. Seeds of four tomato varieties: Ibadan local (Ib. local), UC, Roma VF and Beske were nursed on 5th of March, 2019 for early/raining season planting and transplanted to the field on 2nd of April, 2019.The late season planting was on 4th of September and transplanted to the field on 1st of October. The experiment was repeated in the cropping seasons of year 2020. The experimental design was a Randomized Complete Block Design (RCBD) with three replications. The unit plot size was 2mx2m.The tomato variety seeds were nursed in a well pulverized rich loamy soil and was transplanted into the field after 5weeks at a planting distance of 90cm by 30 cm. Two weeks interval records of plant height (cm), number of leaves per plant, leaf area per plant (cm^2), dry weight of leaves and fruits per plant (g), number of flower clusters per plant, number of fruits per plant, weight of individual fruit (g), weight of fruits per plant (kg), weight of fruits per plot (kg) and fruit yield (t/ha) were taken up to maturity and tomato yield was assessed at the

final harvest. Weather data includes rainfall (RR), maximum temperature (T_max), minimum temperature (T min) and relative humidity(R/H) was taken simultaneously on weekly basis in two planting seasons. Data were analyzed to establish the relationship between various growth stages and weather elements considered using multiple correlation method and ANOVA.

3.1 VARIABILITY ANALYSIS

The data were analyzed by the use of IBM SPSS Statistics version 17 and R packages. While the descriptive statistics were represented in the form of tables and graphs, the inferential statistics involved the use of multiple correction and analysis of variance (ANOVA). The multiple correlations was used to establish the degree of association between different climatic conditions while the ANOVA test for means analysis was employed to further test the significance of the relationships between different weather variability on tomato production at 5 percent significance level and 95 percent confidence level for year 2019 and 2021.

The multiple coefficients denoting a correlation of one variable with other variables denoted as $R_{ABCD...K}$ which denote that A is correlated with B, C, and D up to K. For example, if you want to compute multiple correlations between A, B, and C, it can be express as

$$R_{A.BC} = \sqrt{\frac{\Gamma_{AB}^2 + \Gamma_{AC}^2 - 2\Gamma_{AB}\Gamma_{AC}\Gamma_{BC}}{1 - \Gamma_{BC}^2}}$$

Where $R_{A.BC}$ is the multiple correlations between A and linear combination between B and C, Γ_{AB} is the correlation between A and B, Γ_{AC} is the correlation between A and C and Γ_{BC} is the correlation between B and C.

Significance testing of R^2

H_o: $p^2 = 0$

Against

H_1: $p^2 \neq 0$

The population value of R^2 is p^2. Hence, R^2 is an estimator of p^2

Test statistic: The F statistic is used for testing the significance of R^2 and is given as

$F_{cal} = \frac{(n-k-1)R^2}{k(1-R^2)}$ and $F_{tab} = F_{k,n-k,\alpha}$

Where $R^2 = 1 - \frac{(1-R^2)(n-1)}{n-k-1}$ which is the percentage of variance in the constant variable explained by linear combination of the regression model.

4.0 ANALYSIS OF DATA

MONTHLY DATA RECORD FOR YEAR 2019 AND 2021 AT THERESEARCH FARM OF THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE (FUTA)

Table 4.1: Monthly data record for year 2019 at FUTA research farm

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T mean	25.9	26.5	26.7	26.6	26.0	25.2	24.3	24.6	24.8	25.1	25.4	25.2
T min	21.9	22.9	23.8	23.5	23.3	22.8	22.0	21.8	22.4	22.6	22.8	21.6
T max	30.4	31.0	30.7	30.6	29.6	28.5	27.5	28.4	28.0	28.6	28.6	29.2
R H	89.1	83.4	84.7	84.4	87.0	89.4	90.4	88.2	90.5	89.4	89.9	83.7
Rain	51.6	99.1	120.0	439.2	281.4	466.6	119.6	83.6	343.6	247.5	411.5	101.6
Wind speed	1.9	2.2	2.4	2.1	2.0	2.2	2.5	2.6	2.2	1.9	1.8	1.9

Table 4.2: Monthly data record for year 2021 at FUTA research farm

2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T mean	25.9	26.5	26.5	26.2	26.2	25.6	24.8	24.5	25.1	25.7	25.1	25.9
T min	22.1	22.8	23.6	23.4	23.3	23.3	22.2	22.2	22.6	22.8	22.6	21.9
T max	30.3	31.1	30.3	29.9	29.8	28.8	27.8	27.8	28.3	29.2	28.3	30.3
R H	79.1	81.2	85.5	86.2	86.2	89.8	90.5	90.5	90.0	88.1	90.0	77.8
Rain	36.3	80.6	224.8	433.0	489.5	339.0	154.6	452.5	223.9	419.6	223.9	20.7
Wind speed	1.8	1.9	2.3	2.1	1.8	2.2	2.6	2.2	1.9	1.7	1.9	1.6

Table 4.3: Growth and yield early rain fed and late rain fed season of tomatoes.

Seasons of sowing	Root weights (g)	Shoot weights (g)	No. of branches	Plant height (cm)	50% flowering days	Fruit weights (g)	Fruit yield (kg/ha)
Early (rain fed) (March-June)	14.7	33.1	22	122	56	15720	4.37
Late (rain fed) (August- December)	13.4	31.2	19	109	54	12847	3.12

Table 4.4: Varietal effects (across the seasons) on the performance of tomatoes

Varieties	Root weights (kg)	Shoot weight (g)	No. of branches	Plant height (cm)	50% flowering days	Fruit weight (g)	Fruit yield (kg/ha)	Harvest index
Beske	11.24	1210.3	17.5	104.7	54.3	346.9	19354.7	0.31
Ibadan local	11.43	1950	21.0	123.4	53.3	369.5	20447.3	0.22
Roma vf	7.82	415.3	11.3	80	55.7	134.8	9320.5	0.33
VC	9.9	330.5	9.7	76	56	120.2	6348.2	0.33

4.2 CORRELATION BETWEEN THE DIFFERENT CLIMATIC FACTORS

Table 4.5: Degree of relationship between the climatic factors for the months in the year 2019

	RH	RAIN	WD	TMEAN	TMIN	TMAX
RH	1.0000					
RAIN	0.4219	1.0000				
WD	0.9190	0.2627	1.0000			
TMEAN	0.9802	0.3997	0.9083	1.0000		
TMIN	0.9735	0.3682	0.9046	0.9989	1.0000	

TMAX	0.9847	0.4415	0.9174	0.9970	0.9924	1.000

Table 4.5 shows the correlations between the climatic factors are positive and statistically significant at 5% level. However, the degree of association between RAIN and WD, TMEAN, TMIN and TMAX is weak positive while the rest associations are strong positive. These indicates that, the combinations of climatic factor RAIN and any other factors do not really have effect on the production of tomatoes in Nigeria while the combinations of other factors are very important factors to influence the yield of tomatoes in Nigeria positively. That is, the yield of tomatoes in Nigeria for year 2019 with reference to the combinations of climatic factors WD, TMAX, TMIN, RH and TMEAN will give much quantity of quality tomatoes.

Table 4.6: Degree of relationship between the climatic factors for the months in the year 2021

	TMEAN	TMIN	TMAX	RH	RAIN	WD
TMEAN	1.0000					
TMIN	0.5543	1.0000				
TMAX	0.9380	0.2563	1.0000			
RH	-0.6497	0.2500	-0.8549	1.0000		
RAIN	-0.1354	0.5402	-0.3510	0.6226	1.0000	
WD	-0.3311	0.2015	-0.4544	0.5504	0.1328	1.0000

Table 4.6 shows the correlations between the climatic factors TMEAN&TMIN, TMEAN&TMAX, RAIN& TMIN, RH&RAIN and WD&RH are strong positive, which indicates the relationship between those combinations would have positive influence (quality and quantity) on the yield of tomatoes in Nigeria.

The correlation between the climatic factors TMEAN&RH and TMAX&RH is a strong negative relationship which indicates that, the combination of the factors has a very strong negative influence on the yield of tomatoes in Nigeria.

The correlations between the climatic factors TMIN&TMAX, TMIN&RH, TMIN&WD and RAIN and WD is a weak positive relationship which indicates that, the combination of the factors may or may not really have any positive influence on the yield (quality and quantity) of tomatoes in Nigeria.

The correlations between the climatic factors TMEAN&RAIN, TMEAN&WD and TMAX&RAIN is a weak negative relationship which indicates that, the combination of the factors may or may not really have any negative influence on the yield (quality and quantity)of tomatoes in Nigeria.

