



ICONFOOD'25

4TH INTERNATIONAL CONGRESS ON FOOD RESEARCHES

Food Right for Future

October 16-18, 2025 / Sivas, Türkiye

Sivas Cumhuriyet University

Food Studies Application and Research Center



ABSTRACT BOOK

Editors

Prof. Dr. Özlem Pelin CAN

Assoc. Prof. Dr. Emre HASTAOĞLU

Assoc. Prof. Dr. Meryem GÖKSEL SARAÇ

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ABSTRACT BOOK

ICONFOOD'25 4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

June 5-8, 2025
London, UK

Editors

Prof. Dr. Özlem Pelin CAN
Assoc. Prof. Dr. Emre HASTAOĞLU
Assoc. Prof. Dr. Meryem GÖKSEL SARAÇ

25.10.2025

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adopted by Mariam Rasulan

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CONGRESS ID

TITLE OF CONGRESS

ICONFOOD'25
4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

PARTICIPATION

Keynote & Invited

DATE - PLACE

October 16-17, 2025

ORGANIZATION

İKSAD-Institute of Economic Development and Social Researches
&
Sivas Cumhuriyet University Food Studies Application and Research Center

Congress Honorary President

Prof. Dr. Ahmet ŞENGÖNÜL - Rector of Sivas Cumhuriyet University

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Asst.  efahat TA  I

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PARTICIPATING COUNTRIES (26)

Türkiye, Pakistan, Nigeria, India, Romania, TRNC, Canada, Azerbaijan, Morocco, Africa, Algeria, Oman, Georgia, Iran, Hungary, Kosovo, Tunisia, Serbia, North Macedonia, Indonesia, Malaysia, Uzbekistan, Republic of Korea, Yemen, Vietnam, Poland

TOTAL PAPERS: 299

The number of papers from foreign countries: **156**

The number of papers from Türkiye: **143**

LANGUAGES

Turkish, English

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PHOTO GALLERY



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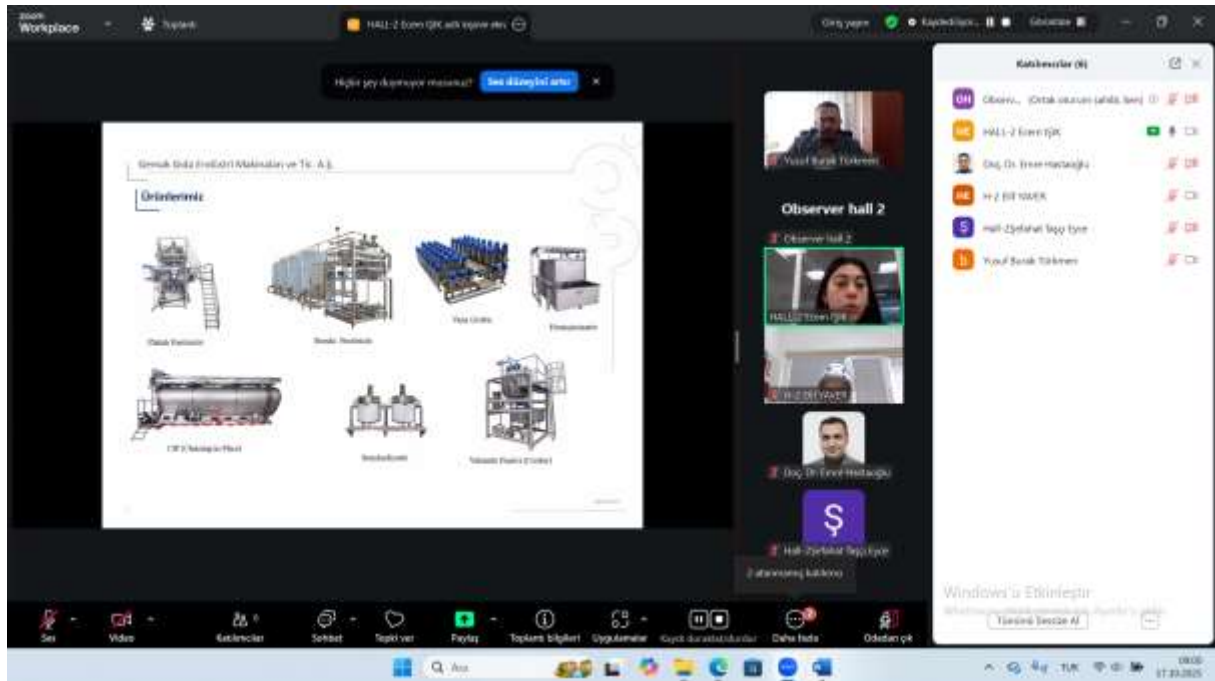
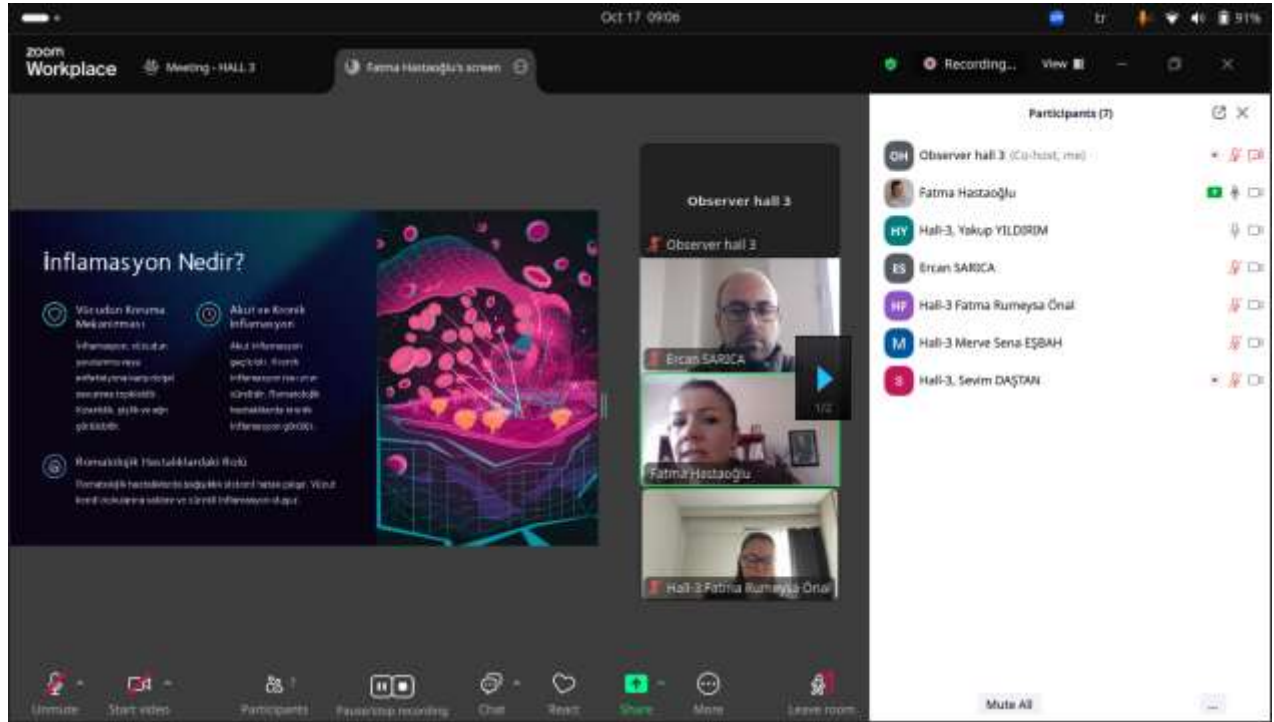


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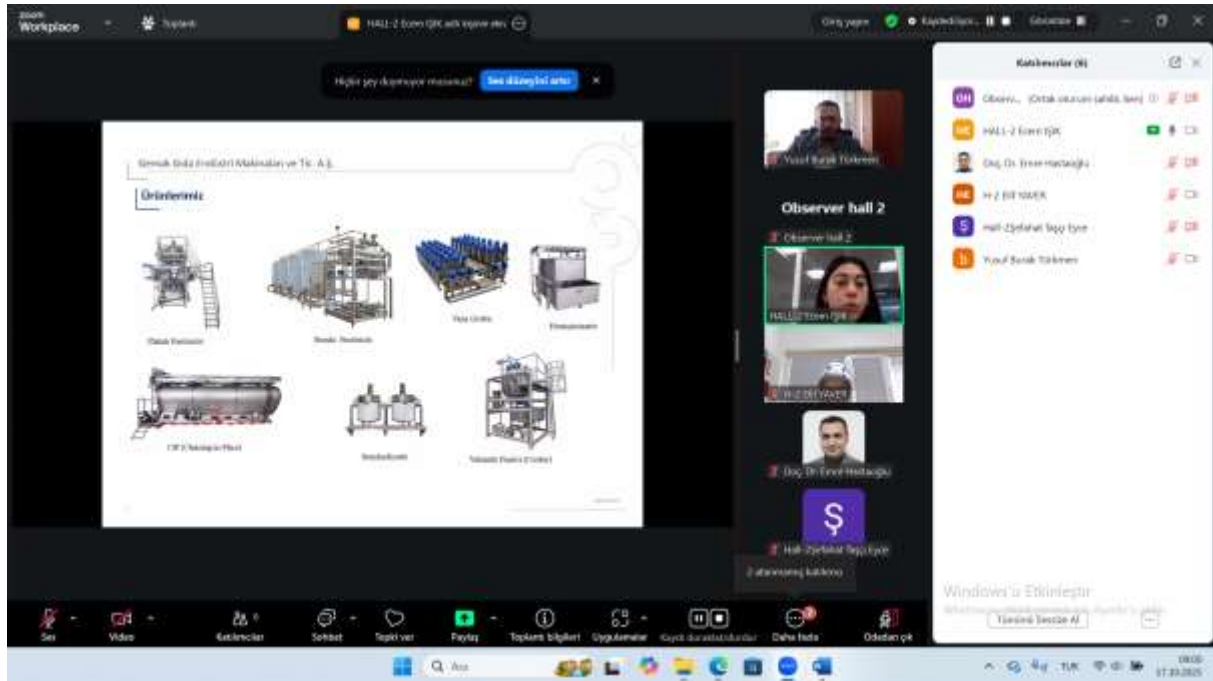
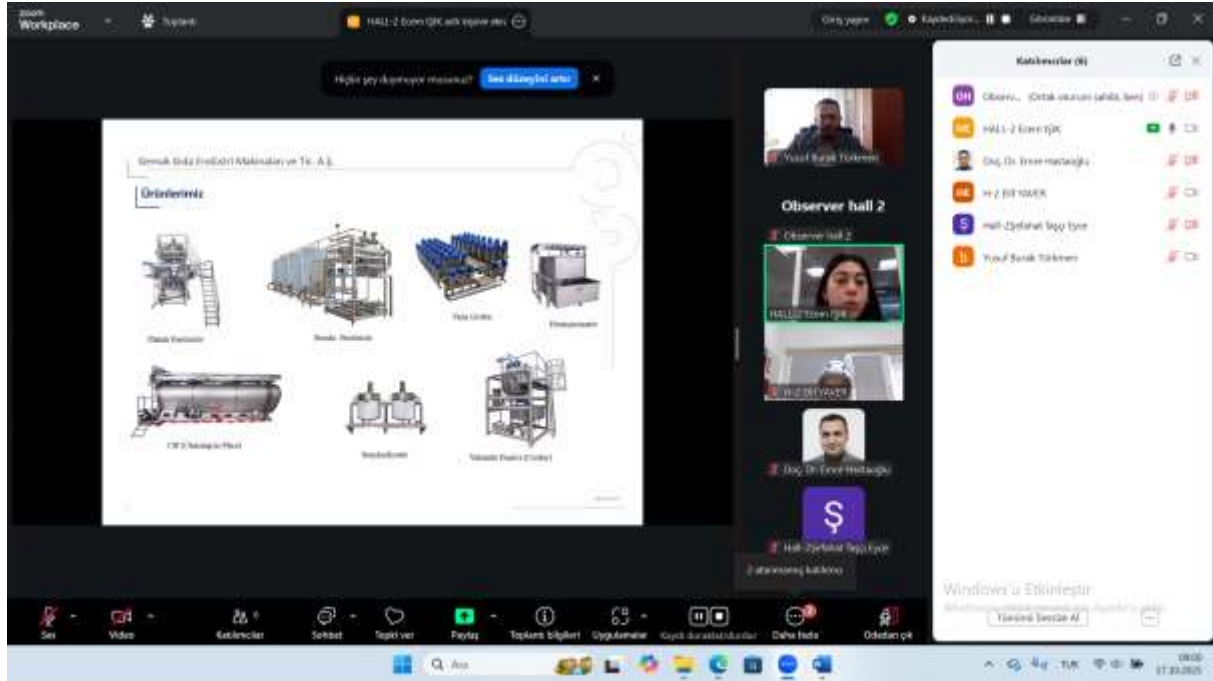
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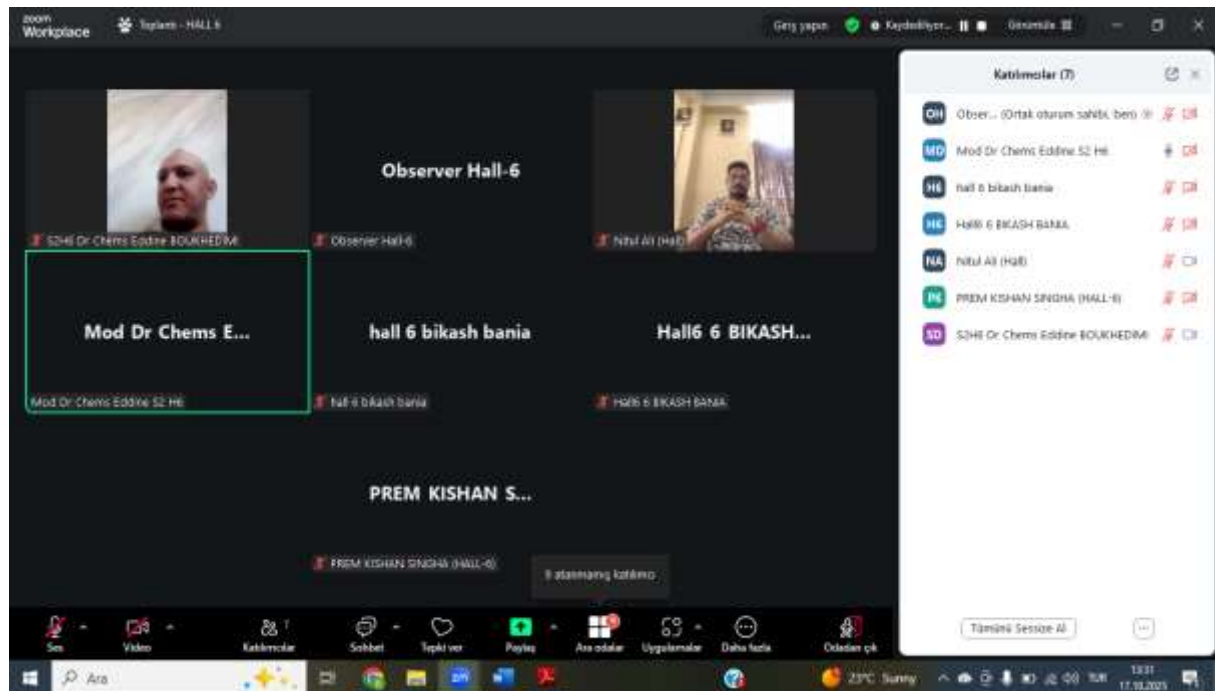
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4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

October 16-17, 2025

SIVAS CUMHURİYET UNIVERSITY FOOD STUDIES APPLICATION AND RESEARCH CENTER

CONGRESS FACE TO FACE PROGRAM

- Opening Ceremony-

16.10.2025

Time: 10.00-10.30

Food and Agriculture Organization of the United Nations (FAO) 80th Year Video

Prof. Dr. Özlem Pelin CAN

Congress Chair

Prof. Dr. Ahmet řENGÖNÜL

Rector of Sivas Cumhuriyet University

Dr. Atabek MOVLYANOV

IKSAD

- Keynote Speakers-

Prof. Dr. Maksim REBEZOV

10.45-11.15

Prof. Dr. Halil Mecit ÖZTOP

11.20-11.50

Ebru AKDAĞ

13.30-14.00

Adress: Sivas Cumhuriyet University 100th Year Culture
Center

SESSION-1

Moderator: Assoc. Prof. Dr. Emre HASTAOĞLU**Address: Sivas Cumhuriyet University 100th Year Culture Center****Ankara Local Time: 14.15-15.00**

TITLE	AUTHOR(S)	AFFILIATION
THE USE OF NUTRITIONAL SUPPLEMENTS IN CHILDREN: LITERATURE EVIDENCE AND CLINICAL PERSPECTIVE	Özge AKTAŞ Emine DİNÇER	Sivas Cumhuriyet University, Türkiye
INVESTIGATION OF THE REHYDRATION KINETICS OF SUN-DRIED FRUIT SLICES	Ahsen SAYGI Zeynep Mine ŞENOL	Sivas Cumhuriyet University, Türkiye
HERITAGE SHARED ACROSS BORDERS: DISCUSSIONS ON CULTURAL APPROPRIATION OF TURKISH CUISINE PRODUCTS	Şefahat EYCE	Sivas Cumhuriyet University, Türkiye
INNOVATIVE NON-THERMAL TECHNOLOGIES FOR IMPROVING THE SAFETY AND NUTRITIONAL QUALITY OF INFANT FOODS	Betül KARAPINAR Tuğba DEMİR	Sivas Cumhuriyet University, Türkiye

SESSION -2

Moderator: Assoc. Prof. Dr. Meryem GÖKSEL SARAÇ**Address: Sivas Cumhuriyet University 100th Year Culture Center****Ankara Local Time: 15.15-16.00**

TITLE	AUTHOR(S)	AFFILIATION
THE EFFECT OF CINNAMON ADDED TO KEFIR BEFORE AND AFTER FERMENTATION ON SOME GLYCEMIC AND APPETITE PARAMETERS	Melih ÜRGÜP Kübra MİNYAS Mine ÇOLAK Buse YAVUZ Armağan Aytuğ YÜRÜK	Erciyes University, Türkiye
USE OF CAMELINA SEED MUCILAGEN AS A FAT REPLACER IN MAKING GLUTEN-FREE COOKIES	Necla ÖZDEMİR ORHAN Zeynep EROĞLU	Bitlis Eren University, Türkiye Munzur University, Türkiye
THE EFFECTS OF PARTICLE SIZE & EMULSIFIER AMOUNT ON TRIBOLOGICAL, RHEOLOGICAL, TEXTURAL & SENSORIAL PROPERTIES OF MILK CHOCOLATE	Burcu ŞAŞMAZ Gülbüz GÜNEŞ	İstanbul Technical University, Türkiye

SESSION -3

Moderator: Assoc. Prof. Dr. Ayşe Burcu AKTAŞ**Address: Sivas Cumhuriyet University 100th Year Culture Center****Ankara Local Time: 16.15-17.00**

TITLE	AUTHOR(S)	AFFILIATION
THE POTENTIAL OF FERMENTED FOODS TO TRANSFER ANTIBIOTIC RESISTANCE GENES	Neslihan ARSLAN Bülent ÇETİN	Sivas Cumhuriyet University, Türkiye Atatürk University, Türkiye
EVALUATION OF ASTAXANTHIN PRODUCTION BY BACTERIA ISOLATED FROM AQUATIC ECOSYSTEMS USING HPLC	Medine GÜLLÜCE Belkıs Gökçen YEŞİLYURT Taha Yasin KOÇ Yakup ÖZDEMİR	Atatürk University, Türkiye
THE INVISIBLE HAZARD IN COOKING EQUIPMENT: THE TRANSITION OF HEAVY METALS INTO FOODS	Esra TANRIVERDİ Mehmet GÜLLÜ	Tokat Gaziosmanpaşa University, Türkiye
FOOD HYGIENE AND SUSTAINABLE NUTRITION IN MASS CATERING SYSTEMS: DETERMINATION OF KNOWLEDGE LEVELS	Tuba TEKİN Nurcan BAĞLAM	Sivas Cumhuriyet University, Türkiye

SESSION -4

Moderator: Moderator: Assist. Prof. Dr. Hatice Aybüke KARAOĞLAN**Address: Sivas Cumhuriyet University 100th Year Culture Center****Ankara Local Time: 17.15-18.00**

TITLE	AUTHOR(S)	AFFILIATION
RESVERATROL-MEDIATED REDOX MODULATION AND CYTOTOXICITY IN GLIOMA CELLS: A COMPARATIVE IN VITRO STUDY	Zuhal TUNÇBİLEK Gonca KABAK	Sivas Cumhuriyet University, Türkiye
<i>ALLIUM POLYANTHUM</i> EXTRACT INDUCES OXIDATIVE STRESS-MEDIATED CELL DEATH IN RAT GLIOMA CELLS VIA IMPAIRMENT OF ANTIOXIDANT DEFENSE SYSTEMS	Tuğba AĞBEKTAŞ Ayça TAŞ	Sivas Cumhuriyet University, Türkiye
NUTRITIONAL QUALITY, BIOACCESSIBILITY, AND HEALTH EFFECTS OF PLANT-BASED MILK ALTERNATIVES	Kevser Sena IŞIK Hatice Aybüke KARAOĞLAN	Sivas Cumhuriyet University, Türkiye
THE IMPORTANCE OF SEAFOOD AS FUNCTIONAL FOOD	Egemen Etki GÖKTAN Özlem Pelin CAN	Sivas Cumhuriyet University, Türkiye

Closing Ceremony Congress Chair
Prof. Dr. Özlem Pelin CAN

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October 16-17, 2025

SIVAS CUMHURİYET UNIVERSITY FOOD STUDIES APPLICATION AND RESEARCH CENTER

CONGRESS ONLINE PROGRAM

<https://us02web.zoom.us/j/81303483436?pwd=5mpNR4ooWYUuLJu7MTTV3bWOUcxZVo.1>

Meeting ID: 813 0348 3436

Passcode: 151718

Session-1, Hall-1

17.10.2025

Moderator: **Prof. Dr. Özlem Pelin CAN**Meeting ID: **813 0348 3436/ Passcode: 151718**Ankara Local Time: **09:00 – 11:00**

Title	Author(s)	Affiliation
THE USE OF TOMATO POMACE IN WHITE CHEESE PRODUCTION: EFFECTS ON CHEMICAL, MICROBIOLOGICAL, AND SENSORY PROPERTIES	Özlem Pelin CAN	Sivas Cumhuriyet University, Türkiye
APPLICATIONS OF MACHINE LEARNING IN FOOD SAFETY: CURRENT APPROACHES AND FUTURE PERSPECTIVES	Özlem Pelin CAN	Sivas Cumhuriyet University, Türkiye
FUNCTIONAL NOODLE DEVELOPMENT USING OIL SEED POWDERS: TECHNOLOGICAL AND QUALITY ASSESSMENT	Öznur EYMİR Tekmile CANKURTARAN KÖMÜRCÜ	Necmettin Erbakan University, Türkiye
EFFECTS OF USING NATURAL SPRING WATER AS AN ALTERNATIVE WATER SOURCE IN NOODLE PRODUCTION ON PHYSICAL AND SENSORY PROPERTIES	Sümeyye BALDIK Tekmile CANKURTARAN KÖMÜRCÜ Eda GÜNEŞ	Necmettin Erbakan University, Türkiye
POTENTIAL USAGE OF POMEGRANATE PROCESSING BY-PRODUCTS AS A NATURAL FUNCTIONAL ADDITIVE IN FORTIFICATION OF DAIRY PRODUCTS	Mehmet Ali SALIK	Bingöl University, Türkiye
THE ROLE OF NATURAL PLANT-BASED ADDITIVES AS AN ALTERNATIVE TO SYNTHETIC ANTIOXIDANTS ON THE OXIDATION STABILITY AND FUNCTIONAL PROPERTIES OF BUTTER	Mehmet Ali SALIK	Bingöl University, Türkiye

All participants must join the conference 10 minutes before the session time.

Every presentation should last not longer than 10-12 minutes.

Kindly keep your cameras on till the end of the session.

Session-1, Hall-2

17.10.2025

Moderator: Assoc. Prof. Dr. Emre HASTAOĞLU

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 09:00 – 11:00

Title	Author(s)	Affiliation
PRODUCTION OF CLEAR ICED TEA EXTRACT FROM BLACK TEA WASTE USING MEMBRANE TECHNOLOGY AND PROTOTYPE SYSTEM DESIGN	Rukiye MAVUŞ Ebu Bekir DİŞLİ Ecem IŞIK	Gemak Gıda Endüstri Makinaları ve Tic. A.Ş., Ankara, Türkiye
PILOT UNIT DEVELOPMENT AND PROTOTYPE PRODUCTION FOR COMMERCIAL OVALBUMIN EXTRACTION FROM LIQUID EGG WHITE	Rukiye MAVUŞ Ebu Bekir DİŞLİ Ecem IŞIK	Gemak Gıda Endüstri Makinaları ve Tic. A.Ş., Ankara, Türkiye
THE USE OF CARNAUBA WAX OLEOGEL AS A FAT SUBSTITUTE IN IMMATURE CHICKPEA CRACKERS: TECHNOLOGICAL AND SENSORY EVALUATION	Elif YAYER Nezahat OLCAY Hilal ARSLAN BAYRAKCI	Konya Technical University, Türkiye Selçuk University, Türkiye
FUNCTIONAL FOOD COMPOUNDS AFFECTING AGE-RELATED EYE HEALTH	Yusuf Burak TÜRKMEN Zeynep B. GÜZEL SEYDİM	Süleyman Demirel University, Türkiye
FRYING PERFORMANCE AND STORAGE STABILITY OF EXTRA VIRGIN OLIVE OIL-BASED OLEOGEL	Elif KÜTAHNECİ	Kapadokya University, Türkiye
EVALUATION OF COFFEE WASTE IN THE FOOD INDUSTRY	Emirhan ÇOKOĞULLU Aslı ZUNGUR BASTIOĞLU	Aydın Adnan Menderes University, Türkiye
GASTRONOMY IN THE AGE OF THE METAVERSE: VIRTUAL DINING EXPERIENCES AND THEIR REFLECTION IN THE FUTURE	Şefahat EYCE	Sivas Cumhuriyet University, Türkiye
İMETHODS FOR CATEGORIZING PROCESSED AND UNPROCESSED FOODS	Emre HASTAOĞLU	Sivas Cumhuriyet University, Türkiye
COMPARISON OF THE NUTRITIONAL PROPERTIES OF VEGAN AND NON-VEGAN MILKS	Emre HASTAOĞLU	Sivas Cumhuriyet University, Türkiye

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Session-1, Hall-3

17.10.2025

Moderator: Assoc. Prof. Dr. Fatma HASTAOĞLU

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 09:00 – 11:00

Title	Author(s)	Affiliation
EFFECTS OF FOOD CHOICES ON INFLAMMATION IN RHEUMATIC DISEASES: CLINICAL IMPORTANCE OF NUTRITION	Fatma HASTAOĞLU	Sivas Cumhuriyet University, Türkiye
THE ROLE OF PROCESSED FOODS IN THE DEVELOPMENT OF CHRONIC DISEASES	Fatma HASTAOĞLU	Sivas Cumhuriyet University, Türkiye
NUTRITIONAL VALUE & HEALTH EFFECTS IN TERMS OF PHYTOCHEMICAL CONTENT OF <i>PRUNUS PERSICA</i> (L.) BATSCH (PEACH)	Yakup YILDIRIM	Selçuk University, Türkiye
THE IMPORTANCE OF ANTIOXIDANTS IN CARDIOVASCULAR DISEASES	Merve Sena EŞBAH Fatma Rümeysa ÖNAL Gökçen DOĞAN	Lokman Hekim University, Türkiye
THE IMPORTANCE OF SUSTAINABLE NUTRITION FOR ATHLETES	Fatma Rumeysa ÖNAL Merve Sena EŞBAH Gökçen DOĞAN	Lokman Hekim University, Türkiye
KETOGENIC DIET APPLICATION BEFORE BARIATRIC SURGERY: METABOLIC AND CLINICAL IMPLICATIONS	Sevim DAŞTAN Mahir ARSLAN	Sivas Cumhuriyet University, Türkiye
PROTEIN HYDROLYSATES AS FUNCTIONAL FOODS AND THEIR EFFECTS ON HEALTH	Hatice BEKİROĞLU	Şırnak University, Türkiye
COMPARISON OF PHYSICOCHEMICAL AND ANTIOXIDANT PROPERTIES BETWEEN RAW AND HEAT-TREATED ALMOND MILK ANALOGUES	İdil DİBEK Ercan SARICA	Bolu Abant İzzet Baysal University, Türkiye
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Session-1, Hall-4
17.10.2025
Moderator: Malina VISTERNICU
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 09:00 – 11:00

Title	Author(s)	Affiliation
THE ROLE OF HIGH FAST FOOD, SUGARY BEVERAGE, AND SUGAR INTAKE IN THE DEVELOPMENT OF CHRONIC KIDNEY DISEASE: A CLINICAL AND LITERATURE-BASED ANALYSIS	Faizan Afzal	Hajvery University Lahore, Pakistan
SMART PACKAGING SYSTEMS: ROLE OF BIOSENSORS IN FOOD SAFETY AND SHELF-LIFE EXTENSION	Perumal HariPriya Murugesan Kamaraj	SRM Institute of Science and Technology, Ramapuram Campus, Chennai- 600089, Tamil Nadu, India
MONITORING MEAT FRESHNESS IN SMART PACKAGING USING ANTHOCYANINS FROM RED CABBAGE	Loredana-Mariana HUȚUȚUI Sonia AMARIEI	"Stefan cel Mare" University of Suceava - Faculty of Food Engineering, Suceava, Romania
FOOD SAFETY "THINK ABOUT EASY AND EFFECTIVE APPLICATION OF THE REGULATIONS PROVIDED FOR FOOD SAFETY"	Dr. RAHMOUNI HANANE	University of Oran 2 Mohamed Ben Ahmed, Algeria
SUSTAINABLE AGRICULTURAL PRACTICES AND THEIR IMPACT ON FOOD SECURITY IN DEVELOPING NATIONS	ADEPOJU Samuel Adebawale	Ajayi Crowther University, Oyo, Oyo State. Nigeria, West Africa, Africa.
EFFECTS OF THREE PHYTOGENIC AQUEOUS BLENDS ON NUTRIENT UTILISATION EFFICIENCY OF BROILER CHICKEN	Ogundeji, N. A., Akinlade, O. O., Akinlade, O. O., Sangosina, M. I., Leramo, O. O., Olufayo, O. O., Okusanya, P. O., Irivboje, O. A., Olorunsogbon, B. F.	Federal College of Agriculture, Moor Plantation, Ibadan, Nigeria
CAFFEINE EXPOSURE AND ITS NEUROBEHAVIORAL ALTERATIONS IN ZEBRAFISH (DANIO RERIO)	Cătălina IONESCU Viorica RARINCA Malina VISTERNICU Alin CIOBICA	Apollonia University, Romania Alexandru Ioan Cuza University of Iasi, Romania. "Olga Necrasov" Center, Romania Academy of Romanian Scientists, Romania
TOXICOLOGICAL AND HEALTH IMPLICATIONS OF TARTRAZINE (E102) CONSUMPTION FROM FOOD PRODUCTS	Malina VISTERNICU Catalina IONESCU Viorica RARINCA Alin CIOBICA	Apollonia University, Romania Alexandru Ioan Cuza University of Iasi, Romania. "Olga Necrasov" Center, Romania Academy of Romanian Scientists, Romania

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Session-1, Hall-5
17.10.2025
Moderator: Wazeeha Zubair Ansari
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 09:00 – 11:00

Title	Author(s)	Affiliation
ANTIOXIDATIVE PHENOLIC COMPOUNDS OF EDIBLE WILD MUSHROOMS	Sanem BULAM	Giresun University, Türkiye
PRELIMINARY FINDINGS ON THE EFFECTS OF PSEUDO-CEREAL FLOURS AND ENZYME ADDITIVES IN GLUTEN-REDUCED WAFER FORMULATIONS	Deyana ABBAS Zehra UFUK Selçuk ARSLAN Tuğba İNANÇ HORUZ Fatih BALCI	Gaziantep University, Turkey Tübitak Marmara Teknokent, Türkiye
INNOVATIVE NON-THERMAL TECHNOLOGIES FOR SUSTAINABLE FOOD PROCESSING	Mohd Arsh Khan, Wazeeha Zubair Ansari	Integral University, Lucknow Aligarh Muslim University, Aligarh
ECO-FRIENDLY PROCESSING TECHNOLOGIES TO REDUCE FOOD WASTE AND ENERGY USE	Wazeeha Zubair Ansari, Mohd Arsh Khan	Aligarh Muslim University, Aligarh Integral University, Lucknow
IMPACT OF THE HARVESTING REGION ON THE PHYTOCHEMICAL COMPOSITION AND NUTRITIONAL POTENTIAL OF FUMARIA PARVIFLORA IN MOROCCO	Salma MAKDOUF, Karima EL BOUQDAOUI, Abdelhakim El Makssoudi, Mounia Cherki	Hassan II University of Casablanca (Morocco) Higher Institute of Nursing Professions and Health Techniques, Casablanca (Morocco)
IN VITRO EVALUATION OF POLYOL PATHWAY INHIBITION, CYTOTOXICITY, AND ANTIMICROBIAL ACTIVITY OF EPHEDRA FRAGILIS	Fatima Abdou-Allah, Fouzia Hmimid, Meryem Souidek, Fatima Ez-zahraa Ousaid, Lamiaa Ait Si, Ismail Guenaou, Imane Nait Irahah, Nouredine Bourhim, Kabine Mostafa	Hassan II University, Morocco. University Chouaïb Doukkali, Morocco
THE IMPACT OF EXTRACTION SOLVENT ON THE PHYTOCHEMICAL COMPOSITION AND IN VITRO ANTACID ACTIVITY OF POMEGRANATE LEAVES	Mohammed Cheurfa, Abdallah Noui, N.I Kessairi, B. Takherisste, A. Meklati	University of Djillali Bounaama-Khemis Miliana, Algeria. National School of Nanoscience and Nanotechnology. Algeria University Center of Tipaza, Algeria
ENHANCED PHOTOCATALYTIC REMOVAL OF TOXIC DYES USING A NOVEL TRIPLE MOLYBDATE	Rawia Nasri, Mohamed Faouzi Zid	University of Tunis El Manar, Tunisia
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Session-1, Hall-6
17.10.2025
Moderator: Lawal Atinuke Adenike
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 09:00 – 11:00

Title	Author(s)	Affiliation
A SCREENING OF SOME SUPERFOODS AND MEDICINAL PLANTS AS A POTENTIAL SOURCE OF SUGARS, INULIN AND LOW-MOLECULAR FRUCTANS	Nadezhda Petkova Dobromira YANEVA Ivanka HAMBARLYISKA Dragomir Vassilev	University of Food Technologies, Technological Faculty, Department of Organic Chemistry and Inorganic Chemistry
IMMOBILIZATION OF PECTINASE ON ORANGE PEEL USING <i>Luffa cylindrica</i> FOR ENHANCED STABILITY AND APPLICATION IN JUICE CLARIFICATION	Lawal Atinuke Adenike	Science Laboratory Technology, Federal Polytechnic, Ilaro, Nigeria
AWARENESS AND USE OF UNIVERSAL PRODUCT CODES AS A CATALYST FOR GROWTH IN OMANI SMALL SCALE FARMING	Afaq AHMAD Wadhah AL MANDHARI Maryam AL WASHAHI Nadheera AL HOSNI Maha Al Balushi	Modern College of Business and Science, Oman
PERCEPTION OF CLIMATE VARIABILITY BY YAM (<i>Dioscorea</i> spp) FARMERS IN NIGERIA	Obaniyi Kayode Samuel, Adedeji Ayomikun Pricilla	Landmark University
PHARMACOLOGICAL POTENTIAL OF CYNARA CARDUNCULUS L. FROM MOROCCO: TOXICOLOGICAL, ANTIDIABETIC, AND ANTIMICROBIAL INSIGHTS	Meryem Souidek, Fatima Abdou-Allah, Lamiaa Ait Si, Fatima Ez-Zahra Ousaid, Faiza Chbel, Fouzia Hmimid, Houssine Azeddoug	Hassan II University of Casablanca, Morocco University Chouaïb Doukkali, El jadida, Morocco
DOMESTICATION EFFECTS ON THE PHYTOCHEMICAL COMPOSITION AND ANTIBACTERIAL ACTIVITY OF THYMUS ESSENTIAL OILS IN MOROCCO	Aabdousse Jamal, Boulli Abdelali, Wahid Nadya, Oussif Ilis, Salim Nora	Sultatn Moulay Slimane University Beni Mellal
QUALITY ASSESSEMENT OF SUYA (TSIRE) AS AFFECTED BY CORIANDER (<i>Coriandrum sativum</i>)	Oshibanjo Olusegun Debola, Solomon Taiwo Abraham	University of Jos, Plateau State, Nigeria
LEPIDIUM SATIVUM: A FUNCTIONAL PLANT WITH UNDERESTIMATED NUTRITIONAL AND THERAPEUTIC POTENTIAL	Hamza EL KISSANY, Hicham EL-BOUKHARY, Hicham EL KISSANI, Adil LAAZIZ, Abdelouahed HAJJAJI	Sultan Moulay Slimane University, Beni Mellal, Morocco. Sidi Mohamed Ben Abdellah University, Fez, Morocco

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Session-2, Hall-1

17.10.2025

Moderator: Prof. Dr. Meltem SARIOĞLU CEBECİ

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 11:30 – 13:30

Title	Author(s)	Affiliation
PRODUCTION OF BIODEGRADABLE MATERIALS FROM FOOD WASTE: EXAMPLES FROM TÜRKİYE AND THE WORLD	Meltem SARIOĞLU CEBECİ	Sivas Cumhuriyet University, Türkiye
ENVIRONMENTAL IMPACTS OF SINGLE-USE FOOD PACKAGING	Şakire Nur HASTAOĞLU Meltem SARIOĞLU CEBECİ	Sivas Cumhuriyet University, Türkiye
GREEN EXTRACTION OF BIOACTIVE COMPOUNDS FROM ESPRESSO COFFEE WASTE USING NADES: COMPARATIVE EVALUATION WITH ETHANOL	Ayşenur ACAR Vildan EYİZ	Selçuk University, Türkiye
A GENERAL OVERVIEW OF POSTBIOTICS: CURRENT CONCEPTS AND APPLICATIONS	Zeki EROL Soner TUTUN	Dokuz Eylül University, Türkiye
PEA PROTEIN-FENUGREEK SEED MUCILAGE FILMS INCORPORATING LEMONGRASS ESSENTIAL OIL NANOEMULSIONS: EFFECTS OF PROCESSING METHODS AND CONCENTRATION	Dilara KONUK TAKMA Huriye Gözde CEYLAN	Aydın Adnan Menderes University, Türkiye
DEVELOPMENT AND SENSORY EVALUATION OF SOFT CANDY AND LOZENGE FORMULATIONS CONTAINING BEE PRODUCTS AS FUNCTIONAL FOODS	Hatice Gözde HOSTA YAVUZ İbrahim YAVUZ Mustafa KARHAN	Akdeniz University, Türkiye
3D PRINTING TECHNOLOGIES IN THE DESIGN OF FUNCTIONAL FOODS FOR DYSPHAGIA	Hatice Gözde HOSTA YAVUZ İbrahim YAVUZ	Akdeniz University, Türkiye
CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF RAW MILK AND WHITE CHEESE SOLD OPENLY: SAMPLE OF KİLİS	Tuğba KILIÇ Gülcan KOYUNCU Cansu ÖZALTUN	Kilis 7 Aralık University, Türkiye

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Session-2, Hall-2

17.10.2025

Moderator: Assist. Prof. Dr. Anıl Can BİRDAL

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 11:30 – 13:30

Title	Author(s)	Affiliation
FOOD SAFETY DURING EARTHQUAKE PERIOD: FEBRUARY 6 EARTHQUAKE SİVAS PROVINCE	Esen Bilge BİÇER Resul Ekrem Akbulut Ayşe Hümeysra TAŞKIN KAFA Mürşit HASBEK Hilmi ATASEVEN	Sivas Cumhuriyet University, Türkiye
OLEOGEL APPLICATIONS AND FUTURE IN THE FOOD INDUSTRY	Aslıhan TÜĞEN Harun DIRAMAN	Afyon Kocatepe University, Türkiye
ENCAPSULATION APPLICATIONS IN THE FOOD ENDUSTRY	Eda İlhan BAŞOĞLU Perihan YOLCI ÖMEROĞLU Ömer Utku ÇOPUR	Bursa Uludağ University, Türkiye
THE ROLE OF UAV AND REMOTE SENSING IN MODERN AGRICULTURE AND FOOD SUSTAINABILITY	Anıl Can BİRDAL Rutkay ATUN	Sivas Cumhuriyet University, Türkiye
EVALUATING THE COMMERCIALIZATION POTENTIAL OF FOOD PRODUCTS THROUGH SIMULATION APPLICATIONS	Andaç KOÇ Ali Coşkun DALGIÇ	Gaziantep University, Türkiye
SUSTAINABILITY REPORTING STANDARDS IN TURKEY: THE CASE OF THE FOOD SECTOR	Selda Gözdenur ÇETİN Zerrin KENANOĞLU	Ege University, Türkiye
HEALTH BENEFITS OF CHOCOLATE CONSUMPTION	Çağlar GÖKIRMAKLI	Süleyman Demirel University, Türkiye
INFLUENCE OF THE IONIC STRENGTH WITH HIGH PRESSURE HOMOGENIZATION ON STRUCTURAL AND TECHNO-FUNCTIONAL PROPERTIES OF SESAME PROTEIN ISOLATE	Osman GÜL Latife Betül GÜL Abdullah AKGÜN	Kastamonu University, Türkiye Ondokuz Mayıs University, Türkiye. Trakya University, Türkiye

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Session-2, Hall-3

17.10.2025

Moderator: **Prof. Dr. Fatih TÖRNÜK**Meeting ID: **813 0348 3436/ Passcode: 151718**Ankara Local Time: **11:30 – 13:30**

Title	Author(s)	Affiliation
GLYCEMIC INDEX, ITS RELATIONSHIP WITH DISEASES AND APPROACHES FOR ITS REDUCTION	İrem KAYA Fatih TÖRNÜK	Sivas Cumhuriyet University, Türkiye
FONKSİYONEL BİR BESLENME ÖĞESİ OLARAK DİYET LİFLERİ VE SAĞLIK ÜZERİNDEKİ ETKİLERİ	Beyza BAYRAKTAR Damla UYSAL ORUÇ	Danone Tikveşli Arge Merkezi
WHAT IS THE "NUTRI-SCORE" FRONT-PACKAGE NUTRITION LABEL? ITS STATUS IN TURKEY	Beyza Nur GÜNEŞ Nazife YILMAZ	Erzincan Binali Yıldırım University, Türkiye
THE PLACE OF SUPERFOODS IN NUTRITION AND THEIR EFFECTS ON HEALTH	Şeyma TÜRÜT Nazife YILMAZ	Erzincan Binali Yıldırım University, Türkiye
THE EVALUATION OF DIETARY FIBER-ENRICHED BEVERAGES	Burcu DÜNDAR KIRIT	Çukurova University, Türkiye
PRODUCTION AND QUALITY EVALUATION OF FUNCTIONAL FRUIT/VEGETABLE-BASED DRINKS	Burcu DÜNDAR KIRIT Erdal AĞÇAM Nuray İNAN ÇINKIR Asiye AKYILDIZ	Çukurova University, Türkiye
ADVANCED GLYCATION END PRODUCTS AND THEIR ASSOCIATION WITH SYMPTOMS AND ANTHROPOMETRIC FEATURES IN WOMEN WITH POLYCYSTIC OVARY SYNDROME: A CASE-CONTROL STUDY AT A PRIVATE UNIVERSITY	Sena YILDIRIM Ceren AKAR Öykü ERYÜCEL Melis KEKÜLLÜOĞLU TAN Gözde DURLU BİLGİN	Yeditepe University, Türkiye
SPRAY DRYING OF MINERAL SOLUTIONS PREPARED UNDER ALKALINE CONDITIONS: EFFECTS ON CALCIUM AND MAGNESIUM SOLUBILITY AND IN VITRO BIOACCESSIBILITY INDEX	Kübra Feyza EROL Gözde KUTLU Fatih TÖRNÜK	Health Sciences University, Türkiye Ankara Medipol University, Türkiye Sivas Cumhuriyet University, Türkiye

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Session-2, Hall-4
17.10.2025
Moderator: Bijender Singh
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 11:30 – 13:30

Title	Author(s)	Affiliation
METAL-ORGANIC FRAMEWORKS AS EMERGING MATERIALS FOR SUSTAINABLE WATER TREATMENT AND FOOD SAFETY APPLICATIONS	Mohamed Darouiche, Abderrahman Aajmi, Mohamed Rhaya, Brahim Ennasraoui, Said Alahiane, Amane Jada, Abdelaziz Ait Addi, Hassan Ouachtak	Ibn Zohr University, Agadir, Morocco Haute Alsace University, Mulhouse 68100, France Strasbourg University, Strasbourg 67081, France
CULTIVATING HEALTH: EVALUATING THE INFLUENCE OF PERMACULTURE ON THE NUTRITIONAL PROFILE OF SWEET POTATOES AND ITS IMPLICATIONS FOR HUMAN HEALTH	Nabila Beidi Mohammed OUHSSINE	Laboratory of Natural Resources and Sustainable Development, Faculty of Sciences. B.P 242. Kenitra, Morocco
BIOTECHNOLOGICAL VALORISATION OF SHRIMP WASTE: PHYSICOCHEMICAL AND MICROBIAL QUALITY	Hassna LEKNIZI, Elyachoui Mohamed, Brahim BOURKHISS	Université Ibn Tofail, Faculté des sciences de Kenitra
BIOCHEMICAL AND MINERAL CHARACTERIZATION OF LENS CULINARIS VARIETIES: NUTRITIONAL POTENTIAL AND FOOD APPLICATIONS	Soukaina NJILI Aicha ROSSAFI Mohammed OUHSSINE	Laboratory of Natural Resources and Sustainable Development, Faculty of Sciences. B.P 242. Kenitra, Morocco
ADVANCES IN SOLID-STATE FERMENTATION FOR BIO-CONVERSION TO PRODUCE HIGH VALUE-ADDED PRODUCTS	Nwachukwu, N. G., Olukotun, G.B.	National Biotechnology Research and Development Agency (NBRDA), Abuja, Nigeria.
PRODUCTION OF RAW STARCH HYDROLYZING α -AMYLASE BY BACILLIS SUBTILIS SUBSP. SUBTILIS AND ITS APPLICABILITY IN IMPROVING FOOD NUTRITION	Bijender Singh, Nidhi Phogat, Sumit Kumar	Central University of Haryana, Jant-Pali, Mahendergarh-123031, Haryana, India
PHYTOCHEMICAL, HAEMATOLOGICAL AND ANTI-TRYPANOSOMAL POTENTIAL OF CARICA PAPAYA LEAF IN RATS INFECTED WITH TRYPANOSOMA BRUCEI	Aminu A., Idris H. Y1., Muhammad A. A., Abdulkadir S., Sunusi B., Balarabe S.	Bayero University Kano. Nigeria Saadatu Rimi College of Education Kumbotso, Kano, Nigeria. Yusuf Maitama Sule Federal University of Education, Kano
EXPLORING ACTINOBACTERIA FROM ALGERIAN DESERT SOILS FOR THEIR ANTIMICROBIAL ACTIVITY AGAINST PHYTOPATHOGENIC MICROORGANISMS	Fedwa BEGHDADI, El-Hadj DRICHE	Hassiba Benbouali University of Chlef, Hay Salem, 02000 Chlef, Algeria.