4.2.1 ASSUMPTION OF NORMALITY

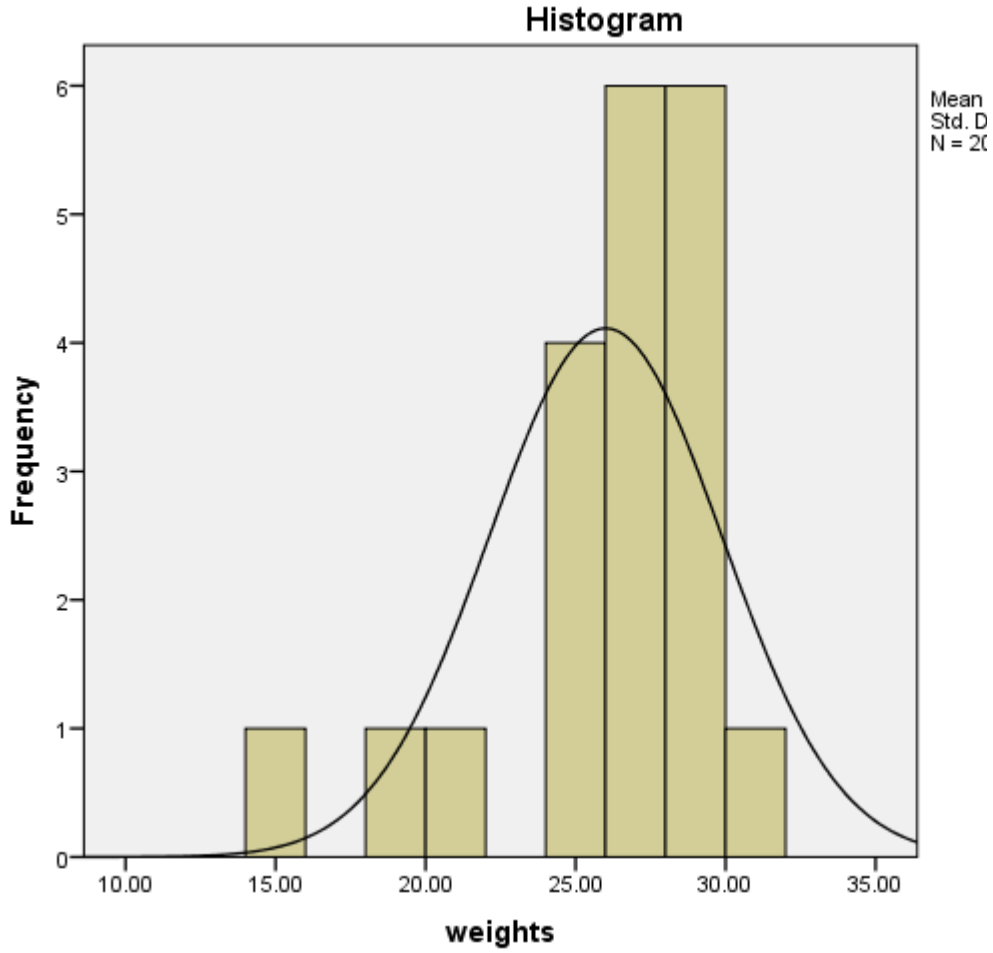

Figure 4.1 plot of weights of tomatoes with a normality curve

4.2.2 ANALYSIS OF VARIANCE ON THE WEIGHTS OF TOMATOES

Table 4.7: analysis of variance on varietal effects (across season) of the performance of tomatoes

Source of variation	Degree of freedom	Sum of squares	Mean sum of squares	F – ratio	Pr(>F)
Treatment	3	5.902	1.967	2.819	0.130
Blocks	2	241.075	120.538	172.704	0.000
Error	6	4.188	0.698		
Total	11	421.990			

Table 4.7 shows the result of the analysis of variance on varietal effects of the performance of tomatoes and the interpretation is as follows:

Comparisons of treatment effects

H_o: the treatment means are not significantly different

H_1: the treatment means are significantly different

$\alpha = 0.05$

P – value = 0.130

Decision rule: reject H_o if P – value is significantly less than the level of significance α, otherwise accept.

Conclusion: looking at the above analysis, P – value which is 0.130 is greater than the level of significance $\alpha = 0.05$, we do not reject H_o and conclude that the means of the treatment effects are not significantly difference. Simply put, the varieties of the tomatoes (across seasons) significantly contribute to the performance (yield) of tomatoes.

Comparisons of block effects

H_o: the means of the block effect are not significantly different.

H_1: the means of the block effect are significantly different.

$\alpha = 0.05$

P – value = 0.000

Decision rule: reject H_o if P – value is less than the level of significance α, otherwise accept.

Conclusion: : looking at the above analysis, P – value which is 0.000 is less than the level of significance $\alpha = 0.05$, we do not accept H_o and conclude that the means of the block effects are significantly difference. That is, the block effect of the means do not have any significance contribution on the performance (yield) of tomatoes.

4.2.3 POST HOC TEST FOR BLOCK EFFECTS USING TUKEY HSD

Table 4.8: Multiple Comparisons of the means on block effect

Dependent Variable: the weights of the yield of tomatoes.

Tukey HSD

(I) WEIGHTKINDS	(J) WEIGHTKINDS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ROOTWEIGHT	SHOOTWEIGHT	9.1197*	.59074	.000	7.3071	10.9322
	FRUITWEIGHT	9.8539*	.59074	.000	8.0413	11.6664
SHOOTWEIGHT	ROOTWEIGHT	-9.1197*	.59074	.000	-10.9322	-7.3071
	FRUITWEIGHT	.7342	.59074	.474	-1.0783	2.5467
FRUITWEIGHT	ROOTWEIGHT	-9.8539*	.59074	.000	-11.6664	-8.0413
	SHOOTWEIGHT	-.7342	.59074	.474	-2.5467	1.0783

Table 4.8 shows the post hoc analysis of the means of block effect to know which of the mean weight makes the analysis significantly different. Looking at the above analysis, the P – value (shoot weights – fruit weights) which is 0.474 is greater than the level of significance $\alpha = 0.05$, then, the mean effect of shoot weights – fruit weights are not significantly different while the other mean weights (root weights – shoot weights and root weights – fruit weights) are significantly different.

5.1 SUMMARY

This project work examined the impact and variability of climatic effect on the yield of tomatoes in Nigeria. The specific objectives are to determine the monthly mean weather recorded from the meteorological unit, FUTA for 2019 and 2021. Also, to evaluate the multiple correlation between the weather parameters with respect to the tomatoes varieties and lastly, analyzed the impact and variability of varieties of tomatoes on tomatoes yield in Nigeria.

5.2 CONCLUSION

This research study was undertaken with prior motive of knowing the impact and variability of climatic effect on the performance of tomatoes in Nigeria. Multiple correlation was carried out on monthly data between the climatic factors considered in this research work to know their impact on tomatoes yield. For year 2019, it can be deduced that, the correlations between

the climatic factors are positive and statistically significant at 5% level. The combinations of RAIN any other climatic factors do not really have effect on the production of tomatoes in Nigeria while other factors combination influences the production of tomatoes in Nigeria positively. Also in year 2021, based on the climatic factors combinations TMEAN&TMIN, TMEAN&TMAX, RAIN&TMIN, RH&RAIN and WD&RH are strong positive, which indicates positive influence on the yield of tomatoes in Nigeria while the correlation between the climatic factors TMEAN&RH and TMAX&RH has a negative influence on the production of tomatoes in Nigeria. Analysis of variance was conducted on foot weight, root weight and shoot weight against with respect to the four (4) varieties of tomatoes in this research study. It was deduced that, the treatment means are not significantly different, which simply means, the varieties of the tomatoes (across season) positively contribute to the growth of the tomatoes which helps in production of tomatoes in Nigeria.

5.3 RECOMMENDATION

This paper recommends that, the farmer should take the weather factors very important as it is an important influence on the growth (yield) of tomatoes in Nigeria.

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EVALUATION OF SUITABILITY CLASSES FOR AGRICULTURAL USE OF SOME SOIL ORDERS IN THE THRACE REGION, TURKIYE

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ABSTRACT

Land suitability classes are prepared in order to evaluate how suitable the land use types are for agricultural lands. The aim of this research is to determine whether the soil classification made in the cultivation of cultivated plants in Thrace Region, Turkiye is suitable for which plant or not, and if so, what is the degree of suitability. From past to present, which plant grows better in which type of soil and yields, and the suitability conditions, which are tried to be found by trial and error, are determined according to the degree of suitability by evaluating the plant-soil-climate-topography characteristics together. Agricultural systems should be planned together by evaluating the suitability of the plants in the crop rotation, which consists of irrigation, fertilization, soil cultivation, drainage, soil protection and optional crop plants, by introducing modern farm plans as well as making land use plans. In this study, the degree of suitability of the lands for agricultural use is evaluated. The suitability of soils with Entisol, Inceptisol, Vertisol and Alfisol soil orders, which are dominantly distributed in the region, for grasses, legumes, bulbs, nightshades, cucurbits, cabbages, compound flowers, pastures, forests and recreation areas were evaluated. In addition, the relationship of land suitability subclasses with plant growth and management was determined.