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Session-2, Hall-5
17.10.2025
Moderator: Nguyen Thi My Thanh
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 11:30 – 13:30

Title	Author(s)	Affiliation
SUSTAINABLE VALORIZATION OF ACID WHEY PROTEINS: AN INTEGRATED APPROACH FOR THE MOROCCAN DAIRY SECTOR	Mohamed EL MORSY Laila AFIA	Ibn Zohr University, Morocco
ADVANCING FOOD STUDIES THROUGH MOLECULAR BIOLOGY: TOOLS, APPLICATIONS, AND PERSPECTIVES	Bouchemal Amina, Ladouali Zeyneb, Benhoula Mohamed, Mechiah Fahima, Inouri Ahlem, Meghlaoui Zoubaida, Madi Nassim, Adnane Hamza	Centre de Recherche en Technologies Agro-Alimentaires, Route de Targa Ouzemmour, Campus Universitaire, Bejaia 06000, Algeria University of Bouira, Bouira, Bouira 10000, Algeria
INTRODUCING SOME SOLUTIONS FOR THE "UPCYCLING" TREND IN THE F&B (FOOD AND BEVERAGE) INDUSTRY	Nguyen Thi My Thanh	Nha Trang University
QUALITY PARAMETERS OF FIZZY DRINK MADE FROM RED GRAPE (Vitis vinifera)	Alokun-Adesanya O.A, Olowookere R.O	The Federal Polytechnic, Ilaro, Ogun State, Nigeria Mountain Top University, Pakuro, Ogun State, Nigeria
STRUCTURAL, ELECTRONIC, AND THERMOELECTRIC PROPERTIES OF CU ₂ SE WERE INVESTIGATED USING FIRST-PRINCIPLES CALCULATIONS WITHIN THE DFT-PBE FRAMEWORK	Faiza Baghida	Moulay Ismail University Faculty of Sciences, Meknes ,Morocco
FROM WASTE TO WELLNESS: GREEN EXTRACTION OF BIOACTIVE COMPOUNDS FOR FUNCTIONAL FOODS	Monika Stojanova Dragutin A. Djukic Marina T. Stojanova	Educational and Cultural Activities "Open Science", North Macedonia Acad. Prof. Dr. Dragutin A. DJUKIC University of Kragujevac, Faculty of Agronomy, Serbia University of Ss. Cyril and Methodius, North Macedonia
MICROALGAE AS FUNCTIONAL FOOD INGREDIENTS: NUTRITIONAL POTENTIAL AND APPLICATIONS OF CHLORELLA VULGARIS AND SPIRULINA PLATENSIS	BABA HAMED Samia, ILIAS Wassila, BEN BAYER Wided, BERREBBAH Amel ALIOUA	université des Sciences s et de la Technologie d'Oran Mohamed Boudiaf (USTO-MB) Ecole Supérieure en Sciences Biologiques d'Oran Laboratoire de Génétique moléculaire et Cellulaire (LGM), université des Sciences s et de la Technologie d'Oran Mohamed Boudiaf (USTO-MB)

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Session-2, Hall-6
17.10.2025
Moderator: Chems Eddine BOUKHEDIMI
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 11:30 – 13:30

Title	Author(s)	Affiliation
ANALYSIS OF NIGERIAN EXPENDITURE AND INFLATION UNDER BUHARINOMICS: PROMISE OR PRACTISE?	Sadiq M.S., Singh I.P., Ahmad M.M., Sani, B.S.	FUD, Dutse, Nigeria SKRAU, Bikaner, India BUK, Kano, Nigeria
FOODBORNE CLOSTRIDIAL INFECTIONS: RISK ASSESSMENT AND CONTROL IN ANIMAL-ORIGIN PRODUCTS	Gulieva Sabina Bahtiyorovna Qambarov Abdurauf Abdurasulovich	Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology
ECONOMIC BURDEN OF FOODBORNE DISEASES: A MEDICAL LABORATORY APPROACH TO DETECTION AND PREVENTION	Mr. Bikash Bania, Mr. Nitul Ali, Dr. Prem Kishan Singha, Dr. Hrishikesh Choudhury	Rangia College, Rangia
FACTORS INFLUENCING WILLINGNESS TO PAY MORE FOR ORGANIC FOOD: A CROSS-COUNTRY ANALYSIS	Chems Eddine BOUKHEDIMI	University of Tizi-Ouzou, Department of commerce sciences. Algeria
FROM FOOD SECURITY TO FOOD SOVEREIGNTY: REFRAMING THE RIGHT TO FOOD IN INTERNATIONAL HUMAN RIGHTS LAW	Priya Chaudhuri Tuhina Sinha	Amity University Jharkhand
FOOD SAFETY REGULATIONS AND CONSUMER AWARENESS	D.Aravindhnan, N.Arshad Ahamed, K.Dinesh Rajan	Bharath Institute of Higher Education and Research, Chennai, India
ARBUTUS (ARBUTUSUNEDO L.): ECONOMIC AND FOOD IMPACTS	Ikram Elbezyouy, Ilias Oussif, Aabdousse Jamal, Wahid Nadya	Université Sultan Moulay Slimane,BP 523, 23000Béni Mellal, Morocco.
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Session-3, Hall-1**17.10.2025****Moderator: Assist. Prof. Dr. Tuğba DEDEBAŞ****Meeting ID: 813 0348 3436/ Passcode: 151718****Ankara Local Time: 14:00 – 16:00**

Title	Author(s)	Affiliation
AQUEOUS ENZYMATIC OIL EXTRACTION: A SUSTAINABLE ALTERNATIVE APPROACH	Tuğba DEDEBAŞ	Afyon Kocatepe University, Türkiye
POSSIBILITIES FOR USING COCONUT OIL IN FOOD	Tuğba DEDEBAŞ	Afyon Kocatepe University, Türkiye
PROPERTIES OF EGG POWDERS PRODUCED BY DIFFERENT DRYING METHODS	Mehmet KILINÇ Mehmet Yıldırım	Afyon Kocatepe University, Türkiye Afyon Gıda Kontrol Laboratuvarı
THE EFFECT OF HEALTH EDUCATION ON ULTRA-PROCESSED FOOD CONSUMPTION AND HEALTHY EATING ATTITUDES AMONG UNIVERSITY STUDENTS	İrem TÜYSÜZ Ayşenur TUĞRUL Tuba TEKİN Nurcan BAĞLAM	Sivas Cumhuriyet University, Türkiye
EFFECT OF MALTITOL AND ERYTHRITOL USE ON REDUCED SUGAR BISCUIT FORMULATION	Eda İSKENDER Görkem ÖZÜLKÜ Hüseyin DEMİRCAN	Yıldız Technical University, Türkiye
CHARACTERIZATION OF VOLATILE COMPOUNDS IN LACTOFERRIN- ENRICHED YOGURT	Yonca KARAGÜL YÜCEER Hasan UZKUÇ Özlem ŞAHİNER	Çanakkale Onsekiz Mart University, Türkiye

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Session-3, Hall-2

17.10.2025

Moderator: Prof. Dr. Ülker Aslı GÜLER

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 14:00 – 16:00

Title	Author(s)	Affiliation
MICROWAVE APPLICATIONS IN THE FOOD INDUSTRY	Mehtap GÖRGÜN ERŞAN Yunus ALTINOK	Sivas Cumhuriyet University, Türkiye
FROM AGRICULTURAL WASTE TO ADDED VALUE: RECYCLING APPROACHES FOR A SUSTAINABLE FUTURE	Ülker Aslı GÜLER	Sivas Cumhuriyet University, Türkiye
USE OF DRIED <i>SACCHAROMYCES CEREVISIAE</i> CELLS IN THE ENCAPSULATION OF <i>L. ACIDOPHILUS</i> PROBIOTIC BACTERIA	Sibel YILMAZ Nevzat KONAR İlyas ATALAR Tahra EL-OBEİD Muhammet İrfan AKSU Şirin OBA İLTER Ömer Sait TOKER İbrahim PALABIYIK	Eskişehir Osmangazi University, Türkiye Katar University, Katar Atatürk University, Türkiye Amasya University, Türkiye Yıldız Technical University, Türkiye Tekirdağ Namık Kemal University, Türkiye
GENETIC AND GENOMIC APPROACHES TO ENHANCING MAIZE (<i>ZEAMAYS</i> L.) YIELD: A CONTEMPORARY REVIEW	Gülşen GÜÇLÜ Tuğba GÜRKÖK TAN	Sivas Cumhuriyet University, Türkiye Çankırı Karatekin University, Türkiye
ABIOTIC STRESS-RELATED GENES IN GENETICALLY MODIFIED WHEAT	Gülşen GÜÇLÜ Tuğba GÜRKÖK TAN	Sivas Cumhuriyet University, Türkiye Çankırı Karatekin University, Türkiye

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Session-3, Hall-3**17.10.2025****Moderator: Dr. Hacer AKPOLAT****Meeting ID: 813 0348 3436/ Passcode: 151718****Ankara Local Time: 14:00 – 16:00**

Title	Author(s)	Affiliation
ULTRA-PROCESSED FOODS AND NOVA: MEASUREMENT VALIDITY, CONSUMER UNDERSTANDING, AND POLICY OPTIONS	Hacer AKPOLAT	Bayburt University, Türkiye
CONSUMER CONFIDENCE AND PERCEPTION REGARDING FOOD PRESERVATIVES	Besime BAKİLER Rıdvan BOZER Merve ÖZER YILDIRIM Duygu BENZER GÜREL	Fersan ARGE Merkezi, İzmir, Türkiye
AN OVERVIEW OF FERMENTED BEVERAGES AND PICKLE JUICE IN WORLDWIDE AND TÜRKİYE	Gülşah KALAYCIOĞLU Merve ÖZER YILDIRIM Duygu BENZER GÜREL Ozan BEÇİT	Fersan ARGE Merkezi, İzmir, Türkiye
ANALYSIS OF QUALITY PARAMETERS IN PICKLE BRINES FROM DIFFERENT BRANDS	Burcu OKUKLU ÖZTÜRK Beyza ADILAK Merve ÖZER YILDIRIM Duygu Benzer Gürel Ebru İŞİTMEZOĞLU	Izmir Institute of Technology, Türkiye Fersan ARGE Merkezi, İzmir, Türkiye
USE OF AQUATIC PRODUCTS WASTE AND BY-PRODUCTS IN GASTRONOMY	Esra BALIKÇI	Yozgat Bozok University, Türkiye
THE POTENTIAL FOR UTILIZING BLACK CARROT PULP, A BY-PRODUCT OF TURNIP PRODUCTION, AS A FUNCTIONAL FOOD INGREDIENT	Tuğba ŞİMŞEK Murat İNTEPE Alp Eren ŞAHİN	Bursa, Türkiye Afyonkarahisar, Türkiye
NATURAL UMAMI SOURCE: ASPARAGUS STEM	Arda KOCASARAÇ İlkay YILMAZ	Başkent University, Türkiye
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Session-3, Hall-4
17.10.2025
Moderator: Lecturer, PhD Irina-Ana DROBOT
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 14:00 – 16:00

Title	Author(s)	Affiliation
SOCIOECONOMIC VARIABLES INFLUENCING FOOD SAFETY KNOWLEDGE AND PRACTICES BAMBARA (OKPA) PUDDING VENDORS IN NSUKKA AGRICULTURAL ZONE, ENUGU STATE, NIGERIA	Arigbo, Precious Obinna Ugwuanyi, Tasiemobi Darlinton Nnamezie, Grace Chinenye	University of Nigeria, Nsukka
THE PSYCHOLOGY OF AESTHETIC FOOD ARRANGEMENT	Lecturer, PhD Irina-Ana DROBOT	Technical University of Civil Engineering Bucharest, Faculty of Engineering in Foreign Languages, Department of Foreign Languages and Communication, Bucharest, Romania
SUSTAINABLE FOOD SYSTEMS: CHALLENGES, INNOVATIONS, AND PATHWAYS FOR GLOBAL FOOD SECURITY	Saurabh Tribhuwan, Prof.Pooja Rasal	JES's SND College of Pharmacy, Yeola, Dist. Nashik, India
LEVERAGING COMPUTER VISION IN FOOD QUALITY CONTROL: ADVANCEMENTS, CHALLENGES, AND FUTURE PROSPECTS	Abubakar Sidiq Nurudeen	Federal Polytechnic, Kaltungo. Gombe State, Nigeria
WHEY UTILISATION AND SUSTAINABLE FOOD INNOVATION: FROM DAIRY BY-PRODUCT TO HIGH-VALUE INGREDIENT	MECHIAH Fahima, BOUCHEMAL Amina, LADOUALI Zeyneb, INOURI Ahlam, BENHOULA Mohammed, MEGHLAOU Zoubaida, MADI Nassim	Centre de Recherche en Technologies Agro-Alimentaire
METAPHORS OF PLENTY: A STYLISTIC STUDY OF FOOD SECURITY RHETORIC IN PRESIDENT TINUBU'S 2025 INDEPENDENCE DAY	Adesanmi, Moses Ademola	Federal Polytechnic, Ilaro, Nigeria
HARVESTS AND HARDSHIPS: PROTECTION-PRODUCTIVITY PARADOX REALITIES OF NIGERIA'S RICE AND MAIZE PRODUCTION UNDER BUHARINOMICS	Sadiq Mohammed Sanusi, Singh Invinder Paul, Ahmad Muhammad Makarfi, Sani Bashir Sanyinna	FUD, Dutse, Nigeria SKRAU, Bikaner, India BUK, Kano, Nigeria

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Session-3, Hall-5
17.10.2025
Moderator: Prof. Dr. Taoufiq KADRI
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 14:00 – 16:00

Title	Author(s)	Affiliation
POLYPHENOLS IN FRUITS AND VEGETABLES AND THEIR ANTIOXIDANT CHEMISTRY: A REVIEW	Ahmed Attahiru, Abubakar Umar Birnin-Yauri, Abubakar Yahaya	Kebbi State University of Science and Technology, Aliero, Kebbi State, Nigeria
APPLICATION OF MACHINE LEARNING IN PREDICTING FOOD QUALITY AND SHELF LIFE	Y. Sarayu Reddy S. Suji	R.M.K. Engineering College Thiruvallur, India
FOOD FORTIFICATION	R.Devadharshini, Meenatchi.S, Gomathy.E, Dr.R.Srinivasan	Bharath institute of higher education and research, chennai-600073, India
FOOD AND NUTRITION IN SPANISH AS A FOREIGN LANGUAGE (ELE) TEXTBOOKS: A CONTENT ANALYSIS OF B1 AND B2 LEVEL MATERIALS	Prof. Dr. Taoufiq KADRI	Abdelmalek Essaadi University, Morocco
COMPARATIVE ANALYSIS OF FLOOD DAMAGES TO AGRICULTURAL SECTOR USING GEO- SPATIAL TECHNOLOGIES. A CASE STUDY FROM DG KHAN AND RAJANPUR DISTRICTS	Mareena khurshid	Institute of Geography Punjab university Lahore – Pakistan
FUNCTIONAL FOODS AND NUTRACEUTICALS IN CHRONIC DISEASE MANAGEMENT	R. Swathi, S. Rubin thara, E. Praveena	Bharath Institute of Higher Education and Research, Chennai, India.
ZEBRAFISH AS A NUTRITIONAL GENOMICS MODEL: CASE STUDY ON FOOD-DERIVED BIOACTIVE PEPTIDES AND ANTI-DIABETIC POTENTIAL	Anju ishwarya Ramachandran Murugesan Kamaraj	SRM Institute of Science and Technology, India
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Session-3, Hall-6
17.10.2025
Moderator: Nwachukwu Gladys Ndidiamaka
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 14:00 – 16:00

Title	Author(s)	Affiliation
BIOCHEMICAL CHARACTERIZATION AND BIOACTIVITY OF CAROB (CERATONIA SILIQUA L.) SEEDS, PULP, AND LEAVES: A NATURAL SOURCE OF ENVIRONMENTAL BIOACTIVE COMPOUNDS	Hasna ZAGGOUMI, Said BOUDA, Souhir KATBNI, Imane NEG, Ibtissam MARDOUME, Doha BELKACHACH, Sonia MARGHALI, Abdelmajid HADDIOUI	Sultan Moulay Slimane University, Morocco University Tunis
DEVELOPMENT OF A FUNCTIONAL HERBAL BEVERAGE FORMULATED WITH YELLOWFIN TUNA (THUNNUS ALBACARES) BONE EXTRACT	Nguyen Xuan Duy, Tran Thi My Hanh	Nha Trang University, Vietnam
ANNUAL VARIATIONS IN THE PHYSICOCHEMICAL AND NUTRITIONAL PROFILES OF CHIA SEEDS (SALVIA HISPANICA L.) CULTIVATED UNDER MEDITERRANEAN CLIMATE CONDITIONS IN NORTHERN MOROCCO	Aicha ROSSAFI Soukaina NJILI Mohamed ROSSAFI Mohammed OUHSSINE	Laboratory of Natural Resources and Sustainable Development, Morocco University of Ibn Tofail, Morocco
UNVEILING ADAPTIVE COMPONENTS FOR ENVIRONMENTAL HETEROGENEITY IN IPOMOEA CARNEA JACQ.	Muhammad Safdar, Syed Mohsan Raza Shah	University of Education, Lahore, Pakistan
NANO-INSECTICIDES: EFFECTS OF BIOSYNTHESIZED SILVER NANOPARTICLES USING AZARDIRACHTA INDICA EXTRACTS ON FIELD INSECT PEST AND NUTRITIONAL CONTENTS OF ROSELLE CALYCES (HIBISCUS SABADRIFFA L.)	Alao Fatai Olaitan Olaniran Oladele Abiodun Lateef Agbaje Adebayo Timothy Abiodun JOSEPH Adetunji Elegbede	Ladoke Akintola University of Technology, Ogbomoso, Nigeria
CONSUMERS' ACCEPTABILITY OF SWEETENED CARDABA BANANA (Musa acuminata x balbasiana) AS SIOPAO FILLING	Seth Nicus M. Susas, A, Jian Carl F. Agravante A, Jessa Bella C. Mater, Elcir Doanne F. Escalante A, Ariel M. Larobis A, Angelica M. Dalina A.	Southern Philippines Agri-Business and Marine and Aquatic School of Technology
PROCESS OPTIMIZATION OF GAMMA IRRADIATION ON ACRIDITY CONTENT OF NIGERIA XANTHOSOMA SAGITTIFOLIUM SPECIES	Nwachukwu Gladys Ndidiamaka, Idah Peter A., Chukwu Ogbonnaya, Isah Kassem U., Madu Uchenna Onwuhaka	National Biotechnology Research and Development Agency, Abuja, Nigeria Federal University of Technology, Minna, Nigeria Nigeria Atomic Energy Commission, Abuja, Nigeria

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Session-4, Hall-1

17.10.2025

Moderator: Assoc. Prof. Dr. Ediz GÜRİPEK

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 16:30 – 18:30

Title	Author(s)	Affiliation
BIOREGIONAL GASTRONOMY TOURISM: A CONCEPTUAL FRAMEWORK ON ECOSYSTEM-BASED AUTHENTICITY AND SUSTAINABLE IDENTITY CONSTRUCTION	Ediz GÜRİPEK	Tokat Gaziosmanpaşa University, Türkiye.
FROM VIRTUAL TO TABLE: THE CONCEPT OF DIGITAL REGIONALISM IN GASTRONOMY TOURISM	Cansu UZUN GÜRİPEK Ediz GÜRİPEK	Tokat Gaziosmanpaşa University, Türkiye
THE CONTRIBUTION OF TRADITIONAL FOODS TO GASTRONOMIC TOURISM FROM A FUNCTIONAL AND CULTURAL PERSPECTIVE	Tuğçe SOYADLI Nesrin MENEMENCİ Salim AKYUREK Damla KARADAYI	Yakın Doğu Üniversitesi, KKTC
DEVELOPING GASTRONOMY TOURISM THROUGH GEOGRAPHICALLY IMPLICATED PRODUCTS: THE EXAMPLE OF SOUTHEASTERN ANATOLIA REGION	Hayriye Duman	Batman University, Türkiye
THE POSITION OF THE HALAL IN THE SOCIO-CULTURAL CONSTRUCTION OF COMMUNITAS: THE CASE OF THE HALAL FOOD FESTIVAL	Mehmet SALİ	Kırklareli University, Türkiye
EDIBLE WILD MUSHROOMS IN GİRESUN GASTRONOMY CULTURE	Sanem BULAM	Giresun University, Türkiye

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Session-4, Hall-2

17.10.2025

Moderator: Assoc. Prof. Dr. Nesrin İÇLİ

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 16:30 – 18:30

Title	Author(s)	Affiliation
A HEALTHY AND SUSTAINABLE FLAVOR: ANCHOVY WITH FRESH HERBS	Fatma DELİHASAN SONAY	Recep Tayyip Erdoğan University, Türkiye
NUTRITIONAL COMPOSITION AND SENSORY EVALUATION OF ANCHOVY- BASED SAVORY CAKE	Barış KARSLI	Recep Tayyip Erdoğan University, Türkiye
MULTI-RESPONSE OPTIMIZATION OF CARVACROL-LOADED CHITOSAN NANOPARTICLES PREPARED BY EMULSIFICATION-IONIC GELATION	Muhammet Ali ÇAKIR	Kırklareli University, Türkiye
PHYSICAL AND SENSORY PROPERTIES OF CRACKERS ENRICHED WITH POWDERS OBTAINED FROM RED AND GREEN PEPPERS DRIED BY MICROWAVE METHOD	Mukaddes KILIÇ BAYRAKTAR Mukadder AKSOY	Karabük University, Türkiye Necmettin Erbakan University, Türkiye
TECHNOLOGICAL AND SENSORY PROPERTIES OF GLUTEN-FREE BISCUITS ENRICHED WITH POMEGRANATE PULP POWDER	Mukadder AKSOY Mukaddes KILIÇ BAYRAKTAR	Necmettin Erbakan University, Türkiye Karabük University, Türkiye
TRADITIONAL USE OF BERBERIS VULGARIS PLANT IN KASTAMONU: KIZAMIK SOUR AND BLACK SOUP	Nesrin İÇLİ	Kastamonu University, Türkiye
TRADITIONAL USE AND HEALTH EFFECTS OF SAMBUCUS EBULUS PLANT	Nesrin İÇLİ	Kastamonu University, Türkiye

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Session-4, Hall-3

17.10.2025

Moderator: Assist. Prof. Dr. M. Zühal BARAK

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 16:30 – 18:30

Title	Author(s)	Affiliation
FORECASTING TURKIYE'S CITRUS TREE POPULATION FOR SUSTAINABLE AGRICULTURE: A COMPARATIVE ANALYSIS OF LSTM AND PSO-OPTIMIZED HOLT LINEAR TREND APPROACHES	Nurten ŞERİFOĞLU M. Zühal BARAK	Adana Alparslan Türkeş Science and Technology University, Türkiye
THE POTENTIAL OF ARTIFICIAL INTELLIGENCE IN ASSESSING BIOGENIC AMINE EXPOSURE FROM CHEESE CONSUMPTION	Neslihan AYAĞ Elif DAĞDEMİR	Atatürk University, Türkiye
FROM VIDEO TO RECIPE: LEVERAGING VISION LANGUAGE MODELS FOR CULINARY ANALYSIS	Yunus Serhat BIÇAKÇI	Marmara University, Türkiye
ARTIFICIAL INTELLIGENCE IN FOOD: CURRENT APPLICATIONS AND FUTURE DIRECTIONS	Berfin ELMAS DEMİRALP Kübra KORKMAZ AYSEL	Hakkari University, Türkiye Batman University, Türkiye
ANALYSIS OF SPICE CROP PRODUCTION TRENDS IN TÜRKİYE WITH A SUSTAINABILITY PERSPECTIVE: FORECASTING 2030 WITH THE LSTM DEEP LEARNING MODEL	M. Zühal BARAK Esra KARAKAŞ	Adana Alparslan Türkeş Science and Technology University, Türkiye
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Session-4, Hall-4

17.10.2025

Moderator: Moses Adeolu AGOI

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 16:30 – 18:30

Title	Author(s)	Affiliation
A SYNOPSIS OF ARTIFICIAL INTELLIGENCE IN THE FOOD SECTOR	Sagaya Aurelia P	Christ University, Bangalore KA 560029, India
EFFECT OF INSECURITY ON FOOD SECURITY: THE MODERATING ROLE OF FARMERS' RESILIENCE IN MARIGA LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA	Mohammed Mohammed Ndag,, Christian Anyebe, Mohammed Yusuf Gulu, Muhammad Hashim Yusuf	Ahmadu Bello University, Zaria, Nigeria. Department of Sociology, Ibrahim Badamasi Babangida University, Lapai University of Calabar National Environmental Standards and Regulations Enforcement Agency (NESREA)
FOOD WASTE REDUCTION THROUGH SMART IoT AND DEEP LEARNING-BASED MONITORING SYSTEMS	Jatinkumar Bhimjibhai Kotadiya Dr. Dharmendra J. Ambani Ms. Hetal Pravinsinh Jadeja	Atmiya University, Rajkot, India At Harivandana College, Rajkot.
LEVERAGING IoT SCALABILITY IN SMART WAREHOUSING FOR POST-HARVEST FOOD WASTE REDUCTION: MODELS, EVIDENCE, AND IMPLEMENTATION	Oluwadamilola Peace AGOI Moses Adeolu AGOI Samuel Olayiwola AJAGA Oluwanifemi Opeyemi AGOI	Lagos State University of Education, Lagos Nigeria.
LIGHT SCATTERING IN DYNAMICS AND RHEOLOGY OF MIXTURES OSA OF STARCH-XANTHAN IN SOLUTION FOR FOOD PREPARATIONS	BOULHAIA Imene, HADJSADOK Abdelkader, MOULAI-MOSTEFA Nadji , AOUABED Ali	
MULTIMODAL SENTIMENT ANALYSIS IN FOOD REVIEWS	Mr. Souvik Halder Mr. Arijit Halder Mr. Suman Saha Prof. Samiran Chattapadhyay Asst. Prof. Kartick Chandra Mondal	Jadavpur University, India Techno India University, India

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Session-4, Hall-5
17.10.2025
Moderator: Sikander Ali
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 16:30 – 18:30

Title	Author(s)	Affiliation
EFFECT OF VITAMIN D SUPPLEMENTATION ON SYMPTOMS AND CLINICAL OUTCOMES IN ADULTS WITH DIFFERENT BASELINE VITAMIN D LEVELS: A RANDOMIZED STUDY	Soumaya Baataoui, Miloud Chakit, M. Boudhan, M. Ouhssine	Ibn Tofail University, Kenitra, Morocco. Medical Biology Analysis Laboratory Mimosas, Kenitra, Morocco
ASSOCIATION BETWEEN VITAMIN D STATUS, CHOLESTEROL LEVEL AND OBESITY IN MOROCCAN POPULATION	Soumaya Baataoui, Miloud Chakit, M. Boudhan, M. Ouhssine	Ibn Tofail University, Kenitra, Morocco. Medical Biology Analysis Laboratory Mimosas, Kenitra, Morocco
TRADITIONAL FOOD BASED MEDICINE TO TREAT THYROID DYSFUNCTION	Mohanapriya. P, Chamundeeswari. M	St. Joseph's College of Engineering, Chennai 600119, India.
HERBAL NUTRACEUTICALS AND THEIR ROLE IN PREVENTIVE PHARMACY	R. Swathi, G.David	Bharath Institute of Higher Education And Research Chennai, India
EPIDEMIOLOGICAL STUDY OF DETERMINANTS OF LOW BIRTH WEIGHT IN YEMEN	Abduladeem G.M. Al-Selwi, Amr Farhan, Amr R. Haidar	University Mohammed V, Rabat, Morocco. Taiz University in Yemen Scientific Professional Society Microbiologists Association, Yemen Hassan First University of Settat, Morocco
TURNING WASTE INTO NUTRITION: SINGLE CELL PROTEIN PRODUCTION BY CELLULOSIMICROBIUM CELLULANS	Mahnoor Khalid Sikander Ali	University of the Punjab Lahore, Pakistan Government College University, Pakistan
FOOD SAFETY AND TOXICOLOGY IN PHARMACY PRACTICE	R.Sriarasuvasan, K.Vaishnavi, S.Rubinthara.	Bharath Institute of Higher Education and Research, Chennai, India-600073

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Session-4, Hall-6
17.10.2025
Moderator: Okunlade A. O
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 16:30 – 18:30

Title	Author(s)	Affiliation
EFFECTS OF THREE PHYTOGENIC AQUEOUS BLENDS ON NUTRIENT UTILISATION EFFICIENCY OF BROILER CHICKEN	Ogundeji, N. A., Akinlade, O. O., Akinlade, O. O., Sangosina, M. I., Leramo, O. O., Olufayo, O. O., Okusanya, P. O. Irivboje, O. A., Olorunsogbon, B. F.	Federal University of Agriculture, Abeokuta, Nigeria; 2The Federal Polytechnic, Ilaro, Nigeria Federal College of Agriculture, Moor Plantation, Ibadan, Nigeria
THE IMPORTANCE OF MICROBIAL BIOPREPARATIONS IN IMPROVING MEAT QUALITY OF SMALL RUMINANTS: A REVIEW	Shirinboyeva Dilrabo Komilovna Kutliyeva Go'zal Djumaniyozovna Khatamov Akbar	Samarkand State University of Veterinary Medicine, Livestock and Biotechnologies -Institute of Microbiology, Academy of Sciences of the Republic of Uzbekistan
DETECTION AND ANTIBIOGRAM OF MULTIDRUG RESISTANT STAPHYLOCOCCUS AUREUS IN FROZEN CHICKEN SOLD IN OYO STATE, NIGERIA	Okunlade A. O, Solesi T. O	University of Ibadan, Nigeria
EVALUATING THE PROTECTIVE ROLE OF LACTOBACILLUS ACIDOPHILUS AGAINST AFLATOXIN B1-INDUCED GROWTH IMPAIRMENT IN COCKERELS	Okusanya P.O., Jarikre, T. A, Akinlade, O.O., Irivboje, O.A, Jemilehin F. O.,Taiwo V. O	University of Ibadan, Ibadan Oyo State. The Federal Polytechnic Ilaro, Ilaro, Ogun State Nigeria
IDENTIFICATION, CHARACTERIZATION AND POPULATION DETERMINATION OF INDIGENOUS CHICKEN STRAINS IN ETHIOPIA	Berhanu Bekele, Wondmeneh Esatu, Tadelle Dessie	Wachemo University, Ethiopia & International livestock research institute (ILRI), Addis Ababa, Ethiopia
MODERN DIAGNOSTIC METHODS FOR ENTEROTOXEMIA (CLOSTRIDIUM PERFRINGENS) IN SHEEP	Gulieva Sabina Bahtiyorovna Qambarov Abdurauf Abdurasulovich	Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology

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Session-1, Hall-1

18.10.2025

Moderator: Assoc. Prof. Dr. Meryem GÖKSEL SARAÇ**Meeting ID: 813 0348 3436/ Passcode: 151718****Ankara Local Time: 10:00 – 12:00**

Title	Author(s)	Affiliation
GREEN INNOVATION: DEVELOPMENT OF HERBAL TEA-BASED NANOFIBERS	Büşra YUSUFOĞLU Rukiye YİĞİT Beyza URUNİ Lal ÖZSOY Filiz ALTAY	Istanbul Technical University, Türkiye
RECYCLING OF FOOD WASTES TO THE NUTRIENT CYCLE WITH BIOTECHNOLOGICAL METHODS	Sümeyye GÜVENDİ GÜNDOĞDU Sevcan AYTAÇ Sevinç AYDIN	İnönü University, Türkiye Firat University, Türkiye Munzur University, Türkiye
FROM TRADITIONAL METHODS TO FUTURE APPROACHES IN POMEGRANATE JUICE PROCESSING: INNOVATIVE METHODS	Asiye AKYILDIZ Erdal AĞÇAM Bahar YALÇIN	Çukurova University, Türkiye Mardin Artuklu University, Türkiye
THE ENTRY OF THE RIGHT TO FOOD SOVEREIGNTY INTO INTERNATIONAL HUMAN RIGHTS LAW: THE UNITED NATIONS DECLARATION ON THE RIGHTS OF PEASANTS AND OTHER PEOPLE WORKING IN RURAL AREAS	Pınar KARAMAN YALÇIN	Marmara University, Türkiye
VALORIZATION OF ORANGE PEEL AND KIWI POMACE THROUGH DIFFERENT DRYING AND INFUSION: EFFECTS ON BIOACTIVE PROPERTIES AND BEVERAGE FORMULATION	Fadime Begüm TEPE Tolga Kağan TEPE	Giresun University, Türkiye
ANALYTICAL METHODS FOR THE CHARACTERIZATION OF SECONDARY METABOLITES: FROM EXTRACTION TO IDENTIFICATION	Seda UFUK Melek ZOR Memnune ŞENGÜL	Atatürk University, Türkiye Ağrı İbrahim Çeçen University, Türkiye
PRODUCTION AND CHARACTERIZATION OF CRACKERS ENRICHED WITH MACA, PSYLLIUM, AND MADIMAK POWDERS	Semanur Saçlı Pelin KARAKUŞ Sedef IŞIKTEPE Meryem GÖKSEL SARAÇ	Sivas Cumhuriyet University, Türkiye
OPTIMIZATION OF THE SOAKING PROCESS OF PISTACHIO OUTER SHELL	Sema KARA Hüseyin Bozkurt Songül Şahin ERCAN	Gaziantep University, Türkiye

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Session-1, Hall-2

18.10.2025

Moderator: Assoc. Prof. Dr. Nagihan KARAASLAN AYHAN**Meeting ID: 813 0348 3436/ Passcode: 151718****Ankara Local Time: 10:00 – 12:00**

Title	Author(s)	Affiliation
RESEARCH ON THEUSE OF <i>MORINGAOLIEFERA</i> IN WATER KEFIR PRODUCTION	Zeynep Banu GÜZEL SEYDİM Ramazan ERÇELİK	Süleyman Demirel University, Türkiye
THE POTENTIAL USE OF EDIBLE FLOWERS IN CEREAL-BASED PRODUCTS	Ferya KIRAN Sultan ACUN	Amasya University, Türkiye
IDENTIFICATION OF THE ANTIBACTERIAL COMPOUNDS FROM <i>STREPTOMYCES</i> sp. UZ08 FOR THE CONTROL OF SOME FOOD PATHOGENS	Çiğdem YÜKSEL DEMİRCİ Mustafa OSKAY	Manisa Celal Bayar University, Türkiye
THE EFFECT OF COLD PLASMA APPLICATION ON THE TECHNOLOGICAL AND FUNCTIONAL MODIFICATION OF PLANT-BASED PROTEINS	Bihter CEBECİ Senem KAMİLOĞLU	Bursa Uludağ University, Türkiye
CHARACTERISTICS OF GLUTEN-FREE BREADS ENRICHED WITH BUCKWHEAT AND <i>SPIRULINA PLATENSIS</i>	Zeynep Jansel AKAY Zeynep AKÇA	Milli Eğitim Bakanlığı, Türkiye
INVESTIGATION OF THE EFFECTS OF <i>MENTHA LONGIFOLIA</i> EXTRACT ON ANTIOXIDANT ENZYME ACTIVITIES IN C6 AND L-929 CELL LINES	Cemile ZONTUL Yavuz SLİĞ	Sivas Cumhuriyet University, Türkiye
DETERMINATION AND EVALUATION OF COPPER AND MANGANESE CONTENTS OF SOME PROPOLIS SAMPLES	Nagihan KARAASLAN AYHAN	Munzur University, Türkiye
NUTRITION IN INDIVIDUALS WITH SWALLOWING DIFFICULTIES	Fatma Melisa YILMAZ Hanım Eda GÖKTAŞ	Sivas Cumhuriyet University, Türkiye
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Session-1, Hall-3

18.10.2025

Moderator: Prof. Dr. Özlem Pelin CAN

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 10:00 – 12:00

Title	Author(s)	Affiliation
INNOVATIVE PRESERVATION TECHNIQUES IN FOODS	İrem KOÇ	Sivas Cumhuriyet University, Türkiye
MONITORING OF COLISTIN RESISTANCE IN E. COLI ISOLATED FROM RETAIL POULTRY MEAT: PHENOTYPIC AND MOLECULAR FINDINGS	Tülin GÜVEN GÖKMEN	Çukurova University, Türkiye
FROM RESISTANCE TO VIRULENCE IN CHICKEN-DERIVED ESCHERICHIA COLI: A MOLECULAR PERSPECTIVE	Tülin GÜVEN GÖKMEN	Çukurova University, Türkiye
DANDELION (TARAXACUM OFFICINALE): BIOACTIVE COMPONENTS AND PHARMACOLOGICAL EFFECTS	Feyzi ATAŞ Mahir ARSLAN	Sivas Cumhuriyet University, Türkiye
RELATIONSHIP BETWEEN VITAMIN B6 (PYRIDOXINE) AND MICROBIOTAS	Feyzi ATAŞ Mahir ARSLAN	Sivas Cumhuriyet University, Türkiye
EVALUATION OF FOOD POISONING CASES PRESENTING TO THE EMERGENCY DEPARTMENT	Şimşek ÇELİK	Sivas Cumhuriyet University, Türkiye
MAD HONEY POISONING PRESENTING WITH BRADYCARDIA AND SYNCOPE ATTACK: A CASE REPORT	Şimşek ÇELİK	Sivas Cumhuriyet University, Türkiye
THE ROLE OF PROTEIN BARS IN SPORTS NUTRITION	Ali Can DAŞDEMİR Mahir ARSLAN Pakize Büşra TEKE TÜRKMEN	Sivas Cumhuriyet University, Türkiye
POSTBIOTICS AND HEALTH	Pakize Büşra TEKE TÜRKMEN Mahir ARSLAN Ali Can DAŞDEMİR	Sivas Cumhuriyet University, Türkiye

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Session-1, Hall-4
18.10.2025
Moderator: Idris Shamsuddeen
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 10:00 – 12:00

Title	Author(s)	Affiliation
APPLICATION OF BACTERIOPHAGE IN FOOD SAFETY	Parisa Raei	Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran
EDIBLE HERBS AS FUNCTIONAL INGREDIENTS: BIOACTIVE COMPOUNDS SHAPING FOOD QUALITY AND HEALTH	Idris Shamsuddeen	Umaru Musa Yar'adua University
OZONATION AND ULTRASOUND AS SUSTAINABLE EMERGING TECHNOLOGIES FOR PESTICIDE REMOVAL FROM FRESH PRODUCE	MEGHLAOUI Zoubaida, MECHIAH Fahima, INOURI Ahlam, BENHOULA Mohammed, BOUCHEMAL Amina, SEKOUR Abderahim, NOURI Ahlam, MERRI Amer, MADI Nassim	Centre de Recherche en Technologies Agro-Alimentaires, Route de Targa Ouzemmour, Campus Universitaire, Bejaia 06000, Algeria
PHARMACIST'S PERSPECTIVE ON FOOD FORTIFICATION AND PUBLIC HEALTH	S.Rubin thara, R.Swathi, E.Praveena, R.SriArasuvasan, K.Vaishnavi	Bharath institute of higher education and research, chennai, India
FOOD SCIENCE & TECHNOLOGY	E.Praveena,R.Swathi,S.Rubinthara	Bharath Institute of higher education and research, chennai, India
POMEGRANATE (Punica granatum L.) PEEL AND ARIL EXTRACTS AS NATURAL LIPID-LOWERING AGENTS: EVIDENCE FROM A RAT MODEL	Lamiae BENCHAGRA Mhamed RAMCHOUN Abdelouahed HAJJAJI Samira BOULBAROUD Abdelouahed KHALIL Hicham BERROUGUI	Higher Institute of Nursing Professions and Health Techniques of Khenifra, Beni Mellal, Morocco University of Sultan Moulay Slimane, Beni Mellal, Morocco Faculty of Medicine and Biological Sciences, Sherbrook, Canada
EXPLORING THE INTERSECTION OF FOOD STUDIES AND PHARMACY: THE IMPACT OF DIETARY INTAKE ON DRUG EFFICACY AND SAFETY	K. Dinesh Rajan, D. Aravindhan, N. Arshad Ahamed	Bharath institute of higher education and search chennai 600073
REGULATORY ASPECTS OF FUNCTIONAL FOODS AND NUTRACEUTICALS	S. Deepak, G. David, A. Palanisamy, C. Ravi	Bharath institute of higher education and search chennai 600073
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Session-1, Hall-5
18.10.2025
Moderator: Bianca ŞUIAN
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 10:00 – 12:00

Title	Author(s)	Affiliation
NANOTECHNOLOGY APPLICATIONS IN FOOD PRESERVATION AND SAFETY	Palanisamy A, Deepak S, G David, C Ravi.	Bharath institute of higher education and search chennai 600073
PERSONALIZED NUTRITION AND GENOMICS – A NEW FRONTIER IN DIETARY HEALTH	Kiran Kulkarni, Prof. Pooja Rasal	JES's SND College of Pharmacy,Nashik,India
IMPROVING DATE PALM FRUIT QUALITY THROUGH BIOCHAR AND COMPOST APPLICATION IN OASIS ECOSYSTEMS	Khawla BARKAT Kamel GUIMEUR Hanane BEDJAOUI	Mohamed Khider University, Faculty of Natural and Life Sciences, Department of Agronomic Sciences, Biskra, Algeria
THE FOODS OF PREGNANT LADIES IN PAKISTAN	Samina Kouser	Ahlul bayt international university of Iran.
BIOACTIVE COMPOUNDS IN GOAT MILK: POTENTIAL APPLICATIONS IN HUMAN NUTRITION	MEGHLAOUI Zoubeida, MECHIAH Fahima, INOURI Ahlam, BENHOULA Mohammed, BOUCHEMAL Amina, SEKOUR Abderahim, NOURI Ahlam, MERRI Amer, MADI Nassim	Centre de Recherche en Technologies Agro-Alimentaires, Route de Targa Ouzemmour, Campus Universitaire, Bejaia 06000, Algeria
IMPACT OF CLIMATE CHANGE ON FOOD AVAILABILITY AND RURAL LIVELIHOODS: A RAJASTHAN PERSPECTIVE	Mohd Kaif, Abdur Rahman Siddiqui, Abdul Hannan, Bhavani singh	Aligarh Muslim University, Self Reliant Action through Joint Initiatives (srijan)4
COMPARATIVE ANALYSIS OF PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF HORSERADISH (ARMORACIA RUSTICANA) LEAVES AND ROOTS – IMPLICATIONS FOR FOOD APPLICATIONS	Bianca ŞUIAN Sonia AMARIEI Ancuţa PETRARU	"Ştefan cel Mare" University of Suceava, Faculty of Food Engineering, Suceava, Romania

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Session-1, Hall-6
18.10.2025
Moderator: Debbou-Iouknane Nejima
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 10:00 – 12:00