Keywords: Land Suitability Classes, Soil Orders, Thrace Region

INTRODUCTION

The formations in organisms that are effective in soil formation create different soil types physically, chemically and morphologically. Soil is a limited, renewable natural resource that will create a living environment for people in the future as it was in the past. Incorrect land uses cause land degradation, therefore, detailed soil maps of the soils should be made in order to determine the appropriate uses of the soils in order to prevent improper land uses. It provides detailed soil maps for land consolidation, irrigation and drainage planning, rural land classification, land use planning, planning of management practices, coordination in farm plans, agricultural production planning studies.

Agriculture is the oldest and most widespread economic activity on earth. Agricultural production as a result of these activities is the basis of human survival and development. Rational land use management and planning is essential for efficient production with increasing world population and decreasing arable land. The challenge of producing adequate and healthy food products for a growing population is exacerbated by changes in climate that deplete soil and water resources (Godfray et al., 2010). Knowledge of the spatio-temporal variations of these resources and the factors supporting them is essential for optimal

agricultural management and planning processes at local and regional scales (Seyedmohammadi et al., 2019).

Kılıc et al. (2003) aimed to evaluate the use potential and suitability for three different types of land use, namely afforestation-recreation, urban settlement and cultivated agriculture in an area of 4891 ha around Antakya. They stated that the land use decisions to be taken by local governments should be in harmony with the principles of sustainable use and management of natural resources. It has been determined that a total of 478 ha of land in the west and north of Antakya can be opened for settlement in the future, and they have revealed the necessity of shifting the urban development towards fertile agricultural lands to the proposed new areas. In addition, they have determined areas suitable for afforestation and recreation.

De Pauw et al. (2004) classified the suitability of the land on the basis of various products in their land assessment studies in Syria. They determined the areas that meet the product demands by making conformity classification on the basis of various products in the agricultural ecological regions they have determined in Syria.

Dengiz et al. (2005); determined that 55.1% of the study area is very good and good (S1, S2) in terms of agricultural suitability, 16.5% is moderately suitable (S3), and 27.9% is not suitable for agriculture (N).

Abdelfattah and Shahid (2007) stated in their study that soil existence is gradually disappearing due to improper land use and agricultural practices in arid and semi-arid regions of the world.

Yorulmaz et al. (2011) investigated the suitability for agricultural use (TKUS) and potential land use status (POTKUL) of plain soils in their study titled "Determination of Potential Land Uses in Tavas Plain Soils" in Denizli. While the study emphasized the importance of using the lands according to the appropriate skill classes, it also stated the necessity for sustainable agriculture and development. In the study, it was determined that 35.2% of the study area consists of fertile agricultural lands, while 3% consists of non-agricultural lands

Morphological, physical and chemical properties of some lands where wheat-sunflower rotation was made in Yeniçiftlik Neighborhood location of Marmara Ereğlisi District of Tekirdağ Province were determined and classified according to soil taxanomy. They determined the plant suitability of these soils, which are subjected to wheat-sunflower rotation, to add diversity to the rotation by creating alternative plant patterns from plants that are suitable according to the soil and topography characteristics, and to prevent soil fatigue that may occur (Yılmaz and Boyraz Erdem, 2018).

In this study, the soils of Tekirdağ Province Çorlu District Karametmet Neighborhood were classified. The lands of Karamehmet Mahallesi are classified in Entisol, İnceptisol, Vertisol and Alfisol Orders. Classes of suitability for agricultural use have been created according to plant-soil-topography demands of the classified soils.

METHODOLOGY

Tekirdağ Province Çorlu District Karamehmet Neighborhood is given in Figure 1. In the Çorlu district of Tekirdağ, the average temperature for many years is 13.0 °C, the annual average precipitation is 575.3 mm, and the annual average relative humidity is 77.66%. The soils of the study area were determined in xeric moisture regime and mesic soil temperature regime (Dinç et al., 1997).

Profile pits were dug to represent each order. Morphological examinations were made in each genetic horizon of the research profiles (Soil Survey Division Staff, 1993). The soil compatibility classes of plants; soil depth, surface stoniness, stoniness in the profile depth, slope, drainage, texture class, organic matter (according to the calcification status of the profile), salinity, alkalinity, lime, pH, base saturation (Cangir, 1988; Mc Rae et al., 1981; Sys et al., 1991a, b, 1993; Anonymous, 2008).

Figure 1. Google Earth image showing the borders of Tekirdağ Province Çorlu District Karamehmet Neighborhood

CONCLUSION AND DISCUSSION

The soils of the study area were classified according to Keys to Soil Taxonomy (Soil Survey Staff, 2014). The soils of the study area were determined according to the Soil Taxonomy: Entisol, Vertisol, Inceptisol, and Alfisol orders. Lands 6 Lower Order; 8 Large Groups; It is classified as 13 Subgroups (Table 1).

The presence of shiny surfaces of 100 cm thickness within the profile depth from the surface of the local soils or the long axes of wedge-shaped aggregates are tilted between 10^o and 60^o; P1, P3, P5, P7, P12, P15, P17 numbered soils where the horizons in the main body contain more than 30% clay fraction and cracks open and close periodically are classified in Vertisol Order.

P4 soils with a Cambic "B" horizon or, in other words, with soil profiles with significant structure development and/or low Chroma (chroma) compared to the horizons below and above, and a "B" horizon with a distinct color distinction, Inceptisol It is classified in the Orders.

P8, P9, P10 with an Argillic "B" horizon and a base saturation of more than 35%; Soils P11, P13, P16, P18 were evaluated in the Alfisol Order.

Profiles numbered P2, P6, P14, which do not comply with 11 out of a total of 12 Soil Orders available in the Soil Taxonomy, were evaluated within the Entisol Order.

Table 1. Evaluation of Research Area Soil Profiles According to Soil Survey Staff (Soil Survey Staff, 2014).

SOIL TAXONOMY (2014)				Profiles
Order	Suborder	Great groups	Subgroups	
Vertisol	Xerert	Haploxerert	Entic Haploxerert	P1, P3, P15
			Udic Haploxerert	P5, P12
			Typic Haploxerert	P17
		Calcixerert	Typic Calcixerert	P7
Inceptisol	Xerept	Haploxerept	Fluventic Haploxerept	P4
Alfisol	Xeralf	Palexeralf	Calcic Palexeralf	P8
			Haplic Palexeralf	P9
		Haploxeralf	İnceptic Haploxeralf	P11, P13
			Ultic Haploxeralf	P18
			Typic Haploxeralf	P10, P16
Entisol	Arent	Xerarent	Haplic Xerarent	P2
	Fluvent	Xerofluvent	Typic Xerofluvent	P6
	Orthent	Xerorthent	Typic Xerorthent	P14

Land suitability orders show whether the land is suitable for different uses. The lands that do not have the danger of damaging the land resources and can fulfill the profitable agricultural conditions of the inputs by covering the cost are included in the appropriate "S" orders. They are numbered according to the increasing degree of conformity. On the other hand, lands that have a nature that will damage land resources at the end of a certain period of time when used

immediately or continuously and have no economic value in special agricultural practices; it is evaluated in the unsuitable "N" orders.
25 different plant species that can adapt to the ecological conditions of the soils in a region are given in Table 2 with their suitability classes.

Table 2. Land Suitability Classes of Land Use Types Belonging to Research Profiles.