Title	Author(s)	Affiliation
NUTRACEUTICAL VALUE OF POMEGRANATE (PUNICA GRANATUM L.): INSIGHTS INTO LOCAL VARIETIES FROM ARID ENVIRONMENTS	Bourenine Kahina, Nait Kaci-Boudiaf Malika, Saadoun Noria	Université Mouloud Mammeri, Tizi-Ouzou, Algérie
COMBINED EFFECTS OF SHADE AND WATER STRESS ON PHYSIOLOGY AND GROWTH OF TOMATO PLANTS (SOLANUM LYCOPERSICUM L)	Mohamed BELLAHCEN Rana CHOUKRI Mohamed FAIZE Mourad BAGHOUR	University Mohammed I, Nador, Morocco University Chouaïb Doukkali, Morocco
BEYOND NUTRITION: FOOD AS MEDICINE	Kishore.R, Meenatchi .S ,Keerthana.V k.vaishnavi, Dr.R Saravanan	Bharath Institute Of Higher Education And Research
DUAL ROLE OF DIETARY TRYPTOPHAN IN MEMORY REGULATION	Huma Ikram, Shahla Perveen, Darakhshan J. Haleem	University of Karachi, Karachi-75270, Pakistan.
WATER SECURITY FOR FOOD SECURITY: THE SEAWATER DESALINATION STRATEGY IN ALGERIA AS A PILLAR OF RESILIENCE	BENHOULA Mohammed, MECHIAH Fahima, LADOUALI Zeyneb, INOURI Ahlam, BOUCHEMAL Amina, MEGHLAOUI Zoubaida, RAHMANI Rania, BOUCHERBA Nawel, MADI Nassim	Centre de Recherche en Technologies Agro-Alimentaires, Route de Targa Ouzemmour, Campus Universitaire, Bejaia 06000, Algeria Université de Bejaia, Faculté des Sciences de la Nature et de la Vie, Laboratoire de Microbiologie Appliquée, Bejaia 06000, Algeria
EVALUATION OF AUTO MECHANIC WORKSHOP ACTIVITIES ON CROP RPRODUCTION IN SELECTED MECHANIC WORKSHOPS IN FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA	Ode Onyeche Ann, Ishaku I. Yari Mallo, Anaga Socchi Otisi	Abuja University, Nigeria National Biotechnology Research and Development Agency Abuja, Nigeria.
MOLECULAR DOCKING EVALUATION AND ANTICOCCIDIAL BIOACTIVITY OF THE ANTICOCCIDIAL POTENTIAL OF POLYPHENOLS EXTRACTED FROM OLEA EUROPAEA L. KERNELS IN BROILER CHICKENS	Debbou-Iouknane Nejima, Amokrane-Aidat Rachida, Oukhmanou-Bensidhoum Sonia, Brahmi Fatiha	Research Center in Agro-food Technologies, Road of Targua Ouzemour, Bejaia, Algeria. University of Bejaia, Bejaia, Algeria
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Session-1, Hall-7
18.10.2025
Moderator: K.R.Padma
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 10:00 – 12:00

Title	Author(s)	Affiliation
ESSENTIAL NUTRIENTS AND DIETARY RECOMMENDATIONS FOR WOMEN'S HEALTH ACROSS THE LIFESPAN	Nasrin Ziayee	Ahlul-Bayt International University Tehran.
FOOD SAFETY & PHARMACOVIGILANCE	Meenatchi.S , Gomathy.E , Deva Dharshini.R , Keerthana.V , Kishore. R, DR.R Saravanan	Bharath Institution Of Higher Education And Research Chennai, India -600 073
COMPREHENSIVE BIOACTIVITY AND SAFETY EVALUATION OF ESSENTIAL OILS: ANTIMICROBIAL, ANTIOXIDANT, AND TOXICOLOGICAL PERSPECTIVES	Ait Si Lamiaa, Hmimid Fouzia, Abdou-Allah Fatima, Souidek Meryem, Ousaid Fatima Ez-zahra, Guenaou Ismail, Nait Irahah Imane, Lahlou Fatima Azzahra, Kabine Mostafa, Bourhim Nouredine	Hassan II-Ain Chock University, Morocco Chouaib Doukkali University, Morocco Hassan II University of Casablanca, Morocco Mohammed VI University of Health Sciences Faculty of Medicine, Casablanca, Morocco
OBESITY, MALNUTRITION, AND THE DOUBLE BURDEN OF DISEASE	Suyash Pawar, Prof. Pooja Rasal	JES's SND College of Pharmacy,Nashik,India
THE ROLE OF PUBLIC GOVERNANCE IN ADVANCING FOOD SAFETY AND HEALTHY NUTRITION POLICIES: A REGIONAL CASE STUDY OF SAMTSKHE-JAVAKHETI	Lika Talakhadze Nikoloz Gabunia Tinatin Jankhoteli Miranda Jankhoteli	Samtskh-Javakheti State University, Georgia
DIETARY SHIFTS IN THE POST-PANDEMIC WORLD	Shalvi Pawar, Prof. Pooja Rasal	JES's SND College of Pharmacy,Nashik,India
FOOD SECURITY AND CLIMATE CHANGE: A REVIEW	Hicham EL-BOUKHARY, Hamza ELKISSANY, Adil LAAZIZ, Abdelouahed HAJJAJI	Sultan Moulay Slimane University, Beni Mellal, Morocco. Sidi Mohamed Ben Abdellah University, Fez, Morocco
FUNCTIONAL FOODS AND THEIR ROLE IN CHEMOPREVENTION	K.R.Padma	Sri Padmavati Mahila Visvavidyalayam (Women's University), Tirupati,AP

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Session-2, Hall-1

18.10.2025

Moderator: Assist. Prof. Dr. Gülgün AYLAZ

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
QUANTITATIVE DETECTION OF ADULTERATION WITH GROUND-PICKED OLIVE OIL IN TREE-PICKED OLIVE OIL USING NEAR AND MID-INFRARED SPECTROSCOPY	Fatih Özgür DEMİR Hüseyin AYZAZ Mustafa ÖĞÜTCÜ Muhammed Ali DOĞAN Uğurcan AYDIN	Çanakkale Onsekiz Mart University, Türkiye
USE OF AVOCADO SEEDS IN FOOD PRODUCTS	Arda Nur ÇİMEN Ceyda DADALI	Ege University, Türkiye
AN ALTERNATIVE APPROACH TO MEAT: ARTIFICIAL MEAT	Ceyda DADALI Arda Nur ÇİMEN	Ege University, Türkiye
GIDA TAKVİYELERİNDE YER ALAN HAYVANSAL ÜRÜNLER	Melda GÜR Ümran ÇİÇEK	Tokat Gaziosmanpaşa University, Türkiye
KARAYOLU ÇEVRESİNDE YETİŞTİRİLEN BUĞDAYLARDA AĞIR METAL BİRİKİMİNİN ARAŞTIRILMASI	M. Fatih ERTUGAY Sena AKBAŞ	Binali Yıldırım University, Türkiye
EFFECT OF MEDIA SELECTION ON ESCHERICHIA COLI GROWTH: A COMPARISON WITH MOLECULAR DOCKING	Gülgün AYLAZ	Sivas Cumhuriyet University, Türkiye
THE GLUTEN-FREE PRODUCTION OF AFYON BÜKMESİ	Dilek DEMİR Ayşe Büşra MADENCİ Eda GÜNEŞ Doğukan BAYESEN	Necmettin Erbakan University, Türkiye
INCREASING THE AWARENESS OF ANTALYA PROVINCE GEOGRAPHICAL INDICATIVE PRODUCTS BY CULINARY ARTS STUDENTS WITHIN THE SCOPE OF SUSTAINABLE GASTRONOMY	Filiz ARSLAN Sudenaz AYSAN Zümran ERGEN	Akdeniz University, Türkiye

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Session-2, Hall-2

18.10.2025

Moderator: **Prof. Dr. Mehtap ERŞAN**

Meeting ID: 813 0348 3436/ Passcode: 151718

Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
THE EFFECTS OF POSTBIOTICS ON HEALTH: AN EVALUATION IN LIGHT OF SCIENTIFIC EVIDENCE	Merve ÖZKAN Burak DEMİRHAN	Gazi University, Türkiye
NEW GENERATION FUNCTIONAL INGREDIENTS: DEFINITION AND OBTAINING OF POSTBIOTICS	Merve ÖZKAN Burak DEMİRHAN	Gazi University, Türkiye
THE ROLE OF NATURAL LIPOPHILIC ANTIOXIDANTS IN ENHANCING THE OXIDATIVE STABILITY OF EDIBLE OILS	Aysun YURDUNUSEVEN YILDIZ	Pamukkale University, Türkiye
CHEMICAL ADDITIVES USED IN THE FOOD INDUSTRY	Mehtap ERŞAN Aslı Eda ERDOĞAN	Sivas Cumhuriyet University, Türkiye
FUNCTIONAL INSIGHTS INTO PSYCHOBIOLOTIC LAB ISOLATED FROM YOGURTS: ANTIOXIDANT AND HEALTH-PROMOTING POTENTIAL	Şeyda Merve KARATAŞ	Gümüşhane University, Türkiye
USE OF PECTIN OBTAINED FROM LOCAL BANANA PEELS IN COOKIE PRODUCTION	Elif ÇAKIR Hümeysra ÖZBEY Fatma DEMİRÇELİK Sena BODURLAR	İstanbul Aydın University, Türkiye
PRESENCE OF STEARIC ACID IMPROVES OLEOGEL QUALITY PARAMETERS	Merve AKALAN	Harran University, Türkiye
ZEOLITE-REINFORCED FILMS FOR BIODEGRADABLE FOOD PACKAGING	Sema SAMATYA YILMAZ Melek DEMİREL Ayşe AYTAÇ	Kocaeli University, Türkiye
EVALUATION OF A NEWLY DEVELOPED BIODEGRADABLE PVA/ NaCas –ZEOLITE FILM IN THE COLD STORAGE OF BLUEBERRIES	Melek DEMİREL Rezzan KASIM M. Ufuk KASIM Selda DALER	Kocaeli University, Türkiye

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Session-2, Hall-3
18.10.2025
Moderator: Amina Yahia
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
GESTATIONAL DIABETES, AWARENESS LEVELS OF EFFECTS AMONG MOTHERS & IMPLICATIONS OF LIFESTYLE INTERVENTION VS PHARMACOLOGICAL TREATMENT EFFECTIVENESS	Abeera Zafar Dr. Noor Saba Khadim Jan Dr. Nabiha Iqbal Asma Ajmal Momina Ali Talha Bashir M.Musa Khan	Hajvery University (Euro Campus), Gulberg III Lahore, Pakistan
DIGITIZATION AS A STRATEGIC TRANSITION IN THE MANAGEMENT OF HOUSEHOLD AND SIMILAR WASTE IN ALGERIA	Amina Yahia	Institute of Urban Management Techniques, Oum el Bouaghi University, Algeria.
TRAINING OF TRIGONA ITAMA STINGLESS BEE CULTIVATION INCREASES THE KNOWLEDGE AND INCOME OF BEEKEEPERS IN INDONESIA AND MALAYSIA	Ameilia Zuliyanti Siregar, Cut Nanda Defira, Nurul Syuhada Baharuddin, Siti Rusalmah Aslah Rusli, Baktiar Musa, Ermeey Abd Kadir	University Sumatera Utara Jl. Dr. A. Sofyan 3 Medan, 20155, Sumatera Utara, Indonesia Center for Excellence in Mangrove Science and Technology (PUI) Mangrove USU University Syiah Kuala, Kopelma Darussalam Banda Aceh, 24415, Aceh, Indonesia Universiti Teknologi MARA Cawangan Terengganu, Terengganu, Malaysia
DIGITIZATION AS A STRATEGIC TRANSITION IN THE MANAGEMENT OF HOUSEHOLD AND SIMILAR WASTE IN ALGERIA	Amina Yahia	Institute of Urban Management Techniques, Oum el Bouaghi University, Algeria.
PHARMACOLOGICAL POTENTIAL OF RANDIA DUMETORUM FOR TREATING DIABETES MELLITUS	Priyanshi Goyal, Shaweta Sharma	Galgotias University, Greater Noida, UP, India
THE ROLE OF NUTRITION IN TYPE 2 DIABETES MANAGEMENT: FINDINGS FROM THE DIAMED MEDICAL CLINIC TIRANA	Yllka Themeli, Enkeleda Sinaj	University of Medicine of Tirana, Faculty of Medical Technical
TECHNICAL EFFICIENCY AND DIFFERENTIAL RESOURCE USE ALONG THE ARTISANAL FISH VALUE CHAIN IN KWARA STATE, NIGERIA	Alao B.I, Ambali O. Y, Abdullah, A.M, Adekogba T.T., Adewoye, I.J.	Agricultural and Rural Management Training Institute Kwara State University PMB 1530, Ilorin Kwara State Nigeria
NANOENCAPSULATION STRATEGIES IN FUNCTIONAL BEVERAGES: OPTIMIZING FORMULATION AND BIOAVAILABILITY FOR CARDIOVASCULAR HEALTH	Arbina Hilal Prof. Sajad Mohammad Wani	SKUAST-Kashmir, INDIA.

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Session-2, Hall-4
18.10.2025
Moderator: REMITA Ferial
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
EXPLORING THE BIOACTIVE COMPONENTS AND PHARMACOLOGICAL BENEFITS OF A NORTHERN MOROCCAN TRADITIONAL HERB	Nesrine Benkhaira, Saad Ibnsouda Koraichi, Kawtar Fikri-Benbrahim	Sidi Mohamed Ben Abdellah University, Fes, Morocco
KINETIC MODEL FOR QUALITY AND SAFETY CONTROL IN ARTISANAL CHEESE: A PERSPECTIVE FOR CEMEMBERT TYPE CHEESE PRODUCTION IN ALGERIA	Bouchemal Amina Adnane Hamza	Route de Targa Ouzemmour, Campus Universitaire, Bejaia 06000, Algeria University of Bouira, Bouira, Bouira 10000, Algeria
NUTRITIONAL, THERAPEUTICAL POTENTIAL AND FUNCTIONAL UTILIZATION OF MANGO PEELS	Laiba Riaz, Muhammad Haseeb Ahmad	Government College University Faisalabad, Pakistan
QBD DRIVEN DESIGN AND EVALUATION OF KALONJI OIL-BASED NOVEL NANOSTRUCTURED LIPID COMPOSITE GEL FOR TRANSDERMAL DRUG DELIVERY IN OSTEOPOROSIS	Umme Jiba, Sadia Ameen, Saima Amin, Farhan Jalees Ahmad	School of Pharmaceutical Education and Research, Jamia Hamdard, New Delhi Department of Bio-Convergence Science Jeonbuk National University, Republic of Korea
SEAFOOD SAFETY IN THE MEDITERRANEAN: IMPACTS OF POLLUTION AND STRATEGIES FOR SUSTAINABLE MANAGEMENT	REMITA Ferial, LADOUALI Zeyneb, TIAR Ghoulem, BOUSLAMA Zihad	Centre de Recherche en Environnement (CRE) Alzone 23000, Annaba, Algeria
NUTRACEUTICALS BRIDGING NUTRITION AND MEDICINE	Saurabh S.Suryawanshi Firoj A.Tamboli Pranav H.Pawar Sandip B.Pawar	Bharati Vidyapeeth College of Pharmacy
ASSOCIATIONS OF DIETARY PATTERNS, DAIRY INTAKE, AND BODY COMPOSITION WITH FOREARM BONE MINERAL DENSITY IN PHYSICALLY ACTIVE CAUCASIAN MEN	Anna Kopiczko Joanna Cieplińska Patrycja Widłak Wiktoria Pietrzak Jakub Bałdyka	Józef Piłsudski University of Physical Education in Warsaw, Warsaw, Pol

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Session-2, Hall-5
18.10.2025
Moderator: Muhammad Faisal
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
NUTRITION, LIFESTYLE, AND A PRACTICAL BALANCED DIET PLAN FOR ADULTS AGED 40–49	Muhammad Faisal	Assistant Professor (AI) at Allama Iqbal Open University
IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) TO HEALTH INFORMATION MANAGEMENT STUDENTS: A CASE STUDY OF SANI ZANGON DAURA SCHOOL OF HEALTH TECHNOLOGY DAURA, KATSINA STATE, NIGERIA	Surajo Abba Ahmed	Katsina State College of Health Science and Technology
GASTRONOMY TOURISM: A MULTISENSORY JOURNEY THROUGH CULTURE, IDENTITY, AND SUSTAINABLE DEVELOPMENT	Milos Rabrenovic Monika Stojanova	Montenegro Dance Sport Federation, Montenegro Association for Scientific – research, Educational and Cultural Activities „Open Science“ , North Macedonia
EVALUATION OF DECONTAMINATION PROTOCOLS FOR MYCOBACTERIUM SPP. ISOLATION FROM MULTIPLE ANIMAL SPECIES	BELLIL Dassine, GHROUT-SAIT Alima, DJOUDI Farhet, BELLIL Zahra, MENDIL Ouided, MANSEUR Lyticia, ADDALOU Sonia	Université de Bejaia, Algérie.
ANTIDIABETIC ACTIVITY OF CLADANTHUS ARABICUS PHYTOCONSTITUENTS EXPLORED VIA COMPUTATIONAL DRUG DISCOVERY	Youssef Arif, Wafaa Bendaoud, Mohamed Bouhrim, , Fatiha Chigr , Ahmed Ait Chaoui , Ahmed Arif , Mustapha Boulghallat	Sulatan Moulay Slimane University, Béni Mellal. Morocco
UNPACKING THE PARADOX: SUPPLY CHAIN DYNAMICS AND POLICY INTERVENTIONS DRIVING THE UNEXPECTED DECLINE IN FOOD PRICES IN NIGERIA'S STAPLE CROP MARKETS DURING THE 2024-2025 HARVEST SEASON	Yusuf Ahmed Tijjani, Hassan Mohammed	Ahmadu Bello University Zaria Kaduna Polytechnic
QUANTITATIVE AND QUALITATIVE SCREENING OF ORGANOCHLORINE PESTICIDE RESIDUES IN SOME AVAILABLE FRUITS SOLD IN KAURA NAMODA ZAMFARA STATE	Momoh Shuaibu	Department of Science Laboratory Technology, Federal Polytechnic kaura Namoda, Zamfara, Nigeria
THE IMPORTANCE OF BALANCED DIET FOR STUDENTS' ACADEMIC PERFORMANCE	Shabnam Jurambekova	Webster University, MA TESOL Program, Tashkent, Uzbekistan

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Session-2, Hall-6
18.10.2025
Moderator: Dr. Emmanuel U. ANASO
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
ANATOMICAL FEATURES OF LONG BONES AND THEIR FUNCTIONS	Saraswathi.V,R. Vidhyalakshmi, Kowsika.M, Dhanush kumar.S, Sastha.K, Prashanth.S, Dr.W.Helen, Dr.R.Srinivasam	Bharath Institute of Higher Education and Research, Chennai, Tamilnadu India.
GINGER AS A FUNCTIONAL FOOD INGREDIENT IN DAILY DIETS	Saraswathi.V,R. Vidhyalakshmi, Kowsika.M, Dhanush kumar.S, Sastha.K, Prashanth.S, Dr.W.Helen, Dr.R.Srinivasam	Bharath Institute of Higher Education and Research, Chennai, Tamilnadu India.
MODULATION OF MILK FATTY ACIDS IN LACTATING GOATS THROUGH PILIOSTIGMA THONNINGII ESSENTIAL OIL SUPPLEMENTATION	Dr. Emmanuel U. ANASO	Federal University of Agriculture Mubi, Adamawa Nigeria
MYCOTOXINS AND NEW POSSIBILITIES FOR MYCOTOXIN BIODEGRADATION USING PROBIOTICS	Kutlieva G.D., Turaeva B.I., Kamolova H.F, Kobilob F.B.	Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan
ELEMENTAL PROFILING OF ARGAN KERNEL, LEAVES, AND SHELLS FROM EASTERN MOROCCO BY NEUTRON ACTIVATION ANALYSIS AND K ₀ -STANDARDIZATION	Abdelwahab Badague Hamid Bounouira Elmahjoub Chakir	University Ibn Tofail, Kenitra, B.P 242, Kenitra, Morocco
REGIONAL BIOASSAY-BASED INDICATORS OF SEDIMENT QUALITY ALONG THE MOROCCAN ATLANTIC COAST	Khatami Salma, El Haimeur Bouchra, Bouhallaoui Mina, Errhif Ahmed	Faculty of Sciences Ain Chock Casablanca. National Institute of Fisheries Research Casablanca.
PROBIOTICS AS PHARMACEUTICALS AGENTS IN GUT HEALTH AND IMMUNITY	R. Swathi, Dr. lavanya babu, Dr. Srinivasan	Bharath Institute of Higher Education And Research Chennai, India
FACTORS INFLUENCING SCHOOLCHILDREN PARTICIPATION IN NATIONAL SCHOOL FEEDING PROGRAMME(NSFP) IN SOUTHWESTERN NIGERIA	B. I Alao, Yusuf Ambali, Yusuf A.O, Durodola A.O.	Agricultural and Rural Management Training Institute (ARMTI) Km 18, Ilorin – Ajase Ipo Highway, PMB 1343, Ilorin Kwara State University PMB 1530, Ilorin Kwara State Nigeria.
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Session-2, Hall-7
18.10.2025
Moderator: Mónika Fekete
Meeting ID: 813 0348 3436/ Passcode: 151718
Ankara Local Time: 12:30 – 14:30