Land Usage Types	**Profiles**					
	1	**2**	**3**	**4**	**5**	**6**
A) Grass (*Gramineae*)						
Wheat	S1(hc)	S2c	S1(c)	S2c	S1(c)	N1cn
Barley	S1(hc)	S2c	S1(hc)	S2c	S2ce	N1cn
Rye	S1(hc)	S2ck	S1(c)	S1(c)	S1(c)	S2cn
Maize	S1(hc)	S1(hc)	S1(ch)	S1(co)	S1c	S2cn
Sudan grass	S3(hc)	S2c	S3c	S2c	S3ce	S2cn
B) Legume plants (*Laguminosae*)						
Soybeans	S1(hc)	S1(hc)	S1(ch)	S1(c)	S1(c)	S2cn
Bean	S1(hc)	S2c	S1(hc)	S1(c)	S1(c)	S2cn
Peas	S1(hc)	S2c	S1(hc)	S1(c)	S1(c)	S2cn
Chickpea-lentil	S3(hc)	S2c	S3c	S1(c)	S2ce	S2cn
Alfalfa	S2(hck)	S2ck	S2hck	S1(ck)	S2ck	S2cnk
Hungarian vetch	S1(hc)	S1(ck)	S1(hc)	S1(c)	S1(c)	S3cn
Sainfoin	S1(hck)	S2ck	S1(hck)	S1(ck)	S1(ck)	S2cnk
C) Onions plants (Alliaceae)						
Carrot	S3(hc)	S2ck	S3c	S2c	S3ce	S2cn
Onion- Garlic- Leek	S2(hc)	S2c	S2c	S1(c)	S2ce	S2cn
D) Solanaceous plants (*Solanaceae*)						
Potato	S3(hc)	S1(hc)	S3c	S1(c)	S3ce	S2cn
Pepper- eggplant	S2(hc)	S2c	S2c	S1(c)	S2ce	S2cn
Tomato	S2(hc)	S2hc	S2hc	S1(c)	S2ce	S2chn
E) Cucurbitaceae (*Cucurbitaceae*)						
Watermelon-melon	S3(hc)	S2c	S3c	S1(c)	S2ce	S2chn
Zucchini- cucumber	N1(hc)	S2c	N1c(S2)	S3(c)	N1ce	S2cn
F) Cabbageaceae (*Cruciferae*)						
Cabbage	S2(hc)	S2c	S2hc	S1(c)	S2ce	S2cn
Canola	S2(hc)	S2ck	S2c	S1(c)	S2ce	S2cn
G) Compound Flowers (*Compositae*)						
Sunflower	S1(hc)	S2ck	S1(ch)	S1(c)	S1(c)	S3cn
H) Pasture Allocation						
Pasture	S1(hck)	S2ck	S1(hck)	S1(c)	S1(c)	S2cn
I) Forest and Recreation Areas						
Deciduous trees	S3(c)	S2c	S3c	S1(c)	S3ce	S2cn
Coniferous trees	S3(c)	S2c	S3c	S3c	S3ce	S2cn

(Continuation of Table 2)

Land Usage Types	Profiles					
	7	**8**	**9**	**10**	**11**	**12**
A) Grass (*Gramineae*)						
Wheat	S2c	S3cak	S2ne	S2nke	S2ak	S1
Barley	S2c	S3cak	S2ne	S2nke	S2ak	S1
Rye	S2c	S3cak	S1(n)	S1(k)	S2ak	S1
Maize	S2c	S3cak	S2ne	S2nke	S2k	S1
Sudan grass	S3c	S2ca	S1(n)	S2ne	S2k	S3
B) Legume plants (*Laguminosae*)						
Soybeans	S2c	S3cak	S2ne	S1k	S2k	S1
Bean	S2c	N1cak	S2ne	S2nk	S2k	S1
Peas	S2c	N1cak	S2ne	S2ne	S2k	S1
Chickpeas-lentils	S3c	N1cak	S1(n)	S2ne	S2ak	S3
Alfalfa	S3c	N1cak	S1(nk)	S1(nk)	S2k	S2
Hungarian vetch	S2c	S3cak	S1(n)	S1(nk)	S2k	S1
Sainfoin	S3c	N2	S2(n)	S2nke	S2k	S1
C) Onions plants (*Alliaceae*)						
Carrot	N2co	N1cak	S1(nh)	S2ne	S2k	S3
Onion - Garlic - Leek	S3c	N1cak	S1(n)	S1(n)	S2hk	S2
D) Solanaceous plants (*Solanaceae*)						
Potato	S3c	S3cak	S1(n)	S1	S2k	S3
Pepper- eggplant	S3c	N1cak	S1(n)	S1(n)	S2k	S2
Tomato	S3c	S3cak	S2ne	S2ne	S2k	S2
E) Cucurbitaceae (*Cucurbitaceae*)						
Watermelon-melon	S3c	S3cak	S1(n)	S1(n)	S2k	S3
Zucchini-cucumber	N1c	N1cak	S2ne	S3ne	S2ak	N1
F) Cabbageaceae (*Cruciferae*)						
Cabbage	S3c	N1cak	S1(n)	S1	S2k	S2
Canola	S3c	N1cak	S1(n)	S2ne	S2k	S2
G) Compound Flowers (*Compositae*)						
Sunflower	S2c	S3cak	S1(n)	S2(nk)	S2ak	S1
H) Pasture Allocation						
Pasture	S2c	S3cak	S1(n)	S2ne	S1(k)	S1
I) Forest and Recreation Areas						
Deciduous trees	S3c	S3ca	S1	S3ne	S1(k)	S3
Coniferous trees	S3c	S3ca	S2ne	S2ne	S2	S3

(Continuation of Table 2)

Land Usage Types	**Profiles**					
	13	**14**	**15**	**16**	**17**	**18**
A) Grass (*Gramineae*)						
Wheat	S2k	S3hak	S1(c)	S2cak	S2c	S2cak
Barley	S2k	S3ak	S1(c)	S2cak	S1(c)	S2cak
Rye	S1(k)	S2ko	S1(c)	S1(cak)	S2c	S1(cak)
Maize	S1(hk)	S2ko	S1(c)	S1(hcak)	S1(c)	S2ck
Sudan grass	S2k	S3k	S3c	S1(hck)	S3(c)	S1(ck)
B) Legume plants (*Laguminosae*)						
Soybeans	S1(h)	S2hk	S1(c)	S1(hcak)	S1(c)	S2ck
Bean	S1	S2hko	S1(c)	S2hck	S1(c)	S2ck
Peas	S1(hk)	S3ak	S1(c)	S2hck	S2c	S2ck
Chickpeas-lentils	S1(k)	S2hako	S1(c)	S1(hcak)	S3c	S1(cak)
Alfalfa	S1(k)	N1ao	S1(hc)	S2hck	S2c	S1(cak)
Hungarian vetch	S1	S3k	S1(c)	S1(hck)	S1(c)	S1(ck)
Sainfoin	S1k	S2k	S1(c)	S1(hcak)	S1(c)	S1(ck)
C) Onions plants (Alliaceae)						
Carrot	S2k	N2	S3c	S1(hcak)	S3(c)	S1(ck)
Onion - Garlic - Leek	S2hk	S2ak	S1(hc)	N1hcak	S2c	S1(cak)
D) Solanaceous plants (*Solanaceae*)						
Potato	S1(h)	S2hko	S1(c)	S1(hck)	S3c	S1(c)
Pepper- eggplant	S1(hk)	S3ak	S1(c)	S1(hcak)	S2c	S1(cak)
Tomato	S1hk	S3hak	S1(c)	S2hck	S2c	S2cak
E) Cucurbitaceae (*Cucurbitaceae*)						
Watermelon-melon	S1(k)	S3hak	S1(c)	S1(hcak)	S3c	S1(ck)
Zucchini-cucumber	S2k	S3ak	S2(c)	S2hck	N1c	S2cak
F) Cabbageaceae (*Cruciferae*)						
Cabbage	S1(k)	S2ako	S1(c)	S2hcak	S2c	S1(cak)
Canola	S1(k)	S2ko	S2c	S1(cak)	S2c	S1(cak)
G) Compound Flowers (*Compositae*)						
Sunflower	S1(hk)	S3ak	S1(c)	S2cak	S2c	S1(cak)
H) Pasture Allocation						
Pasture	S1(k)	S2k	S1(ch)	S1(cak)	S1(c)	S1(cak)
I) Forest and Recreation Areas						
Deciduous trees	S3k	S3k	S3c	S1(ck)	S3c	S1(cak)
Coniferous trees	S3k	S3k	S3c	S1(c)	S3c	S2cak

The Legend of Suitability Classes for Crop Production

S1-Highly suitable; providing more than 85% of maximum product efficiency; ands that do not have significant limitations on continued application of one type of use, or have minor limitations that will not significantly reduce productivity or profitability and increase inputs above an acceptable level.

S2-Moderately suitable; providing 60-85% of maximum product efficiency; are lands that collectively have moderate limitations in the case of continued application of one type of use. While handicaps that provide limitations reduce productivity or profitability and increase the level of inputs required; all the advantages to be gained by using the land still make it attractive. However, it is significantly below the productivity expected from land in class 1 (S1). Both practicability and affordability probably require inputs that match.

S3-Marginally suitable; providing 40-60% of maximum product efficiency; are lands that collectively have severe limitations in the case of continued application of this type of use. While handicaps that provide limitations reduce productivity and profitability and increase the level of inputs required; this expenditure only ensures marginal profitability. It needs inputs that are applied but economical under appropriate conditions.

The 2 orders classified as unsuitable are summarized with their typical characteristics and presented below.

N1-Temporarily unavailable; providing 25-40% of maximum product efficiency; these are the lands that are currently unsuitable for the type of use being processed. In today's conditions, its productivity in terms of cost has certain limitations. However, it should be taken into account that these apologies may disappear over time. The restrictions are severe enough to prevent the successful and continuous use of the lands at the desired level.

N2-Consistently unsuitable; providing <25% of maximum product efficiency; considering the input and management practices, they are never economic lands. It has severe limitations that prevent the possibility of successful and continuous use against the desired type of use

Symbols of the Land Suitability Subclass

Land Quality	Limitation	Symbol
Associated with plant growth	Existence of reasons forcing the availability of plant nutrients	n
	The presence of factors that reduce oxygen availability in the root zone	o
	Humus deficiency (burnt barn manure or green manure or compost need)	h
Associated with management	Susceptible to erosion	e
	Compressibility (bottom blasting requirement)	c
	Presence of acidity according to the optimum pH demand of the plant	a
	Lime needs	k
	Salinity	s
	Stoniness	t

Soils are classified in S1 and S2 classes in terms of the suitability classes made in line with the plant's needs, but the problems of compressibility, humus deficiency, presence of acidity according to the optimum pH demand of the plant and lime requirement, and sensitivity to erosion come to the fore in Vertisol Orders soils.

The problems of compressibility in the soil of Entisol Order, the existence of reasons forcing the availability of plant nutrients, the presence of acidity according to the optimum pH demand of the plant and the need for lime are noteworthy. The soils of Alfisol Order are susceptible to erosion, the existence of reasons forcing the availability of plant nutrients, the presence of acidity according to the optimum pH demand of the plant, the need for lime, compressibility, humus deficiency problems come to the fore.The P8 profile, on the other hand, is in the S3 class for some plants, while it is in the class of temporarily and permanently unsuitable for some plants. In Ineptisol Order Soils, the problem of compressibility draws attention.

As a result, Land Use Plans should be made by making detailed Soil Maps throughout the country, taking into account the soil, topography and climate characteristics. Agricultural lands were also planned in line with the Land Use Plans, and Land Suitability classes for the growing conditions of the plants were created in line with the soil and topography demands of the plants. Agriculture should be done according to the characteristics of each classified soil. If we want to obtain the highest and best quality product from the unit area in agricultural production, the variability of soil characteristics, climatic characteristics and topographic characteristics should not be ignored and agriculture must be done in line with the demands of the plants.

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OCCURRENCE OF AFLATOXIN M1 IN YOGHURT SAMPLES FOUND IN MARKETS IN KOSOVO DURING SPRING 2023

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ABSTRACT

Aflatoxin M1 (AFM1) is a harmful byproduct of aflatoxin B1 (AFB1), a cancer-causing mycotoxin created by Aspergillus fungi that can infect various crops. AFM1 can pass from AFB1-tainted feed to milk and dairy products, including yogurt, creating a potential health hazard for people who consume them. For the purpose of analyzing the quantity of AFM1 toxin, 74 yogurt samples were gathered from the markets of Kosovo's largest food suppliers during spring 2023. These samples were manufactured in Kosovo and seven other countries that export to Kosovo: Albania, North Macedonia, Bosnia and Hercegovina, Slovenia, Greece, Italy, and Germany. The Enzyme-linked immunosorbent assay (ELISA), a quick and precise analytical technique, was used for the analysis. The findings of this study show that there are no statistically significant differences in AFM1 levels between yogurt samples

produced in Kosovo and other countries. The average concentrations of AFM1 in yogurt samples from Kosovo and other countries were 0.071 μg/kg and 0.080 μg/kg, respectively. Of all the samples, 66 (89%) exceeded the maximum permissible limit of 0.05 μg/kg. Among the countries that export to Kosovo, yoghurt made in Albania had the highest median AFM1 level at 0.085 μg/kg and the highest maximum level at 0.195 μg/kg among all countries. Yoghurt made in Slovenia had the lowest median AFM1 level among all countries at 0.057 μg/kg. Yoghurt made in Germany had the lowest maximum AFM1 level among all countries at 0.055 μg/kg. All samples from Albania, Greece, and Bosnia and Hercegovina exceeded the maximum permissible limit for AFM1. Samples from Kosovo, North Macedonia, and Slovenia has shown a relatively high prevalence of AFM1.

Considering an average yoghurt consumption of one cup or approximately 250 grams per day and considering the Total Median value of Aflatoxin M1 Concentration (0.071 μg/kg), the Estimated Daily Intake was calculated to be 17.75 μg.

These results highlight the need for monitoring and enforcing regulatory limits to ensure yoghurt safety and protect public health. Steps should be taken to reduce AFM1 contamination and implement measures to minimize its presence in dairy products. These measures will help protect consumer health and promote the production and consumption of safe and high-quality yoghurt.

Keywords: yoghurt, aflatoxin M1, ELISA, food, toxin.

PHOSPORIC ACID ACTIVATION EFFECT ON THE PROPERTIES OF A BIOADSORBENT DERIVED FROM LIGNOCELLULOSIC WASTE

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Abstract

In order to find ways for protecting and preserving the environment toward all kind of pollutants, sevaral new cheaper and effective adsorbents based-lignocellulosic biomasses have been developed and used for toxic components removal from watewater. In this study, carboneous materials with developped porosity were prepared from locally and abundant waste using simultaneous activation route. The collected waste was chemically activated using H_3PO_4 as an oxidizing agent followed by heating up to 800°C. The obtained activated carbon samples were surface-characterized by iodine number and methylene blue index evaluation and activation vield with Burn-off. Results obtained were satisfactory and the mode of activation improved significantly the porosity of the biomass.

Keywords :, chemical activation, physical activation, iodine number, Methylene Blue index, Burn-off.

BIOCONTROL IN VITRO EFFICACY OF TRICHODERMA ASPERELLUM AGAINST SOIL BORNE FUNGAL PATHOGENS

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ABSTRACT

Food safety is a major concern of our time, and consumers are increasingly aware of the importance of eating healthy and safe food. In this pursuit, the issue of pesticides used in conventional agriculture has raised significant concerns. Chemical pesticides have been used for decades to protect crops from pests and diseases, but their impact on human health and the environment is increasingly being questioned. Furthermore, regulatory and legislative pressures laws to restrict the use of chemical pesticides are also contributing to the transition to bio pesticides. Trichoderma asperellum is a fungal species widely used in agriculture as a bio fungicide. It helps prevent plants from infectious diseases caused by soil-borne pathogens. Among these soil-borne pathogens, the most common fungi are *Rhizoctonia solani, Phytophthora sp., Verticillium dahliae,* and *Fusarium oxysporum.* These pathogens have garnered attention due to their wide distribution, destructive nature, and ability to infect a broad range of economically important crops. In this study, the ability of *T. asperellum* against the fourth pathogens, was investigated *in vitro. T. asperellum* showed a high level of effectiveness in inhibition of pathogens mycelial growth as it varied between 86% and

55.03% respectively against *F. oxysporum* and *V. dahliae*. Also, it displayed a stronger inhibitory effect on the germination achieving an inhibition rate of 41.03% and 68.83% against *F. oxysporum* and *V. dahliae*. Additionally, the colonization percentage of each pathogen was relatively low, ranging between 14% and 34% respectively of *F. oxysporum* and *R. solani.* However, in contrast, *T. asperellum* exhibited a significantly higher colonization rate, varying between 69% and 86%.

Keywords : Biocontrol, Inhibition, germination, mycelial growth, colonization, *Trichoderma asperellum*, soil borne pathogens.