Title	Author(s)	Affiliation
AN OVERVIEW OF PHYTOCHEMICAL, ETHNOPHARMACOLOGICAL, AND BIOLOGICAL CHARACTERIZATION OF SAME RARE PLANT SPECIES: LITERATURE REVIEW	Hania Hamrouni	National Engineering School of Gabes, University of Gabes, 6072 Gabes, Tunisia
LEAF STRUCTURAL AND FUNCTIONAL MODIFICATION OF IPOMOEA CARNEA JACQ. AN INVASIVE PLANT SPECIES, UNDER DIVERSE SALINITY GRADIENT	Saira Malik, Syed Mohsan Raza Shah, Uniza Fatima bukhari, Tasawar Fatima bukhari, Iqra	University of Education, Lahore, Pakistan
SAFEGUARDING THE MEDITERRANEAN: ADDRESSING POLLUTION FROM INDUSTRIAL AND URBAN SOURCES	LADOUALI Zeyneb, REMITA Ferial, TIAR Ghoulam, BOUSLAMA Zihad	Centre de Recherche en Environnement (CRE) Alzone 23000, Annaba, Algeria
A GREEN ECONOMY FOR TOURISM AND FOOD: SUCCESSFUL DEVELOPMENT OF SUSTAINABLE AND ECOLOGICAL DESTINATIONS	Msc. Selvije Lajqi, Soreja Adzajlic, Kushtrim Agaj	University "Haxhi Zeka, Kosovo
CIRCULAR ECONOMY IN RUMINANT PRODUCTION VIA RUMEN MODULATION: WASTE-TO-FEED STRATEGIES WITH MICROBIAL INOCULANTS FOR SUSTAINABLE NUTRIENT RECYCLING	FANIYI, Tolulope Oreoluwa	Ajayi Crowther University, Oyo, Oyo State. Nigeria, West Africa, Africa.
INTEGRATED BIOSECURITY AND RUMEN MODULATION APPROACHES: LINKING RUMEN HEALTH WITH FOOD SAFETY, ANTIMICROBIAL RESISTANCE (AMR) REDUCTION, AND ONE HEALTH FRAMEWORKS	FANIYI, Tolulope Oreoluwa	Ajayi Crowther University, Oyo, Oyo State. Nigeria, West Africa, Africa.
VALORIZATION OF AGRO-INDUSTRIAL BYPRODUCTS IN RUMINANT DIETS: ENHANCING RUMEN FERMENTATION THROUGH INNOVATIVE USE OF BREWERY BYPRODUCTS, FRUIT PEELS, AND OILSEED RESIDUES	FANIYI, Tolulope Oreoluwa	Ajayi Crowther University, Oyo, Oyo State. Nigeria, West Africa, Africa.
DIGITAL MICROINTERVENTIONS IN NUTRITION: EFFECTIVENESS OF VIRTUAL CULINARY MEDICINE PROGRAMS IN PROMOTING PLANT-BASED DIETS	Mónika Fekete, Virág Zábó, Andrea Lehoczki, Zoltán Ungvári	Semmelweis University, 1089 Budapest, Hungary

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ICONFOOD'25
4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

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**ROMATOLOJİK HASTALIKLARDA GIDA TERCİHLERİNİN İNFLAMASYON ÜZERİNE
ETKİLERİ: BESLENMENİN KLİNİK ÖNEMİ**

**EFFECTS OF FOOD CHOICES ON INFLAMMATION IN RHEUMATIC DISEASES:
CLINICAL IMPORTANCE OF NUTRITION**

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ÖZET

Romatizmal hastalıklar, bağışıklık sisteminin hatalı çalışmasına bağlı olarak gelişen ve vücutta uzun süreli inflamasyon ile seyreden kronik hastalık grubudur. Romatoid artrit, sistemik lupus eritematozus, ankilozan spondilit gibi hastalıklar, inflamasyonun sürekli aktive olduğu, sistemik hasara yol açan karmaşık hastalıklardır. Bu hastalıkların yönetimi günümüzde sadece ilaçlara değil, aynı zamanda yaşam tarzı değişikliklerine, özellikle de beslenme düzenine dayalı yaklaşımlarla desteklenmektedir. Beslenmenin inflamasyon üzerindeki etkisi son yıllarda yapılan çok sayıda çalışmada ortaya konmuş ve bu etkileşim klinik uygulamalarda da önem kazanmaya başlamıştır. Araştırmalar, bazı gıdaların pro-inflamatuar yanıtı artırabileceğini; bazı gıdaların ise anti-inflamatuar etki sağlayarak inflamasyon seviyesini düşürebileceğini göstermektedir. Omega-3 yağ asitleri, antioksidanlar, yüksek lifli sebze-meyveler gibi unsurlar inflammatuar süreçleri baskılayabilirken; trans yağlar, aşırı şeker, işlenmiş gıdalar inflamasyonu artırıcı etkiler göstermektedir. Ayrıca, bazı besin intoleransları (gluten, süt proteinleri gibi) bireyden bireye farklılık gösterebilir ve eliminasyon diyeti gibi yaklaşımlar aracılığıyla bu hassasiyetlerin belirlenmesi mümkün olabilir. Bu çalışmada, romatolojik hastalıkların inflammatuar mekanizmaları ile besin öğeleri arasındaki biyokimyasal etkileşim detaylı biçimde ele alınmış, literatürdeki kanıtlar sentezlenerek klinik çıkarımlar yapılmıştır. Ayrıca, bağırsak mikrobiyotasının besin aracılığıyla düzenlenmesinin hastalık seyrine olası katkıları tartışılmıştır. Sonuç olarak, beslenmenin bu hasta grubunda yalnızca destekleyici değil, tedaviyi bütünleyen bir unsur olarak değerlendirilmesi gerektiği vurgulanmaktadır.

Anahtar Kelimeler: romatolojik hastalık, inflamasyon, gıda tercihi, beslenme

ABSTRACT

Rheumatic diseases represent a broad category of chronic, systemic inflammatory disorders resulting from dysregulation of the immune system. Conditions such as rheumatoid arthritis, systemic lupus erythematosus, and ankylosing spondylitis are characterized by persistent inflammation, tissue degradation, and multisystem involvement. While pharmacological therapy remains central to disease control, dietary interventions have gained increasing attention as adjunct strategies in managing systemic inflammation.

Recent evidence has revealed the significant role of nutrition in modulating inflammatory pathways. Certain dietary components—such as omega-3 fatty acids, antioxidants, prebiotics, and dietary fibers—exhibit anti-inflammatory properties, whereas excessive intake of refined sugars, trans fats, processed

foods, and specific proteins may promote pro-inflammatory responses. Moreover, growing research underscores the bidirectional communication between the gut microbiome and immune modulation, suggesting that nutrition-based microbiota regulation may offer new opportunities in disease management.

This paper aims to synthesize current literature on the relationship between food choices and inflammatory responses in rheumatic diseases. We discuss biochemical interactions between nutrients and immunological mediators, the relevance of personalized elimination diets, and the role of gut microbiota-targeted nutrition. In conclusion, it is advocated that nutritional therapy should not be viewed merely as supportive but rather as an integral component of holistic rheumatologic care.

Key Words: rheumatologic disease, inflammation, food preference, nutrition

İŞLENMİŞ GIDALARIN KRONİK HASTALIK GELİŞİMİNDEKİ ROLÜ
THE ROLE OF PROCESSED FOODS IN THE DEVELOPMENT OF CHRONIC DISEASES

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ÖZET

Son yıllarda işlenmiş gıda tüketiminde küresel bir artış gözlemlenmektedir. Bu artış, beraberinde kronik hastalıkların görülme sıklığında ciddi bir yükselişi getirmiştir. Ultra işlenmiş gıdalar; yüksek kalori, düşük besin değeri ve zararlı katkı maddeleri içermeleri nedeniyle sağlık üzerinde olumsuz etkiler yaratmaktadır. Bu çalışmada, işlenmiş gıdaların özellikle obezite, kardiyovasküler hastalıklar, tip 2 diyabet, çeşitli kanser türleri, gastrointestinal bozukluklar, nöropsikiyatrik durumlar ve endokrin sistem hastalıkları üzerindeki etkileri incelenmiştir. Güncel literatür taranarak, bu gıdaların kronik hastalık gelişiminde nasıl rol oynadığı ayrıntılı biçimde ortaya konulmuştur. Elde edilen bulgular, bireysel ve toplumsal düzeyde beslenme politikalarının yeniden yapılandırılması gerektiğini göstermektedir. İşlenmiş gıdaların sınırlandırılması, hem koruyucu sağlık hizmetlerinin geliştirilmesi hem de sağlık harcamalarının azaltılması açısından önem arz etmektedir.

Anahtar Kelimeler: işlenmiş gıda, kronik hastalık, beslenme

ABSTRACT

In recent years, there has been a global increase in processed food consumption. This increase has brought with it a significant increase in the incidence of chronic diseases. Ultra-processed foods have negative effects on health due to their high calories, low nutritional value and harmful additives. In this study, the effects of processed foods, especially on obesity, cardiovascular diseases, type 2 diabetes, various types of cancer, gastrointestinal disorders, neuropsychiatric conditions and endocrine system diseases, were examined. The current literature was reviewed and the role of these foods in the development of chronic diseases was revealed in detail. The findings show that nutritional policies need to be restructured at individual and societal levels. Limiting processed foods is important both for the development of preventive health services and for the reduction of health expenditures.

Keywords: processed food, chronic disease, nutrition

**SİYAH ÇAY ATIKLARINDAN MEMBRAN TEKNOLOJİSİYLE BERRAK SOĞUK ÇAY
EKSTRAKTI ÜRETİMİ VE PROTOTİP SİSTEM TASARIMI**
**PRODUCTION OF CLEAR ICED TEA EXTRACT FROM BLACK TEA WASTE USING
MEMBRANE TECHNOLOGY AND PROTOTYPE SYSTEM DESIGN**

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ÖZET

Türkiye’de siyah çay üretimi sırasında ortaya çıkan atık sıvıların, yüksek miktarda polifenoller, flavonoidler, kateşinler ve kafein gibi biyoaktif bileşenler içermesine rağmen, mevcut üretim sistemlerinde bu sıvıların doğrudan uzaklaştırıldığı ve potansiyel değeri olan bu bileşenlerin atık olarak değerlendirildiği, dolayısıyla ekonomik bir katkı sağlanamadığı bilinmektedir. Ayrıca, klasik evaporasyon ve konsantrasyon teknikleriyle işlenen bu sıvıların, istenmeyen "çay kreması" oluşumuna neden olabildiği; bunun da hem ürünün içim kalitesini hem de aromatik ve fonksiyonel bileşen stabilitesini olumsuz etkileyebildiği literatürde ifade edilmektedir. Bu kapsamda, çay işleme atıklarının hibrit membran teknikleri (ultrafiltrasyon ve ters ozmoz) kullanılarak değerlendirilmesiyle; çay kreması oluşumunu engelleyen, içim kalitesi yüksek ve biyoaktif bileşen kaybı minimize edilmiş konsantre çay ekstraktı üretiminin mümkün olabileceği düşünülmektedir. Elde edilmesi hedeflenen ekstraktın berraklaştırılması ve fonksiyonel içecek formuna dönüştürülmesiyle, özellikle genç nüfus ve sağlıklı yaşam tercihleri olan tüketicilere hitap eden soğuk çay pazarı potansiyeli ön plana çıkmaktadır. Ayrıca, sistemde kullanılacak membranların polielektrolitlerle modifikasyonu sayesinde, uzun süreli ve verimli çalışma koşullarının sağlanabileceği; böylece membran kirliliğinin geciktirilerek sistem performansının artırılabilceği değerlendirilmektedir. Olası bir üretim senaryosunda, otomatik çalışabilir üretim hatlarının tasarlanması ve farklı üretim partileri arasında standardizasyon sağlayacak sistemlerin geliştirilmesi ile endüstriyel ölçekli üretim süreçlerinin desteklenebileceği öngörülmektedir. Bu doğrultuda, çevresel sürdürülebilirliğe katkı sağlanması ve yerli üretimle yüksek katma değerli bir ara ürünün gıda ve içecek sanayisine kazandırılması hedeflenmektedir.

Anahtar Kelimeler: ¹Çay atığı, ²Çay konsantresi, ³Çay Kreması, ⁴Ultrafiltrasyon, ⁵Ters Osmoz

**SIVI YUMURTA AKINDAN TİCARİ OVALBUMİN EKSTRAKSİYONU İÇİN PİLOT
ÜNİTE GELİŞTİRİLMESİ ve PROTOTİP İMALAT**
**PILOT UNIT DEVELOPMENT AND PROTOTYPE PRODUCTION FOR COMMERCIAL
OVALBUMIN EXTRACTION FROM LIQUID EGG WHITE**

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ÖZET

Yumurta akı, içerdiği yüksek kaliteli proteinler ve fonksiyonel özellikleri sayesinde gıda, farmasötik ve biyoteknolojik alanlarda kullanım potansiyeli yüksek bir biyokütle kaynağı olarak değerlendirilmektedir. Yumurta akı proteinleri içerisinde en baskın yapı olan ovalbumin, toplam proteinlerin yaklaşık %54'ünü oluşturarak ticari açıdan en değerli fraksiyonlardan biri olarak öne çıkmaktadır. Ovalbumin, yüksek saflık, stabilite ve biyolojik aktivite gibi özellikleri sayesinde; gıda formülasyonları, aşı taşıyıcı sistemleri, immünolojik modeller, kozmetik ürünleri ve biyomedikal uygulamalarda yaygın kullanım alanı bulmaktadır. Literatürde ovalbumin ekstraksiyonu için çeşitli saflaştırma teknikleri geliştirilmiş olsa da, geleneksel yöntemler yüksek kimyasal tüketimi, uzun işlem süreleri, sınırlı otomasyon ve düşük proses kontrolü gibi önemli dezavantajlar taşımaktadır. Bu nedenle, alternatif ve sürdürülebilir teknolojilere duyulan ihtiyaç giderek artmaktadır. Bu bağlamda, kimyasal kullanımı azaltılmış, sürekli çalışmaya uygun, parametrik kontrolü yüksek ve gıda ile temasına uygun membran sistemlerinin ovalbumin üretimine entegrasyonu giderek daha fazla önem kazanmaktadır. Bu çalışmada, sıvı yumurta akından ticari nitelikte ovalbumin elde edilmesine yönelik teknolojik yaklaşımlar ele alınmakta ve ultrafiltrasyon gibi membran tabanlı ayırma tekniklerinin avantajları değerlendirilmektedir. Süreç kapsamında ise, ovalbumin üretimine yönelik pilot ölçekli bir ünitenin tasarlanması ve bu ünite temelinde prototip bir üretim hattı oluşturulmasının teknik potansiyeli incelenmektedir. Ayrıca sistem performansının üretim parametrelerine göre optimize edilmesi ve ticari saflıkta ürün eldesine uygun koşulların belirlenmesi hedeflenmektedir. Sonuç olarak, bu çalışma ile geleneksel yöntemlerin eksiklerini giderebilecek, yerli üretime uygun ve sürdürülebilir bir alternatif oluşturabilecek yeni nesil bir üretim modelinin temel teknik ilkeleri ortaya konulmaktadır. Böylece, ülkemizde henüz bulunmayan ovalbumin üretim süreçlerine yönelik bir altyapının oluşturulmasına katkı sağlanması amaçlanmaktadır.

Anahtar Kelimeler: ¹Ultrafiltrasyon, ²Membran Filtrasyon, ³Yumurta, ⁴Gıda Biyoaktif Bileşenler, ⁵Saflaştırma

**YAĞLI TOHUM TOZLARI KULLANILARAK FONKSİYONEL ERİŞTE GELİŞTİRME:
TEKNOLOJİK VE KALİTE DEĞERLENDİRMESİ**

**FUNCTIONAL NOODLE DEVELOPMENT USING OIL SEED POWDERS:
TECHNOLOGICAL AND QUALITY ASSESSMENT**

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ÖZET

Bu çalışmada, rafine buğday ununa %6 oranında çörek otu, susam, keten tohumu ve mavi haşhaş tozu ilavesinin erişte örneklerinin renk, pişme ve tekstürel özellikleri üzerindeki etkileri araştırılmıştır. Tüm tohumlar laboratuvar tipi bir öğütücüde 500 µm'nin altındaki partikül boyutunda toz haline getirilmiş ve ayrı ayrı erişte formülasyonlarına dahil edilmiştir. Elde edilen sonuçlar, tohum tozlarının hem pişmemiş hem de pişmiş eriştelerin renk parametrelerini önemli düzeyde etkilediğini göstermiştir. Çörek otu ve keten tohumu içeren eriştelerde parlaklık (L*) ve doygunluk (SI) değerleri azalmış, susam ve keten tohumu içeren örneklerde ise kontrol grubuna kıyasla daha yüksek sertlik değerleri elde edilmiştir. Ayrıca, çörek otu ve keten tohumu katkılı eriştelerde pişme kaybı anlamlı düzeyde azalmış ve bu da pişme stabilitesinin arttığını göstermiştir. Elde edilen bulgular, tohum tozlarının besin içeriğini artırmanın yanı sıra eriştelerin teknolojik kalitesini de koruyarak fonksiyonel gıda üretiminde kullanılabileceğini göstermektedir.

Anahtar Kelimeler: Erişte, yağlı tohum, çörek otu, susam, keten tohumu, mavi haşhaş, renk, pişme kalitesi, tekstürel özellik.

ABSTRACT

This study aimed to evaluate the effects of incorporating powdered black cumin, sesame, flaxseed, and blue poppy seeds (6% w/w) into refined wheat flour on the color, cooking, and textural properties of noodle samples. All seed materials were ground to a particle size below 500 µm and added individually to noodle formulations. The results revealed that seed powders significantly influenced the color attributes of both raw and cooked noodles. Noodles enriched with black cumin and flaxseed exhibited reduced lightness (L*) and vividness (SI), while sesame and flaxseed samples displayed enhanced firmness values compared to the control. Additionally, cooking loss was significantly reduced in noodles containing black cumin and flaxseed, indicating improved cooking stability. These findings suggest that

seed powders can be used as functional ingredients in noodle formulations to enhance nutritional content while maintaining acceptable techno-functional properties.

Keywords: Noodle, oil seed powder, black cumin, sesame, flaxseed, blue poppy, color, cooking quality, firmness

**EFFECTS OF USING NATURAL SPRING WATER AS AN ALTERNATIVE WATER
SOURCE IN NOODLE PRODUCTION ON PHYSICAL AND SENSORY PROPERTIES**

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ÖZET

Bu çalışmada, Sivas ilinin Sedirli Köyü bölgesinde yer altından çıkan doğal kaynak suyunun, erişte üretiminde şebeke suyu yerine alternatif olarak kullanımı araştırılmıştır. Doğal kaynak suyunun farklı oranlarının (0%, 25%, 50%, 75% ve 100%) erişte örneklerinin renk, pişirme, tekstür ve duyu özellikleri üzerindeki etkileri incelenmiştir. Ham ve pişmiş erişte örnekleri arasında %100 doğal kaynak suyu ile yapılan örneklerin en düşük L* ve a* değerine ve en yüksek b* değerine sahip olduğu belirlenmiştir. Pişmiş eriştelerde, daha yüksek SI değerleri gözlenmiştir. Nem içeriği, ağırlık artışı, hacim artışı ve pişirme kaybı, kaynak suyunun kullanım oranına göre önemli ölçüde değişmiştir ve en yüksek pişirme kaybı ile nem içeriği, %100 doğal kaynak suyu ile yapılan eriştelerde gözlemlenmiştir. Ham ve pişmiş erişte örneklerinde, kaynak suyunun yüksek kullanım oranları ile birlikte sertlik değeri artmış ve %100 doğal kaynak suyu ile yapılan eriştelerin en yüksek sertliğe sahip olduğu belirlenmiştir. Duyusal değerlendirmeler, görünüş, tat ve koku açısından eriştelerin genel olarak benzer olduğunu, ancak çiğnenebilirlik ve genel kabul edebilirliğin, %75 doğal kaynak suyu ile yapılan eriştelerde en yüksek olduğunu ortaya koymuştur. Bu bulgular, doğal kaynak suyu kullanımının eriştelerin fiziksel ve duyu özelliklerini değiştirebileceğini ve %75 oranındaki doğal kaynak suyu kullanımının, doku ve duyu özellikler açısından en dengeli sonuçları sağladığını göstermektedir.

Anahtar kelimeler: Alternatif Su Kaynakları, Doğal Kaynak Suyu, Erişte, Teknolojik Özellikler

ABSTRACT

This study investigates the use of natural spring water sourced from underground in the **Bedirli** region of Sivas as an alternative to tap water for noodle production. The effects of different natural spring water ratios (0%, 25%, 50%, 75%, and 100%) on the color, cooking, texture, and sensory properties of noodle samples were examined. Among the uncooked and cooked noodle samples, those made with 100% natural spring water had the lowest L* and a* values and the highest b* value. Higher SI values were

observed in the cooked noodles. Moisture content, weight increase, volume expansion, and cooking loss significantly changed depending on the water ratio, with the highest cooking loss and moisture content observed in noodles made with 100% natural spring water. In both uncooked and cooked noodle samples, the firmness increased with higher water usage ratios, and noodles made with 100% natural spring water had the highest firmness. Sensory evaluations showed that appearance, taste, and smell were generally similar across the samples, but chewability and overall acceptability were highest in noodles made with 75% natural spring water. These findings suggest that the use of natural spring water can alter the physical and sensory properties of noodles, with the 75% natural spring water ratio providing the most balanced results in terms of texture and sensory attributes.

Key words: Alternative Water Sources, Natural Spring Water, Noodles, Technological Features

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GREEN INNOVATION: DEVELOPMENT OF HERBAL TEA-BASED NANOFIBERS

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ABSTRACT

This study examined the biologically active potential of herbal teas such as white tea and rooibos tea, which are rich in phenolic compounds and antioxidants. The obtained tea extracts were converted into nanofiber wound dressings by electrospinning. This method was preferred due to its ability to protect heat-labile compounds, high encapsulation efficiency, and form an extracellular matrix-like structure. White tea had the highest initial values with 7,212.23 µg GAE/mL phenolic content and 13,662.50 µg TE/mL antioxidant activity, making it a potent natural source that can be effective in wound healing. In addition, white tea is suitable for the electrospinning process with its low viscosity, high surface tension, and more fluid rheological properties. In contrast, rooibos tea exhibited lower phenolic content (909.24 µg GAE/mL) and antioxidant activity (3,057.50 µg TE/mL); Rheologically, it showed higher viscosity and lower surface tension. This suggests that rooibos tea has a denser structure but may have limited biological activity. The results demonstrate that white tea is a particularly strong candidate for use as a natural, biocompatible, and functional wound dressing material. This research highlights the potential of combining plant-derived bioactive ingredients with nanotechnology for sustainable and health-focused product development. The study was supported by the TÜBİTAK 2209-A University Students Research Projects Support Program.

Keywords: Herbs and plants, nanomaterial, fiber

DOĞAL UMAMI KAYNAĞI OLARAK KUŞKONMAZ SAPI
NATURAL UMAMI SOURCE: ASPARAGUS STEM

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ÖZET

Gıda endüstrisinde umami tadı, lezzet artırıcı katkı maddeleri ile sağlanmaktadır. Geleneksel olarak monosodyum glutamat (MSG) yaygın kullanılırken, tüketiciler giderek daha doğal ve sürdürülebilir ürünlere yönelmektedir. Bu çalışmada, MSG'ye alternatif olarak doğal ve besleyici bir lezzet artırıcı olma potansiyeli taşıyan ve gıda atığı olan kuşkonmaz sapının kullanımı araştırılmıştır. Bu amaçla atık kuşkonmaz sapları dondurarak kurutulmuş, öğütülmüş ve elde edilen ürünle kimyasal ve duyu analizler yapılmıştır. Elde edilen kuşkonmaz sapı umami tadını güçlendirmek amacıyla çeşitli gıda ürünlerinde kullanılmıştır. Ürünlere eklenen bu doğal katkının duyu etkileri, eğitilmiş panelistler tarafından renk, görünüş, koku, lezzet ve genel beğeni açısından duyu analizlerle değerlendirilmiştir.