AKKARAMAN KOYUNLARINA ÜREME SEZONUNDA VİTAMİN-MİNERAL KOMBİNASYONU TEDAVİSİNİN KUZU DOĞUM AĞIRLIĞI VE MORTALİTE ORANINA ETKİSİ

EFFECT OF VITAMIN-MINERAL COMBINATION TREATMENT ON LAMB BIRTH WEIGHT AND MORTALITY RATE IN AKKARAMAN EWES DURING THE BREEDING SEASON

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ÖZET

Bu çalışmada amaç Akkaraman koyununa üreme sezonunda vitamin-mineral kombinasyonu uygulamasının kuzu doğum ağırlığı ile mortalite oranına etkisinin belirlenmesidir. Çalışmada 2-4 yaşlı toplamda 60 Akkaraman koyunu kullanıldı. Koyunlar yaş ve ağırlık bakımından dengeli olacak şekilde 2 gruba ayrıldı. 1. gruba (G1, Vitamin-Mineral Kombinasyonu, n = 30) koç katımından 7 gün önce ve koç katımından 1, 7, 14, 21 gün sonra oral olarak vitamin-mineral kompleksi (Reva Tarım, Konya-Türkiye) uygulandı. 2. gruba (G2, Kontrol, n = 30) G1 ile aynı zamanda sadece içme suyu verildi. Doğum sonrası kuzuların canlı ağırlıkları belirlendi. Bununla birlikte kuzuların ilk hafta mortalite oranları da tespit edilmiştir. Çalışmadan elde edilen verilerin istatistik analizi SPSS® programı kullanılarak yapılmıştır. G1 ve G2'de kuzuların doğum ağırlıkları sırasıyla ortalama 3,99 ±0,08 ve 4,23 ± 0,13 kg olarak tartıldı (P > 0,05). G1 ve G2'de ikiz, tekiz, erkek ve dişi kuzularda doğum ağırlığı sırasıyla

3,75 ±0,09 ve 3,62 ± 0,11 kg (P > 0,05), 4,27 ± 0,11 ve 4,67 ± 0,14 kg (P = 0.041), 4,22 ± 0,14 ve 4,37 ± 0,26 kg (P > 0,05), 3,82 ± 0,85 ve 4,19 ± 0,13 kg (P = 0,021) olarak belirlendi. Bununla birlikte kuzularda ilk hafta mortalite oranı G1 ve G2'de sırasıyla %4,9 ve %7,9'du (P > 0,05). Sonuç olarak, Akkaraman koyunlarında üreme sezonu içerisinde tekrarlayan vitamin-mineral kombinasyonu tedavisi kuzularda genel doğum ağırlığı ve mortalite oranı üzerine etkili olmadı. İlginç şekilde üreme sezonu vitamin-mineral kombinasyon tedavisi yapılan koyunların tekiz kuzularında ve dişi kuzularında doğum ağırlığı daha düşüktü.

Anahtar kelimeler: Akkaraman, doğum ağırlığı, ikiz, kuzu, mortalite oranı, vitamin-mineral

ABSTRACT

This study aimed to determine the effect of vitamin-mineral combination treatment in Akkaraman ewes during the breeding season on birth weight and mortality rate in lambs. A total of 60 Akkaraman sheep, aged 2-4 years, were utilized for the study. The sheep were divided into two groups, ensuring balance in age and weight. Vitamin-mineral combination (Vetasupra Fertil Revagra®, Reva Tarım, Türkiye) was orally administered to Group 1 (G1, Vitamin-Mineral Combination, n = 30) 7 days before and 1, 7, 14, and 21 days after introduction of the ram. The Group 2 (G2, Control, n = 30) received only drinking water, at the same time, similar to G1. The live weights of the lambs were determined after birth. In addition, the first-week mortality rates of lambs were also determined. Statistical analysis of the data obtained from the study was performed using the SPSS® program. Average birth weights of lambs in G1 and G2 were 3.99 ± 0.08 kg and 4.23 ± 0.13 kg, respectively (P > 0.05). The birth weights of twin, single, male and female lambs in G1 and G2 were 3.75 ± 0.09 kg and 3.62 ± 0.11 kg (P > 0.05), 4.27 ± 0.11 kg and 4.67 ± 0.14 kg (P = 0.041), 4.22 ± 0.14 kg and 4.37 ± 0.26 kg (P > 0.05), 3.82 ± 0.85 kg and 4.19 ± 0.13 kg (P = 0.021), respectively. Furthermore, the first week mortality rate of the lambs in G1 and G2 was 4.9% and 7.9%, respectively (P > 0.05). In conclusion, repeated vitamin-mineral combination treatment in Akkaraman ewes during the breeding season did not significantly affect overall birth weight and mortality rate in lambs. Interestingly, the birth weight of single lambs and females was lower in the ewes treated with vitamin-mineral combination during the breeding season.

Key words: Akkaraman, birth weight, lamb, mortality rate, twin, vitamin-mineral

GİRİŞ

Koyunculuk, ekstansif olarak yapılan ve hayvanların yıllık ot ihtiyacının %95'lik kısmını yeşil ve kuru ot olarak elde edildiği çayır-meraya dayanmaktadır (Keady and Hanrahan, 2007). Bu yüzden, koyunculukta üretim performansı, çayır-mera alanlarının bitki kalitesi, erişilebilirliği ve kapasitesine bağlı olarak değişkenlik göstermektedir (Marteinsdóttir et al., 2017; Morris, 2017). Yine bu alanlardaki bitkilerin yapısında bulunan protein ve enerji ile birlikte vitaminlerin (A ve E), makro (Ca.P, Na, K, Mg, Na, Cl) ve mikro minerallerin (Cu, Mn, Zn, Se, Co, I) otlatma dönemlerindeki değişkenlikleri üretim perfomansını oldukça değiştirmektedir. Hayvansal üretimde istenen verimi elde etmek ve muhtemel metabolik bozuklukları en aza indirmek için beslenme ve üreme arasındaki ilişikinin iyi anlaşılması gerekmektedir (Öziş Altinçekiç et al., 2019; Stewart et al., 2021). İşletmelerin iktisadi

devamlılığı üreme performansına bağlıdır. Bunun da en önemli göstergesi ise sezonda doğan kuzu sayısıdır. Neonatal kuzu ölümleri koyunculukta temel üretim düşüklüğünü göstermekte ve işletmenin üreme performansını temsil etmektedir. (Smith, et al., 2000).

Vitamin ve minerallerin hayvanların büyüme ve gelişmelerinin yanı sıra üreme performanslarında da önemli bir rol oynadığı geniş çapta yapılan çalışmalarla tespit edilmiştir (Gabryszuk and Klewiec, 2002). Gebelik veya laktasyon dönemleri de dahil olmak üzere hayvanın fizyolojik durumu, vitamin ve mineral ihtiyacında farklılıklar oluşmasına yol açmaktadır. Artan miktarlarda mineraller gebelik sırasında emilir, fötus büyümesine izin verir ve laktasyonun ilk aylarında destekleyicidir. Anaçların yetersiz beslenmesinin, plasental fetal kan akışında azalmaya neden olduğu ve bunun da fötusun iskelet-kas sistemi ve karaciğer gibi hayati organların gelişmesini engellediği ortaya konmuştur (Wu et al., 2004). Vitamin-mineral eksikliğine bağlı olarak kuzularda kilo kaybı, büyüme geriliği, verim düşüklüğü, beyaz kas hastalığı ve ölümle sonuçlanan problemlere yol açmaktadır (Avcı, 2000).

Rasyonel bir şekilde yönetilen koyunculuk işletmelerinde düşük ekonomik girdiler göz önüne alındığında, beslenme açısından sadece vitamin-mineral takviyesi uygulamasının bile karlılığı doğrudan etkileyecek bir yöntem olduğu belirtilmektedir (Stewart et al., 2021).

Bu araştırmada üreme sezonundaki Akkaraman ırkı koyunlarda vitamin-mineral kompleksi ilavesinin kuzu doğum ağırlığı ile mortalite oranına etkisi incelenecektir.

MATERYAL VE METOT

Hayvanlar ve Deneme Dizaynı

Bu çalışma Kafkas Üniversitesi Hayvan Deneyleri Yerel Etik Kurulundan (KAU-HADYEK/2019-119) alınan izinle yürütüldü. Deneme Kars ilinin Selim ilçesine bağlı Akpınar köyünde özel bir koyunculuk işletmesinde gerçekleştirildi. Çalışmada 2-4 yaşlı, ortalama 55,4 ± 1,4 kg canlı ağırlıkta, vücut kondisyon skoru ve parite bakımından dengeli toplamda 60 Akkaraman koyunu kullanıldı. Çalışma işletmenin rutin beslenme şartları altında gerçekleştirildi. Tüm deneme gruplarının barınma şartları hayvanların refah koşullarına göre ve aynı olacak şekilde ayarlandı. Denemede hayvanlar iki gruba ayrıldı (n=30). 1. gruptaki hayvanlara koç katımından 7 gün önce ve koç katımını takip eden 1., 7., 14. ve 21. günlerde 25 g düzeyinde vitamin-mineral kompleksi (VM) sulandırılarak (1/1) oral yolla verildi. Kontrol grubu olan 2. gruba (G2) ise VM uygulanan grupla eş zamanlı olarak içme suyu sunuldu. Çalışmada kullanılan VM özel bir firmadan (Reva Tarım, Konya-Türkiye) temin edildi.

Performans

Doğan kuzuların anneleri tarafından bakımı gerçekleştirildikten sonra türlerine özgü teraziyle (0,1 kg hassasiyetli) tartılarak, doğum ağırlıkları hesaplandı. Tüm gruplarda doğumu izleyen

ilk hafta takip edilerek neonatal kuzu ölümleri kaydedildi. Kuzuların mortalite oranı, ölen kuzuların doğan toplam kuzulara oranlanmasıyla hesaplandı.