Sonuçlara göre elde edilen ürünün 29,7 g/kg düzeyinde monosodyum glutamat içerdiği belirlenmiştir. Toz kuşkonmaz sapları yumurta, tavuk ve patates gibi farklı yemeklerde panelistlere; toz katılmış ve katılmamış olmak üzere iki ayrı şekilde, farklı kodlarla sunulmuştur. Değerlendirme sonucunda, kuşkonmaz sapı eklenen yemeklerin tat, genel beğeni ve lezzet faktörlerinde anlamlı şekilde daha yüksek puan aldığı gözlemlenmiştir. Yumurtada lezzet kriterinde ($p=0.0062$), tavukta lezzet ve genel beğeni kriterlerinde, patatesten lezzet ve genel beğenide anlamlı fark bulunmuştur. Özellikle lezzet ve genel beğeni kriterlerinde yüksek değerler bulunması lezzet artırıcı olarak kullanılan MSG yerine bir alternatif olabileceğini göstermektedir.

Bu çalışma ile doğal tatlandırıcıların geliştirilmesine ve atıkların katma değerli ürünlere dönüştürülmesine katkı sağlaması beklenmektedir ve gıda sektöründe maliyet etkin ve doğa dostu lezzet artırıcı çözümler arayanlar için yenilikçi bir model oluşturulmuştur.

Anahtar Kelimeler: Umami, Kuşkonmaz Sapi, Monosodyum glutamat, Gıda atığı, Duyusal analiz

ABSTRACT

In the food industry, the umami taste is provided by flavor-enhancing additives. While monosodium glutamate (MSG) has been traditionally used widely, consumers are increasingly shifting toward more natural and sustainable products. In this study, the use of asparagus stems, which are a food waste and have the potential to be a natural and nutritious flavor enhancer alternative to MSG, was investigated. For this purpose, waste asparagus stems were freeze-dried, ground, and the resulting product was

subjected to chemical and sensory analyses. The obtained asparagus stem product was used in various food items to enhance the umami taste. The sensory effects of this natural additive added to the products were evaluated by trained panelists through sensory analyses considering color, appearance, aroma, flavor, and overall liking.

According to the results, the product contained 29.7 g/kg of monosodium glutamate. The powdered asparagus stems were presented to panelists in different codes in two forms: with and without the powder, incorporated into dishes such as eggs, chicken, and potatoes. The evaluation showed that the dishes with added asparagus stem received significantly higher scores in taste, overall liking, and flavor factors. A significant difference was found in the flavor criterion for eggs ($p = 0.0062$), in the flavor and overall liking criteria for chicken, and in the flavor and overall liking criteria for potatoes. Especially the high values in flavor and overall liking indicate that asparagus stem could be an alternative to MSG used as a flavor enhancer.

This study is expected to contribute to the development of natural sweeteners and the conversion of waste into value-added products, creating an innovative model for those seeking cost-effective and eco-friendly flavor-enhancing solutions in the food sector.

Keywords: Umami, asparagus stem, monosodium glutamate, food waste, sensory analysis.

**ROLE OF HIGH FAST FOOD, SUGARY BEVERAGE, AND SUGAR INTAKE IN THE
DEVELOPMENT OF CHRONIC KIDNEY DISEASE: A CLINICAL AND LITERATURE-
BASED ANALYSIS**

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ABSTRACT

Chronic Kidney Disease (CKD) represents a rapidly growing global health concern, contributing significantly to morbidity, mortality, and healthcare costs. The increasing prevalence of CKD has been closely associated with modifiable lifestyle and dietary factors, especially the widespread consumption of fast foods, sugary beverages, and refined sugars. These dietary habits, now prevalent across all age groups and socioeconomic backgrounds, are known to contribute to key risk factors for CKD, including obesity, hypertension, diabetes mellitus, and metabolic syndrome. Despite growing awareness, limited clinical research incorporates real-time patient data to substantiate these associations.

This study aims to bridge this gap by combining an extensive literature review with analysis of real-time clinical data from patients diagnosed with CKD who have a documented history of high intake of processed foods and sugary beverages. The review explores the pathophysiological mechanisms—including increased oxidative stress, chronic low-grade inflammation, insulin resistance, and glomerular hyperfiltration—that underlie diet-induced renal damage. The clinical data, drawn from primary care settings and nephrology clinics, include laboratory parameters, lifestyle questionnaires, and progression patterns in CKD staging, offering direct insight into how dietary excesses translate into kidney dysfunction.

Through in-depth case studies, the research highlights variations in disease progression based on dietary patterns, demonstrating that early dietary interventions—especially reduced sugar and sodium intake—may decelerate kidney function decline. Moreover, patient outcomes reflect how education, counseling, and diet modification can impact long-term renal health, even in early-stage CKD.

This integrative approach strengthens the evidence that fast food and sugary beverage consumption are not merely associated with but are likely contributing to renal deterioration. Public health implications are substantial: this study underscores the necessity for early lifestyle interventions, tailored dietary counseling, and public health policies that limit the availability and marketing of nephrotoxic food products.

By presenting both theoretical foundations and real-world data, this paper offers a holistic perspective on the role of nutrition in CKD and calls for the urgent implementation of preventive strategies in both clinical and community settings. It lays the groundwork for more targeted future research that combines nutritional epidemiology, clinical nephrology, and health policy.

Key Words: Chronic Kidney Disease (CKD), Early-stage CKD, Kidney Disease Prevention, Dietary Habits, Obesity, Hypertension, Kidney Disease Progression Fast Food Consumption, Sugary Beverages, Nutritional Modifications, Lifestyle Changes.

**A SCREENING OF SOME SUPERFOODS AND MEDICINAL PLANTS AS A POTENTIAL
SOURCE OF SUGARS, INULIN AND LOW-MOLECULAR FRUCTANS**

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ABSTRACT

The aim of the current investigation was to evaluate some superfoods and medicinal plants as a potential source of sugars, inulin and low-molecular fructans. Most of the selected plants were considered as superfoods and supplied as food supplement: the root powder flours from shatavari (*Asparagus racemosus*), suma (*Pfaffia paniculata*), maca (*Lepidium meyenii*), Siberian ginseng (*Eleutherococcus senticosus*), costus (*Saussurea lappa*), ashwagandha (*Withania somnifera*), the leaves and roots from Siberian wild echinacea, and flowering heads of cotton thistle. The water extracts were obtained from the plant materials were analysed for total fructans, inulin and sugars. Inulin was detected in the root powder of shatavari, suma, costus, as well as in leaves and roots of Siberian wild echinacea and flowering heads of cotton thistle. Shatavari root powder was evaluated as the richest source of fructans, as inulin content was 29.7 g/100g dw. Its content in suma, costus and cotton thistle was between 2.9 to 1.35 g/100 g dw. Siberian ginseng, ashwagandha and maca roots did not contain fructans only sugars, as maca demonstrated the highest values of sucrose – 18 g/100 g. The current study revealed the nutritional potential of some superfoods to be used as source of dietary fibers, especially flour of shatavari roots.

Keywords: inulin, superfoods, fructans, sugars

**IMMOBILIZATION OF PECTINASE ON ORANGE PEEL USING *Luffa cylindrica* FOR
ENHANCED STABILITY AND APPLICATION IN JUICE CLARIFICATION**

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ABSTRACT

The immobilization of enzymes on low-cost, biodegradable natural supports is gaining prominence in industrial biotechnology due to its potential to improve enzyme reusability, operational stability, and process sustainability. In this study, we report the immobilization of pectinase enzyme extracted from fungal cultures cultivated on orange peel waste. The extracted pectinase was immobilized using orange peel powder as an anchoring substrate and entrapped within a fibrous matrix of *Luffa cylindrica* sponge. *Luffa cylindrica*, known for its highly porous and biodegradable properties, served as an effective support material to enhance the operational efficiency of the enzyme. The immobilized pectinase was evaluated for its thermal and pH stability, reusability, and catalytic performance.

Compared to the free (soluble) enzyme, the immobilized form retained enhanced activity over a broader range of temperatures (30–60 °C) and pH values (4.0–7.0), with over 70% of its initial activity preserved after five consecutive reuse cycles. Furthermore, the immobilized pectinase was applied in the clarification of freshly extracted orange juice, where it demonstrated significant efficiency in reducing turbidity and improving juice clarity without compromising nutritional properties. This highlights the functional potential of immobilized enzymes in food processing industries. The integration of agro-waste products—orange peel and *Luffa cylindrica*, for enzyme immobilization not only provides a cost-effective and sustainable platform for biocatalyst development but also contributes to value-added waste utilization. This study underscores the feasibility of deploying agro-based immobilized enzyme systems in eco-friendly industrial applications, particularly in the fruit juice clarification process.

Keywords: pectinase, enzyme immobilization, *Luffa cylindrica*, orange peel, orange juice clarification, agro-waste, enzyme stability, reusability, biocatalysis, sustainable biotechnology.

UDC: 619:616.006.447-097.3:636.22.2:578

MODERN DIAGNOSTIC METHODS FOR ENTEROTOXEMIA (CLOSTRIDIUM PERFRINGENS) IN SHEEP

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ABSTRACT

Enterotoxemia in sheep, caused by *Clostridium perfringens*, remains a critical issue in small ruminant health, leading to significant economic losses. This study aims to analyze the most effective modern diagnostic tools for early identification and disease control. The review includes molecular (PCR, qPCR, multiplex PCR), serological (ELISA), bacteriological, and toxicological methods. A combined diagnostic strategy is recommended to support timely preventive measures and minimize livestock losses.

Keywords: enterotoxemia, *Clostridium perfringens*, sheep, diagnostics, PCR, ELISA, toxins.

Materials and Methods. An analytical review of national and international scientific literature (15 sources) was conducted, including the textbook by Salimov X.S. et al. (2020), and the works of Uzal F.A., Songer J.G., McClane B.A., among others. Both classical and modern diagnostic approaches were analyzed, including molecular-genetic methods (PCR, qPCR, multiplex PCR), enzyme-linked immunosorbent assay (ELISA), bacteriological and toxicological methods. The methods were evaluated based on sensitivity, specificity, processing time, availability, and suitability for field conditions.

Results. PCR and qPCR were found to be the most sensitive (up to 98%) and specific diagnostic tools for detecting toxin genes (etx, cpb, cpa) in *C. perfringens*. Multiplex PCR allows simultaneous identification of multiple toxin types, which is critical for diagnosing the specific form of clostridial infection. ELISA is widely used in both laboratory and field conditions, provides rapid results, and enables detection of toxins directly in intestinal content or blood samples. The bacteriological method, though effective, requires extended processing time (up to 72 hours) and strict anaerobic conditions.

For convenience, the comparative characteristics of the methods are summarized in the table below:
Diagnostic Methods for Enterotoxemia in Sheep

Diagnostic Method	Sensitivity	Processing Time	Field Applicability	Target Detected
PCR / qPCR	95–98%	4–6 hours	Limited	Toxin genes
Multiplex PCR	90–95%	6–8 hours	Limited	Toxin types
ELISA	85–90%	1–2 hours	High	Toxin proteins
Bacteriological method	70–80%	48–72 hours	Low	<i>C. perfringens</i> culture

Conclusion. A combined diagnostic approach using PCR and ELISA allows for reliable early detection of enterotoxemia in sheep. The use of rapid methods is especially relevant for large-scale sheep farms where immediate action is needed in case of outbreaks. Diagnostics should be supported by epizootiological analysis and clinical observation for developing effective prevention strategies, including vaccination and nutritional control.

**SMART PACKAGING SYSTEMS: ROLE OF BIOSENSORS IN FOOD SAFETY AND
SHELF-LIFE EXTENSION**

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ABSTRACT

The increasing need for healthier, durable, and more sustainable food items has sped up innovations in packaging technologies. Among them, smart packaging systems containing biosensors are a revolutionary solution in contemporary food technology. Smart packaging can be understood as packaging systems that track the state of packaged food and provide information on its quality, safety, or freshness. Biosensors, in this respect, are analytical devices that combine a biological sensing component and a physicochemical transducer to monitor specific biochemical alterations or pollutants present within the food or in its surroundings. This review delves into the application of biosensors in smart packaging to improve food safety and shelf life. Various biosensor types—enzymatic, microbial, immunological, and DNA-based sensors—are discussed based on their sensitivity, specificity, and ability to monitor in real-time. The biosensors are capable of detecting various spoilage markers such as pH changes, gas release (e.g., CO₂, NH₃, or H₂S), microbial contamination, and allergens or toxins. The use of biosensors in smart packaging has a number of advantages: it facilitates real-time and non-destructive monitoring of food quality, minimizes food loss by providing accurate estimation of shelf life, and establishes consumer confidence by providing transparency. In addition, synergies between biosensors and innovative technologies like nanomaterials, radio-frequency identification (RFID), and Internet of Things (IoT) platforms are compelling the design of intelligent packaging systems that can engage dynamically with the supply chain. In spite of their promise, several challenges persist, including the production cost of biosensors, regulatory approval, sensor stability limitations, and scalability for industrial applications. The review underscores existing advances, major limitations, and future research avenues, for example, biodegradable biosensor substrates, wireless data communication, and AI-based quality analysis systems. Overall, biosensor-based smart packaging has the potential to transform food safety management and shelf-life estimation. It presents a viable avenue to a more sustainable, efficient, and consumer-oriented food system, in alignment with worldwide initiatives toward food security and minimizing wastage. Interdisciplinary teamwork between food science, material engineering, and biotechnology will be required to advance such innovation from laboratories to markets.

Keywords: Smart packaging, biosensors, food safety, shelf-life extension, real-time monitoring, nanotechnology, intelligent packaging, RFID, IoT.

**MONITORING MEAT FRESHNESS IN SMART PACKAGING USING ANTHOCYANINS
FROM RED CABBAGE**

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ABSTRACT

Food safety is a major global concern, particularly for perishable products such as meat. These are susceptible to microbiological and chemical spoilage, processes that cause changes in pH, color, and odor. Classical monitoring methods (pH sensors, gas sensors, biosensors, electronic noses) are effective, but their implementation is often difficult and costly. Initially, these systems used synthetic colorants (bromothymol blue), but concerns about their toxicity have led to their replacement by natural, biodegradable compounds such as anthocyanins, water-soluble pigments of the flavonoid class. They can be extracted from a variety of plant sources such as fruits, vegetables, flowers or agri-food waste (e.g. peelings), which can account for 30-50% of the food mass.

In this study, anthocyanins were extracted from red cabbage using maceration with ethyl alcohol and ultrasound-assisted extraction (US). The resulting samples were subjected to physicochemical analyses, and their color response was evaluated as a function of pH variations (1–12). A distinct color transition from red in acidic conditions to violet, blue, and finally yellow in alkaline conditions was observed, confirming the pH indicator potential of the extract.

With the ability to interact with various biopolymers (such as starch or alginate), anthocyanins can be used to develop pH-sensitive films that visually indicate changes during meat spoilage. In this way, consumers can easily identify altered products without opening the packaging.

The results obtained support the applicability of red cabbage anthocyanins in the development of pH-sensitive biodegradable films with direct applications in meat packaging. These systems can provide a visual, rapid and reliable means of assessing freshness. Smart anthocyanin-based packaging is becoming a necessity to combat food waste and reduce public health risks.

Keywords: anthocyanins, intelligent packaging, meat, red cabbage

**RECYCLING OF FOOD WASTES TO THE NUTRIENT CYCLE WITH
BIOTECHNOLOGICAL METHODS**

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ABSTRACT

While both adverse climatic conditions and increasing human population make it difficult to obtain food worldwide, these adverse conditions create panic for the next generation. Declining food resources have led researchers to work on both preventing the waste of food resources and reusing the wastes obtained from these sources by re-joining them in the nutrient cycle. As a result of this orientation, many applications and researches have been made on the recycling and recovery possibilities of food wastes that occur due to various reasons during the food supply chain and previous studies have been investigated with a biotechnological perspective in our study. In these studies, by-products and last products that can reach significant values are obtained from food wastes with four methods determined as solid state fermentation, biomass energy conversion, pyrolysis method and compost technology.

In this review, it is aimed to give an idea for future experimental or theoretical studies by comparing the biotechnological method to be used in the recycling or recovery of raw materials with different properties, the usage areas of the produced products, the differences and similarities between the biotechnological methods.

Keywords: Biotechnology, Food Waste, Recycling, Recovery, Bioconversion.

**ESPRESSO KAHVE ATIKLARINDAN BİYOAKTİF BİLEŞİKLERİN YEŞİL
EKSTRAKSİYONU: ETANOL İLE KARŞILAŞTIRMALI DEĞERLENDİRME**
**GREEN EXTRACTION OF BIOACTIVE COMPOUNDS FROM ESPRESSO COFFEE
WASTE USING NADES: COMPARATIVE EVALUATION WITH ETHANOL**

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ÖZET

Bu çalışmada espresso kahve atıklarından fenolik bileşiklerin geri kazanımında doğal derin ötektik çözücülerin (NADES) etkinliği araştırılmış ve sonuçlar etanol ile karşılaştırılmıştır. Elde edilen ekstraktlar toplam fenolik madde miktarı (TPC), DPPH radikal süpürme aktivitesi, ferrik indirgeme gücü (FRAP) ve kuprik indirgeme kapasitesi (CUPRAC) testleriyle değerlendirilmiştir. Bulgulara göre SA+Glc sistemi en yüksek TPC (32.83 g GAE/kg dm), DPPH (8.26 g TEAA/kg dm) ve FRAP (58.70 g TEAA/kg dm) değerlerini sağlamıştır. Etanol ekstraktı ise CUPRAC analizinde (46.00 g TEAA/kg dm) en yüksek kapasiteyi göstermiştir. SA+Gly formülasyonu çoğu analizde orta düzeyde sonuçlar vermiştir. Korelasyon analizleri, fenolik bileşiklerin özellikle FRAP aktivitesine güçlü katkı sağladığını, CUPRAC değerlerinin ise farklı bileşenlerden etkilendiğini ortaya koymuştur. Bu bulgular, NADES'in kahve endüstrisi yan ürünlerinin değerlendirilmesinde çevre dostu ve verimli çözücüler olarak kullanılabileceğini göstermektedir.

Anahtar Kelimeler: Antioksidan kapasite, Espresso kahve atıkları, Fenolik bileşikler, NADES, Yeşil ekstraksiyon.

ABSTRACT

This study evaluated the effectiveness of natural deep eutectic solvents (NADES) in recovering phenolic compounds from espresso coffee waste and compared their performance with ethanol. Extracts obtained with different solvents were analyzed for total phenolic content (TPC), DPPH radical scavenging activity, ferric reducing antioxidant power (FRAP), and cupric reducing capacity (CUPRAC). The SA+Glc system showed the highest values for TPC (32.83 g GAE/kg dm), DPPH (8.26 g TEAA/kg dm), and FRAP (58.70 g TEAA/kg dm). In contrast, ethanol exhibited the strongest CUPRAC activity (46.00 g TEAA/kg dm), while the SA+Gly formulation presented intermediate performance in most assays. Correlation analysis indicated that phenolic compounds were the main contributors to FRAP activity, whereas additional constituents influenced CUPRAC values. These findings highlight the potential of NADES as eco-friendly and efficient solvents for the valorization of coffee industry by-products.

Keywords: Antioxidant capacity, Espresso coffee waste, Green extraction, NADES, Phenolic compounds.

**SÜRDÜRÜLEBİLİR TARIM İÇİN TÜRKİYE NARENCİYE AĞACI VARLIĞININ
TAHMİNİ: LSTM VE PSO İLE OPTİMİZE EDİLMİŞ HOLT DOĞRUSAL TREND
YAKLAŞIMLARININ KARŞILAŞTIRMALI ANALİZİ**

**FORECASTING TURKIYE'S CITRUS TREE POPULATION FOR SUSTAINABLE
AGRICULTURE: A COMPARATIVE ANALYSIS OF LSTM AND PSO-OPTIMIZED HOLT
LINEAR TREND APPROACHES**

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ÖZET

Tarım sektörü, Türkiye gibi hızla gelişmekte olan ulusal ekonomilerin temel direklerinden biridir ve bu sektördeki stratejik planlamalar sürdürülebilirlik hedeflerine ulaşmada kritik bir role sahiptir. Türkiye, narenciye üretiminde dünya liderleri arasında yer alırken, narenciye sektörünün geleceği; değişen pazar dinamikleri, kötüleşen çevresel faktörler ve artan küresel rekabetin karmaşık etkileşimleri ile yol almaktadır. Bu çalışmada, narenciye ağaçlarının popülasyon yapısının ileriye dönük bir analizi, sektörün uzun vadeli sürdürülebilirliği için temel ve önemli bir gereklilik olarak ele alınmaktadır.

Bu araştırma, Türkiye İstatistik Kurumu (TÜİK) tarafından yayınlanan verilerden 1988'den 2024 yılına kadar olan döneme ait yıllık verileri kullanarak, portakal, mandalina, limon, greyfurt ve turunc ağaçlarının toplam sayılarını, "meyve veren" ve "meyve vermeyen" olmak üzere iki ayrı kategori altında tahmin etmeye yönelik bir model geliştirmeyi amaçlamaktadır.

Bu amaçla, zaman serisi tahmin yöntemlerinden Uzun-Kısa Süreli Bellek (LSTM) ağırları ve hibrit bir optimizasyon yaklaşımı olan Parçacık Sürü Optimizasyonu PSO ile optimize edilmiş Holt doğrusal trend metodlarının sonuçları MSE (Mean Square Error) değerleri üzerinden karşılaştırılmıştır. LSTM, karmaşık ve doğrusal olmayan zaman serisi verilerindeki uzun vadeli bağımlılıkları yakalama yeteneğiyle öne çıkarken, Holt doğrusal trend yöntemi, veri setindeki trend bileşenini modellemede etkilidir. Çalışmada, Holt doğrusal trend modelinin parametreleri, Parçacık Sürü Optimizasyonu (PSO) algoritması kullanılarak optimize edilerek MSE değeri minimize edilerek tahmin performansı maksimize edilmiştir. Geliştirilen bu modeller sayesinde, zaman serisi verileri kullanarak gelecekteki üretim miktarlarını yüksek doğrulukla öngörebilmektedir.