Araştırmadan elde edilen veriler istatistiksel analizinde SPSS 20 (IBM Inc., Chicago-IL) kullanıldı. Veriler Ki-Kare (χ^2) analizi ile test edildi.

BULGULAR

Çalışmada, Akkaraman koyunlarına ait genel doğum ağırlıklarının önem kontrolleri ile doğum tipi ve cinsiyete ait istatistiksel bilgiler tablo halinde sunulmuştur (Tablo 1). Doğum ağırlıkları incelendiğinde iki grup arasında istatistiksel olarak bir farklılık olmadığı görülmüştür ($p>0.05$). Benzer şekilde ikiz doğum ağırlıklarında da anlamlı bir farklılık olmadığı görülmüştür. Tek doğan kuzularda kontrol grubunun ortalaması (4670,41g), VM grubunun ortalamasından (4274,74 g) daha yüksek bulunmuştur ($p<0,05$). Yine Kontrol grubunda bulunan kuzuların doğum ağırlıkları (4187,09 g), VM grubuna göre daha yüksek tespit edilmiştir ($p<0,05$).

Tablo 1. Vitamin-Mineral Kompleksinin doğum ağırlığı üzerine etkisi (g) (P>0,05)

	Doğum Ağırlığı	**İkiz DA**	**Tek DA**	**Erkek**	**Dişi**
Kontrol	4227,95±126,91	3619,56±111,33	4670,41±142,97	4371,79±263,72	4187,09±129,44
VM	3993,17±83,27	3750,00±94,67	4274,74±113,73	4219,44±141,20	3816,09±84,68
P	0,121	0,378	**0,041**	0,593	**0,021**

DA: Doğum ağırlığı. VM: Vitamin-mineral kompleksi

Tablo 2. Vitamin-Mineral Kompleksinin mortalite oranı üzerine etkisi (%) (P>0,05)

Gruplar	**Ölen kuzu/Toplam Doğan kuzu**	**Mortalite oranı**
Kontrol	3//38	7,9
VMK	2//41	4,9
P	0,582	

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ORCHIOPEXY TECHNIQUE IN A CRYPTORCTIC BRITISH SHORT HAIR CAT: THE FIRST CASE IN TÜRKİYE

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Abstract

In this study, the findings of the orchiopexy technique applied to a case of unilateral inguinal cryptorchid in a British short-hair breed cat were evaluated. The patient was brought to the clinic with a complaint of aggression. On clinical examination, it was understood that the right testicle remained in the inguinal canal and did not descend into the scrotal sac. The patient underwent the orchiopexy technique under general anesthesia. The remaining testicle in the inguinal canal was lowered into the scrotal sac. Prophylaxis against secondary infections was provided by antibiotherapy in the postoperative period. About 10 days after the operation, the stitches were removed. The patient was checked once a week for a month. During the postoperative period, it was seen that the operation wound healed completely. Ultrasound examination of the right testicle showed that it was normal, and parenchymal echoes were homogeneous. In addition, according to the information provided by the patient's owner, it was reported that there was a noticeable decrease in the patient's aggression.

Keywords: Cat; Cryptorchidism; Orchiopexy; Scrotum; Urology

Introduction

Cryptorchidism is the most common congenital anomaly (Memon and Sirinarumitr, 2005). In dogs and cats, the testicles usually descend into the scrotal sac within 10 days of birth. If the testicles have not descended into the scrotal sac within 8 weeks from birth, this is called cryptorchidism (Memon and Tibary, 2001). Partial closure of the inguinal ring at the age of 6 months prevents the passage of the testicles to this region (Johnston at al., 2001). Cryptorchidism can be unilateral or bilateral, and the undescended testis can be found in the abdominal cavity, inguinal canal, or in an ectopic subcutaneous location between the

superficial inguinal ring and the scrotum (Evans and Christensen,1993; Peter 2001). It has been stated that the most common form of cryptorchidism among dogs is the right-sided inguinal testis followed by right-sided abdominal testes (Yates et al., 2003).

The most common forms of cryptorchidism among cats are left and right sided inguinal testicles (Yates et al., 2003). Unilateral or bilateral testicular agenesis is rare in cats (Fossum 2007).

The incidence of cryptorchidism is higher in dogs than cats, it varies between 0.80% and 9.80% in dogs and 1.70% in cats (Memon and Sirinarumitr, 2005). Cryptorchidism is more common in some dog breeds, such as toy and miniature poodles, Yorkshire terriers, Chihuahuas, boxers, and miniature Schnauzers, while it is more common in cats and Persians (Memon and Sirinarumitr, 2005; Griffin 2006).

Cryptorchidism is a risk factor for the development of testicular neoplasia (Yates et al., 2003). Neoplastic transformation is approximately 9.2 to 13.6 times more common in undescended testes of dogs than in canine scrotal testicles (Hayes and Pendergrass, 1976; Pendergrass and Hayes, 1975). In dogs, the development of Sertoli cell tumors following seminomas in the undescended testes is quite common (Reif and Brodey, 1965)

In this study, the treatment of a case of unilateral cryptorchidism in a British short-hair cat with an orchiopexy operation technique was discussed.

Materials and Methods

A 1-year-old, male British shorthair breed cat was brought to the Vetmemorial Veterinary Clinic in İstanbul with a complaint of constant aggression. In national or international cat beauty contests for cats of this breed, the fact that the cat has a single testicle causes it to be disqualified from the competition. The owner of the patient stated that this cat would also participate in such a competition and did not want castration.

In the clinical examination, it was determined that the right testis was in the inguinal canal and the other testis was in the scrotal sac (Fig 1).

Fig 1. Identification of the right testis by palpation in the inguinal canal

Ultrasonographic (USG) examination of the right testis (Edan Dus 60) revealed that the testicular parenchyma was normal and the parenchymal echoes were homogeneous (Fig 2a,b).

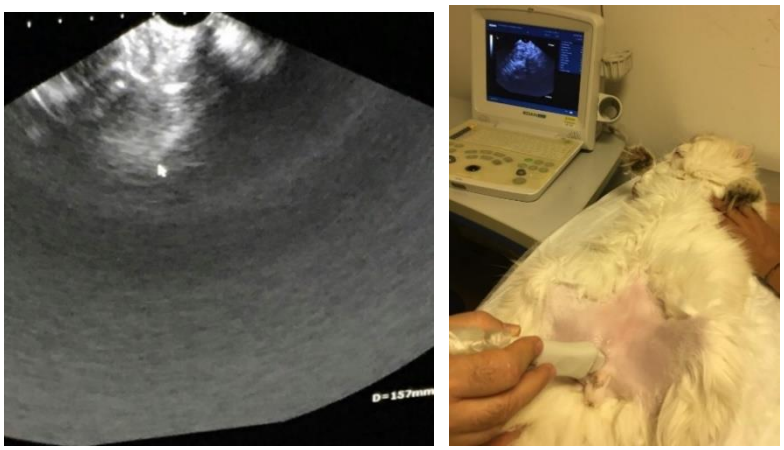

Fig 2 a,b. USG examination of the right testis in the inguinal canal

It was decided to perform an orchiopexy operation to lower the cryptorchid testis remaining in the inguinal canal into the scrotal sac under general anesthesia.

Following xylazine premedication, the patient was intubated with propofol induction. Connected to a closed-system anesthesia device (Matrx), inhalation anesthesia with isoflurane was administered. Then, the testis, which did not fall into its pouch in the operation area, was palpated in the entrance canal of the inguinal canal called osteo vaginale, close to the peritoneal entry hole.

Afterward, the area was shaved and the tissue palpated under ultrasound guidance was definitively diagnosed whether it was testis or not. In the next stage, the operation area was shaved and disinfected. An incision was made under aseptic conditions at the site of the associated swelling. The testicular tissue was reached by gentle manipulation with blunt dissection. In the next step, after the testis was found, the spermatic cord leading to its superior inguinal canal was inspected. The spermatic cord was freed from the surrounding tissues without causing any damage, with arteria, vena and ductus deferens together (Fig 3).

Fig 3. Reaching and revealing the right testis in the inguinal canal by operative intervention

In the next step, an incision was made on the empty scrotum skin below. An attempt was made to create a tunnel for the testicle, which was released above, to be pulled down, and preparations were made for this. To assist this, straight and long-tipped hemostatic forceps inserted through the incision into the scrotum below were advanced up the tunnel opened (Fig 4 a,b).

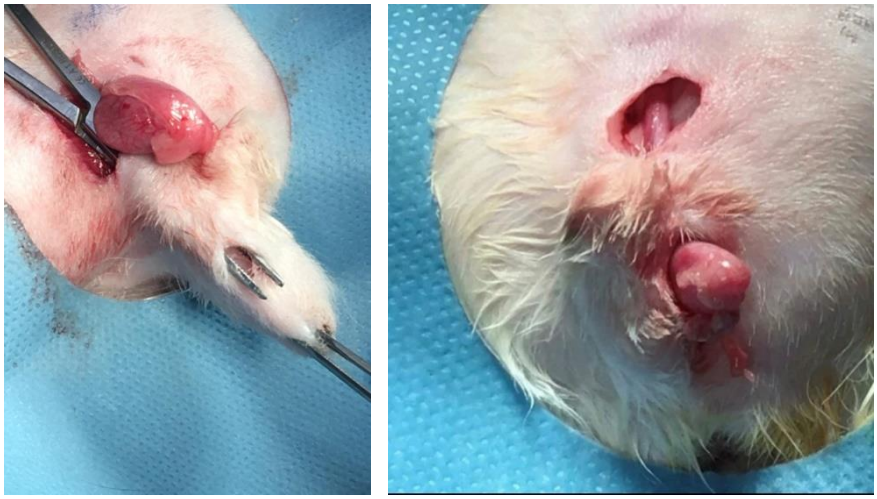

Fig 4 a,b. Advancement of the testis into the scrotum with a tunnel opened with a straight and long-tipped hemostatic forceps

It was held by the tip of the loosened testicle and pulled downwards with the help of forceps. The testis was placed in the scrotum. Fixation sutures were placed both under the skin in the scrotum and in the area that was liberated in the inguinal canal above to prevent it from escaping again. Two or three sutures were applied to the lower scrotum region with 3/0 Vicryl to prevent it from escaping upwards. In the next step, subcutaneous tissue and skin were sutured routinely. 3/0 silk thread was used for leather sutures (Fig. 5). Antiseptic spray was sprayed on the seams.

Fig 5. Closure of the operation wound with surgical sutures

The patient was prevented from damaging the operation wound by applying a collar for about 10 days. In order not to contaminate the operation wound of the patient with cat litter, clipped newsprint was used. After each urine production, these newspaper papers were changed and care was taken to clean them. Ampisid 30 mg antibiotic treatment was given every 12 hours for one week. The patient's condition was checked every three days. About ten days later, the skin sutures were removed.

Results And Discussion

Cases of cryptorchidism are congenital disorders and occur when one or both testicles remain in both the inguinal canal and the abdominal cavity.

The locations of the undescended testicles can be different. Undescended testicles in dogs and cats can be located anywhere between the caudal pole of the kidneys and the inguinal region Hecht, 2008). Diagnosing cryptorchidism and understanding the localization of undescended testicles can be difficult. Diagnosis of undescended testicles in dogs and cats often relies on knowing whether the patient has been castrated and on palpation of the scrotum or inguinal region, but this can be difficult (Miller et al., 2004). It has been reported that it is 48.0% successful to identify the localization of undescended testicles on palpation (Richardson and Mullen, 1993). Invasive techniques such as diagnostic laparotomy or laparoscopy to locate a testis can cause complications (Vannozzi, 2002). The use of high-resolution ultrasound is a sensitive technique for understanding the undescended testis (Hecht, 2001). In the presented case, the owner reported that his cat was not castrated. A palpation examination revealed that the right testis was in the inguinal canal, but a USG examination was also performed to be sure. Although the owner of the patient was told that an orchiectomy could be performed, he did not want castration to prevent his cat from being disqualified from the beauty contest. Other complications of cryptorchidism are sterility and testicular torsion (Peter, 2001; Pearson and Kelly,1975). In this case, no pathological condition was found in the USG examination of the testis remaining in the inguinal canal. By performing an orchiopexy operation, the right testis was lowered into the scrotal sac.

Although testes that have not descended into the scrotal sac cannot produce sperm, they can secrete testosterone, which often results in undesirable behavioral disturbances, aggression, and foul-smelling urine (Scott et al., 2002; Johnston et al., 2001). As a matter of fact, in this case, which was brought with the complaint of aggression, he stated that there was a remarkable decrease in the patient's aggression in the postoperative period.

Conclusion

In cases of cryptorchidism, if it is determined that there is no serious damage to the testicular tissue remaining in the inguinal or abdominal canal, orchidectomy can be applied and positive results can be obtained in cases where orchiectomy is not preferred to eliminate the negative behavioral change that occurs in the patient with uneasiness and to prevent the formation of cancer in the testicular tissue. has been placed. Orchidopexy operation is an alternative for some breeds of cats for aesthetic purposes. This presented case is considered to be of particular importance as it is the first feline orchiopexy case reported from Türkiye in veterinary medicine on a scientific platform.

Conflicts of Interest

The authors declare no conflict of interest.

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A QUANTITATIVE AND QUALITATIVE APPROACH TO THE ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF BUILDING MATERIALS.

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ABSTRACT

This research work proposes a way to assess the sustainability of a building construction process. Building materials, energy and material consumption, waste and nuisance generation, materials end-of-life, building construction organization social impacts are used to evaluate it. The study propose indicators that can effectively and efficiently reach the above challenges and describe the results of their application. The study was based on the construction of three private houses in a developing country (Nigeria). These houses have the same architecture but each one uses a different building process: local materials or standard industrial productions or “fashionable” industrial materials. This study shows that these indicators can help to distinguish between several choices of construction materials. The house made of local materials has a performance at least 1.6 times better than the other two. By contrast, the house made of fashionable materials has the lowest performance in terms of "sustainability" and up to 5 times lower for labour intensity.

KeyWords: Embodied energy, sustainable buildings, ecological building, social impacts.

AFFORDABLE STRATEGY FOR USING LOCAL MATERIALS IN BUILDING:A CASE STUDY OF HOUSING THE URBAN POOR IN NIGERIA.

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ABSTRACT

The rate of urbanization in Nigeria has witnessed tremendous increase in the last five decades. Census in the early Fifties showed that there were about 56 cities in the country and about 10.6 percent of the total population lived in these cities. This rose dramatically to 19.1 percent in 1963 and 24.5 percent in 1985 and still rising till today. Today, the national population is estimated to be about 200 million with the urban population constituting about 60 percent. The phenomenal rise in population, number and size of our cities over the past few years have manifested in the acute shortage of dwelling units which resulted in overcrowding, high rents, poor urban living conditions, and low infrastructure services and indeed high crime rates. Various programs have been implemented to address housing problem. Despite all these interventions, Nigeria's housing problems still remain intractable. The paper recognizes that what Nigerians need to survive the wounds of near-homelessness include good governance, increased access to land, credit, affordable housing and environmentally sound and serviced human settlements. The paper examines the national housing need and housing provision, major constrain in delivery of low cost housing in Nigeria and conclude by recommending locally produced building materials and intermediate technology which can reduce construction cost by about 60 percent as an affordable strategy for construction of low cost housing in Nigeria.

***Keywords**:* Housing Need, Housing Provision, Housing Affordability, Population.

POSSIBLE MECHANISMS OF RETINOPROTECTIVE EFFECTS OF ENDEMIC SAFFRON (CROCUS SATIVUS L.)

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Institute of Physiology named after Academician Abdulla Garayev
Ministry of Science and Education

Saffron (*Crocus sativus L.)* is of significant interest in practical medicine. There are 12 species of saffron in the Caucasus, of which 5 species grow wild in Azerbaijan and 1 species has been introduced into culture, where it is used as a spice, a coloring agent, and in traditional medicine. The medicinal properties of saffron have been known since Ancient Times, and it was believed that saffron cures more than 100 diseases. Recently, scientists from different countries have been studying the beneficial effects of saffron on a scientific basis, relying on empirical information. The purpose of this work was to elucidate the possible mechanisms behind the therapeutic effects of saffron stigma extract in experimental ocular pathology. A comprehensive approach was applied to study the mechanism underlying saffron stigmas extract therapeutic effect on the retina by employing biochemical, pharmacological, and electrophysiological methods. To achieve this goal, on the model of experimental dystrophy of the retina the intensity of lipid peroxidation (LPO), changes in the activity of antioxidant enzymes (SOD, CAT, and GPx), transport ATPases in photoreceptor cells, and the electroretinogram (ERG)were performed after saffron extract administration. The research results showed that, that saffron exerts a normalizing and stimulating influence on certain biochemical processes within the retina. By mitigating oxidative stress, saffron prevents the suppression of transport ATP-ase enzyme and antioxidant defense enzyme activity within the organism, promoting the normalization of metabolic processes and consequentially improving the functional state of the retina. The positive retinoprotective effects of saffron on the eye's receptor apparatus can be attributed to its intricate biochemical composition and the synergistic effect of several mechanisms of action.