Narenciye ağaç sayısının doğru bir şekilde öngörülmesi; fazla veya az üretimin neden olduğu fiyat dengesizliklerini engellemeye, depolama ve lojistik planlamasını optimize etmeye ve ihracat potansiyelini en üst düzeye çıkarmaya yardımcı olacaktır. Böylece, narenciye üretiminin ekonomik sürdürülebilirliği sağlanarak, sektördeki tüm aktörlerin riskleri azaltılmış ve gelir istikrarı desteklenmiş olacaktır. Bu çalışma, tarım politikası yapıcıları, yatırımcılar ve sektördeki paydaşlar için emsalsiz bir stratejik planlama aracı sunmaktadır. Elde edilen tahminler, gelecekteki üretim fazlası veya açığının

önlenmesi, lojistik ve depolama altyapısının optimum düzeyde planlanması, su ve gübre gibi kaynakların verimli kullanımı ve çiftçilerin gelir istikrarının sağlanması açısından hayati önem taşımaktadır. Sonuç olarak, bu modelin sunduğu öngörüler, narenciye sektörünün ekonomik, çevresel ve sosyal sürdürülebilirliği doğru bir şekilde yönetilmesi için bilimsel ve veriye dayalı bir çerçeve oluşturmaktadır.

Anahtar Kelimeler: Tarım Sürdürülebilirliği, Narenciye Tahmini, PSO, Holt Linear Trend Metodu, LSTM, Zaman Serisi Analizi.

ABSTRACT

The agricultural sector is one of the main pillars of emerging national economies like Türkiye, and strategic planning within this sector plays a critical role in achieving sustainability goals. As one of the world's leading citrus producers, Türkiye's citrus sector navigates the complex interactions of shifting market dynamics, deteriorating environmental factors, and increasing global competition. This study addresses a forward-looking analysis of citrus tree population structure as a fundamental and crucial requirement for the long-term sustainability of the sector.

This research aims to develop a forecasting model for the total number of orange, mandarin, lemon, grapefruit, and bitter orange trees, categorized into "fruit-bearing" and "non-fruit-bearing", using annual data from 1988 to 2024 obtained from the Turkish Statistical Institute (TÜİK).

For this purpose, the results of Long Short-Term Memory (LSTM) networks and Holt linear trend methods optimized with a hybrid approach, Particle Swarm Optimization (PSO), were compared based on their Mean Square Error (MSE) values. LSTM excels at capturing long-term dependencies in complex, non-linear time series data, while the Holt linear trend method is effective in modeling the trend component of the dataset. In this study, the parameters of the Holt linear trend model were precisely calibrated using the Particle Swarm Optimization (PSO) algorithm to minimize the MSE value and maximize forecasting performance. Thanks to these developed models, it is possible to predict future production quantities with high accuracy using time series data.

Accurate forecasting of the citrus tree population will help prevent price imbalances caused by over- or under-production, optimize storage and logistics planning, and maximize export potential. Thus, by ensuring the economic sustainability of citrus production, risks for all stakeholders in the sector will be mitigated, and income stability will be supported. This study provides an invaluable strategic planning tool for agricultural policymakers, investors, and sector stakeholders. The forecasts are of vital importance for preventing future production surpluses or shortages, optimizing the planning of logistics and storage infrastructure, ensuring the efficient use of resources like water and fertilizer, and supporting farmers' income stability. In conclusion, the insights provided by this model establish a scientific and data-driven framework for the proactive management of the citrus sector's economic, environmental, and social sustainability.

Keywords: Agricultural Sustainability, Citrus Forecasting, PSO, Holt Linear Trend Method, LSTM, Time Series Analysis.

ÇOCUKLARDA BESİN TAKVİYESİ KULLANIMI: LİTERATÜR VERİLERİ VE KLİNİK PERSPEKTİF

THE USE OF NUTRITIONAL SUPPLEMENTS IN CHILDREN: LITERATURE EVIDENCE AND CLINICAL PERSPECTIVE

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ÖZET

Çocukluk, insan gelişiminde en hızlı yapısal ve işlevsel değişikliklerin yaşandığı kritik bir dönemdir. Bu dönemde beslenme, büyüme, bilişsel gelişim, bağışıklık fonksiyonu ve kronik hastalık riski üzerinde uzun süreli etkiler yaratır. Yetersiz ve dengesiz beslenme, çocukluk çağında büyüme ve gelişme geriliği, bağışıklık sistemi zayıflığı ve kronik hastalıkların riskinde artış gibi çok ciddi sağlık problemlerine yol açabilmektedir. Yetersiz beslenmenin önlenmesine katkı sağladığı düşüncesiyle vitamin, mineral ve besin takviyelerinin kullanımı, son yıllarda çocukluk dönemi dahil olmak üzere tüm yaş gruplarında yaygınlaşmıştır. Yapılan çalışmalarda çocuklarda besin takviyesi kullanım oranının %31- %81 arasında değiştiği, en çok kullanılan takviyelerin multivitamin ve multimineraler, omega 3 balık yağları, propolis ve probiyotik takviyeleri olduğu görülmüştür. Takviye kullanımının; yaş, hane gelir düzeyi, kronik hastalıklar, enfeksiyon hastalıkları, düzenli öğün tüketimi, besin etiketi okuma alışkanlığı, obezite durumu ve ebeveynin takviye kullanımı ile ilişkili olduğu belirlenmiştir. Büyüme ve gelişmeyi desteklemek, vitamin ve mineral eksikliklerini gidermek, beyin gelişimi, bağışıklık sistemini güçlendirmek, hastalıklardan korunmak ise takviye kullanımının başlıca nedenleri arasında yer almaktadır. Ülkemizde de özellikle D vitamini ve demir takviyeleri destek olarak verilmektedir. Ancak her takviyenin etkinlik ve güvenlik profili aynı düzeyde kanıtla desteklenmemektedir. Bu nedenle çocuklarda besin takviyesi kullanımında mutlaka hekim ve diyetisyen danışmanlığı gereklidir. Ayrıca ebeveynlerin, potansiyel faydalar ve olası riskler konusunda bilinçlendirilmesi büyük önem taşımaktadır. Bu çalışmada, çocuklarda besin takviyesi kullanımına ilişkin mevcut literatür incelenerek kullanım sıklığı, belirleyici faktörler ve sağlık etkileri ele alınmıştır.

Anahtar Kelimeler: beslenme, besin takviyeleri, vitamin ve mineraller, çocuklar, çocukluk.

ABSTRACT

Childhood represents a critical period marked by the most rapid structural and functional changes in human development, during which nutrition exerts long-lasting effects on growth, cognitive development, immune function, and the risk of chronic diseases. During childhood, insufficient and unbalanced dietary intake can lead to serious health outcomes, including impaired growth and

development, weakened immune function, and an increased risk of chronic diseases. Driven by the perception that they contribute to the prevention of nutritional deficiencies, the use of vitamin, mineral, and nutritional supplements has significantly increased in recent years across all age groups, including children. Research indicates that the prevalence of nutritional supplement use in children ranges from 31% and 81%, with multivitamin-multimineral supplements, omega-3 fish oils, propolis, and probiotics being the most frequently consumed products. The use of nutritional supplements has been identified as being associated with various factors, including age, household income, the presence of chronic and infectious diseases, regular meal patterns, food label reading habits, obesity status, and parental use of supplements. Supporting growth and development, addressing vitamin and mineral deficiencies, promoting brain development, strengthening the immune system, and preventing illnesses are among the primary reasons for nutritional supplement use. In Turkey, vitamin D and iron supplements are particularly provided as supportive interventions. However, not all nutritional supplements are supported by the same level of evidence regarding their efficacy and safety. Therefore, the use of nutritional supplements in children should always be guided by consultation with a physician and a registered dietitian. Additionally, it is of great importance to educate parents about the potential benefits and possible risks associated with nutritional supplement use. This study examines the current literature on nutritional supplement use in children, focusing on prevalence, determining factors, and health effects.

Keywords: nutrition, nutritional supplements, vitamins and minerals, children, childhood

THE USE OF CARNAUBA WAX OLEOGEL AS A FAT SUBSTITUTE IN IMMATURE CHICKPEA CRACKERS: TECHNOLOGICAL AND SENSORY EVALUATION

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ABSTRACT

Nowadays, public awareness of health is steadily increasing due to the ageing of populations and the heightened risk of lifestyle-related illnesses. Therefore, many food products, such as crackers, require reformulation to diminish the consumption of saturated and *trans* fatty acids, deemed detrimental to health. Oleogels attract attention as a fat substitute to prepare healthier food products in the food industry. However, research on the performance of oleogels on the quality of cracker samples is limited. In this study, shortening in the formulation of crackers enriched with 20% immature chickpea flour was substituted with carnauba wax oleogel at 0, 25, 50, 75 and 100% levels. The technological and sensory features of crackers were investigated. Replacing shortening with carnauba wax oleogel did not any notable change in the dimension values of immature chickpea crackers compared to the control (0% oleogel). Furthermore, spread ratio value of samples made from 100% oleogel was close to the control crackers. However, the replacement of shortening with oleogel reduced the hardness of cracker samples compared to control. Color ΔE values of immature chickpea crackers containing oleogel were statistically ($p>0.05$) similar to each other. According to the sensory evaluation, the substitution of shortening with carnauba wax oleogel in immature chickpea crackers revealed similar taste, odor, appearance, crispness and overall acceptability scores to the control. The data of the present study illustrated that carnauba wax oleogel can be used to produce healthier crackers enhanced with legume flours with acceptable technological quality.

Keywords: Oleogels, Fat substitutes, Crackers, Chickpeas, Functional foods

**SANALDAN SOFRAYA: GASTRONOMİ TURİZMİNDE DİJİTAL YÖRESELLİK
KAVRAMI**

**FROM VIRTUAL TO TABLE: THE CONCEPT OF DIGITAL REGIONALISM IN
GASTRONOMY TOURISM**

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ÖZET

Gastronomi turizmi, uzun yıllar boyunca yerinde deneyimlenen ve yöresel kimlik ile doğrudan ilişkilendirilen bir alan olarak tanımlanmıştır. Ancak son yıllarda gelişen dijital teknolojiler, bu deneyimi mekândan bağımsız hale getirmiş ve yöreselliğin algılanma biçiminde köklü değişimlere yol açmıştır. Bu çalışmada, yapay zekâ ve metaverse temelli uygulamaların gastronomi turizminde “dijital yöresellik” kavramını nasıl ortaya çıkardığı tartışılmaktadır.

Araştırmanın kavramsal çerçevesi, üç temel neden-sonuç ilişkisinden hareketle inşa edilmiştir. İlk olarak, yapay zekâ tabanlı kişiselleştirme araçları, ziyaretçilerin damak tadı ve kültürel tercihlerine uygun öneriler üretmek yöresel mutfakların dijital ortamda yeniden temsil edilmesini sağlamaktadır. Bu durum, turistlerin geleneksel mekânlara fiziksel erişim sağlamadan da yöresel kimlik ile etkileşim kurabilmelerine olanak tanır. İkinci olarak, metaverse tabanlı sanal ortamlar, gastronomi destinasyonlarını üç boyutlu, etkileşimli ve oyunlaştırılmış biçimde sunarak yöresel kültürün aktarımına yeni bir deneyim boyutu eklemektedir. Böylece yöresellik, yalnızca coğrafi bir deneyim olmaktan çıkarak, dijital platformlarda yeniden üretilen bir kimliğe dönüşmektedir. Üçüncü olarak ise, blok zincir ve dijital doğrulama sistemleri, coğrafi işaretli ürünlerin otantik kimliklerini koruma altına almakta ve bu ürünlerin dijital ortamda da güvenilir biçimde temsil edilmesini mümkün kılmaktadır.

Çalışmanın özgün katkısı, gastronomi turizmi literatüründe henüz yeterince tartışılmamış olan “dijital yöresellik” kavramını önermesidir. Bu kavram, fiziksel ve sanal deneyimlerin iç içe geçtiği hibrit bir turizm alanını tanımlamakta; gastronomi turizminin geleceğini yalnızca mekâna bağlı bir etkinlikten çıkararak dijitalleşme sürecine dâhil etmektedir. Bu bağlamda “sanaldan sofraya” uzanan deneyim, gastronomi turizminin sürdürülebilirliği, erişilebilirliği ve küresel ölçekte yaygınlaştırılmasında kritik bir yaklaşım değişimini işaret etmektedir.

Anahtar Kelimeler: Gastronomi Turizmi, Dijital Yöresellik, Yapay Zekâ, Metaverse, Yöresel Kimlik

ABSTRACT

Gastronomy tourism has long been defined as a field experienced in situ and directly associated with local identity. However, the rapid development of digital technologies in recent years has rendered this experience independent of place and has led to profound transformations in the perception of locality. This study discusses how artificial intelligence and metaverse-based applications give rise to the concept of “digital locality” within the context of gastronomy tourism.

The conceptual framework of the study is constructed around three primary cause–effect relationships. First, AI-based personalization tools generate recommendations aligned with visitors’ taste preferences and cultural backgrounds, thereby enabling the digital representation of local cuisines. This allows tourists to interact with local identities without the necessity of physical access to traditional sites. Second, metaverse-based virtual environments present gastronomy destinations in three-dimensional, interactive, and gamified formats, adding a novel experiential dimension to the transmission of local culture. Consequently, locality is transformed from a purely geographical experience into an identity reconstructed within digital platforms. Third, blockchain and digital verification systems safeguard the authenticity of geographically indicated products, ensuring their reliable representation within digital environments.

The study’s originality lies in proposing the concept of “digital locality,” which has not yet been sufficiently explored in the gastronomy tourism literature. This concept delineates a hybrid tourism space where physical and virtual experiences are intertwined, and repositions the future of gastronomy tourism from being merely place-dependent to being integrated into processes of digital transformation. Within this framework, the trajectory “from the virtual to the table” signals a critical shift in approach for the sustainability, accessibility, and global dissemination of gastronomy tourism.

Keywords: Gastronomy Tourism, Digital Locality, Artificial Intelligence, Metaverse, Local Identity

**BİYOBOĞESEL GASTRONOMİ TURİZMİ: EKOSİSTEM TABANLI OTANTİKLİK VE
SÜRDÜRÜLEBİLİR KİMLİK İNŞASI ÜZERİNE KAVRAMSAL BİR ÇERÇEVE**
**BIOREGIONAL GASTRONOMY TOURISM: A CONCEPTUAL FRAMEWORK ON
ECOSYSTEM-BASED AUTHENTICITY AND SUSTAINABLE IDENTITY
CONSTRUCTION**

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ÖZET

Gastronomi turizmi literatüründe hâkim yaklaşımlar, destinasyonların mutfak kültürü, ürün çeşitliliği ve yemek deneyimleri üzerine yoğunlaşmaktadır. Bu perspektif çoğu kez mutfak kültürünün beslendiği ekolojik bağlamı arka planda bırakmaktadır. Gastronomik ürünler kültürel aktarımın yanı sıra belirli ekosistemlerin, iklimsel koşulların ve biyolojik çeşitliliğin somutlaşmış bir çıktısıdır. Bu çalışmada öne çıkarılan “biyobölgesel gastronomi turizmi” kavramı, destinasyonun mutfak kültürünü biyofiziksel çevreyle bütünleşik bir yapı içerisinde ele almayı hedeflemektedir.

Biyobölgesel yaklaşım, bir coğrafi alanın ekolojik sınırlarını ve tarımsal üretim döngülerini gastronomi turizminin merkezine yerleştirmektedir. Böylece bir vadinin mikrokliması, endemik bitki örtüsü, su kaynakları ve üretim pratikleri gastronomik deneyimin özgün bileşenleri hâline gelmektedir. Bu durum üç temel sonuç doğurmaktadır:

Ekosistem-Tabanlı Otantiklik: Turist tabağa ulaşan ürünü tüketmekle sınırlı kalmaz; ürünün yetiştği toprak, üretim süreci ve ekolojik döngüyle etkileşime girer. Bu etkileşim, otantiklik algısını güçlendirir ve gastronomi deneyimini yemek yeme eyleminin ötesine taşıyarak ekosistemle kurulan bütünleşik bir yaşantıya dönüştürür.

Yerel Gıda Egemenliği: Turizm talebi çoğu zaman dış pazarlara yönelir. Biyobölgesel gastronomi turizmi bu talebi yerel üretici-tüketici döngüsüne entegre eder. Böylece üretici gelirleri artar, geleneksel tarımsal pratikler korunur, gıda egemenliği desteklenir. Gastronomi turizmi ithalata dayalı bir vitrin olmaktan çıkar, yerel ekonomiyi sürdürülebilir biçimde besleyen bir mekanizmaya dönüşür.

Sürdürülebilir Kimlik İnşası: Destinasyon markalaşmasında “yerel lezzet” vurgusu sıkça kullanılmaktadır. Ancak bu vurgu çoğu zaman yüzeysel bir anlatı olarak kalır. Biyobölgesel yaklaşım destinasyon kimliğini mutfak repertuarının ötesinde, o mutfağın beslendiği ekosistem kimliği üzerinden tanımlar. Bu yönelim destinasyonlara ekolojik aidiyet kazandırır ve uzun vadeli sürdürülebilirlik açısından farklılaştırıcı bir unsur yaratır.

Sonuç olarak biyobölgesel gastronomi turizmi, gastronomi deneyimlerini mekânsal, kültürel ve ekolojik boyutların kesişiminde ele alan özgün bir kavramsal çerçeve sunmaktadır. Bu yaklaşım turistik otantiklik arayışını derinleştirirken yerel üretim sistemleri ve ekosistemlerin sürdürülebilirliğine doğrudan katkı sağlamaktadır.

Anahtar Kelimeler: Gastronomi Turizmi, Biyobölgesel Yaklaşım, Ekosistem, Gıda Egemenliği, Sürdürülebilir Kimlik

ABSTRACT

In the literature on gastronomy tourism, prevailing approaches concentrate on the culinary culture of destinations, product diversity, and eating experiences. This perspective frequently marginalizes the ecological context that sustains culinary practices. Yet gastronomic products represent not only cultural transmission but also the tangible outcomes of specific ecosystems, climatic conditions, and biodiversity. The concept of “bioregional gastronomy tourism” proposed in this study seeks to frame a destination’s culinary culture within an integrated relationship with its biophysical environment.

The bioregional approach positions the ecological boundaries of a geographical area and its agricultural production cycles at the core of gastronomy tourism. In this framework, a valley’s microclimate, endemic vegetation, water resources, and production practices emerge as distinctive components of the gastronomic experience. This orientation generates three principal outcomes:

Ecosystem-Based Authenticity: Tourists engage not only with the dish served on the table but also with the soil in which ingredients are grown, the processes of production, and the ecological cycles involved. Such engagement strengthens perceptions of authenticity and transforms the gastronomic experience from an act of eating into an integrated encounter with the ecosystem.

Local Food Sovereignty: Tourism demand often gravitates toward external markets. Bioregional gastronomy tourism integrates this demand into local producer–consumer cycles. As a result, producer revenues increase, traditional agricultural practices are preserved, and food sovereignty is reinforced. Gastronomy tourism thereby shifts from an import-dependent showcase toward a mechanism that nourishes the local economy in a sustainable manner.

Sustainable Identity Construction: In destination branding, the emphasis on “local flavors” is frequently employed, yet this emphasis often remains superficial. The bioregional approach defines destination identity not through a repertoire of dishes but through the ecological identity from which those dishes emerge. This orientation cultivates ecological belonging for destinations and introduces a differentiating factor in terms of long-term sustainability.

In conclusion, bioregional gastronomy tourism offers an original conceptual framework that situates gastronomic experiences at the intersection of spatial, cultural, and ecological dimensions. This approach deepens the pursuit of touristic authenticity while directly contributing to the sustainability of local production systems and ecosystems.

Keywords: Gastronomy Tourism, Bioregional Approach, Ecosystem, Food Sovereignty, Sustainable Identity

**PARTİKÜL BOYUTU VE EMÜLGATÖR MİKTARININ SÜTLÜ ÇİKOLATANIN
TRİBOLOJİK, REOLOJİK, TEKSTÜR VE DUYUSAL ÖZELLİKLERİ ÜZERİNDEKİ
ETKİLERİ**

**THE EFFECTS OF PARTICLE SIZE & EMULSIFIER AMOUNT ON TRIBOLOGICAL,
RHEOLOGICAL, TEXTURAL & SENSORIAL PROPERTIES OF MILK CHOCOLATE**

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ÖZET

Bu çalışma, parçacık boyutu ve emülgatör seviyesinin sütlü çikolatanın reolojik, tribolojik, tekstür ve duyusal özellikleri üzerindeki etkilerini incelemiştir. Gerçek yeme deneyimini daha iyi yansıtmak amacıyla analizlerde yapay tükürük de kullanılmıştır. Reolojik analizler, parçacık boyutu ve emülgatör miktarının artmasının plastik viskoziteyi belirgin şekilde azalttığını göstermiştir. Ancak yalnızca emülgatör miktarındaki artış, belli bir noktadan sonra yağ fazındaki yapısal yeniden yapılanma nedeniyle akma gerilimini artırmıştır. Tribolojik ölçümler, daha büyük parçacıkların sınır ve karışık yağlama rejimlerinde sürtünmeyi artırdığını ortaya koyarken, emülgatör miktarının sıvı film oluşumunu destekleyerek karışık rejimlerde sürtünmeyi azalttığı gözlemlenmiştir. Elasto-hidrokinamik koşullarda ve yapay tükürük varlığında ise sürtünme, parçacık boyutu ile emülgatör düzeyinin etkileşiminden daha fazla etkilenmiştir. Tekstür analizlerinde her iki parametrenin de sertlik üzerinde önemli etkileri olduğu görülmüş; özellikle yüksek emülgatör miktarı içeren örneklerde yapay tükürük, ürünleri daha yumuşak hale getirmiştir. Duyusal değerlendirmeler, emülgatör miktarındaki artışın aroma salınımını ve ağızdaki yeme deneyimi hissini iyileştirdiğini; küçük parçacıkların ise daha pürüzsüz bir yapı ve dengeli tat algısı sağladığını göstermiştir. Tüketici beğeni testlerinde ise, küçük parçacıklı ve yüksek emülgatör içeren örnekler tat, yapı ve genel beğeni açısından en yüksek puanları almıştır. İstatistiksel analizler ise tüketici beğenisinin en güçlü belirleyicisinin yapıya ilişkin özellikler olduğunu ortaya koymuştur.

Anahtar Kelimeler: sütlü çikolata, reoloji, triboloji, tekstür, duyusal, tüketici

ABSTRACT

This research examines the combined effects of particle size and emulsifier concentration on the rheological, tribological, textural, and sensory characteristics of milk chocolate. To simulate realistic oral conditions, artificial saliva was incorporated into instrumental analyses. Rheological findings indicated that both increased particle size and emulsifier levels led to a reduction in plastic viscosity, while emulsifier concentration alone elevated yield stress due to structural changes in the fat matrix. Tribological assessments revealed that larger particles increased friction in boundary and mixed

lubrication regimes, whereas emulsifiers reduced friction in mixed regimes by promoting fluid film formation. Under elasto-hydrodynamic conditions with artificial saliva, friction was predominantly influenced by the interaction between particle size and emulsifier concentration. Texture analysis showed significant effects on hardness, with saliva contributing to further softening, particularly in samples with higher emulsifier content. Sensory evaluations and consumer acceptance tests demonstrated that chocolates with smaller particles and higher emulsifier levels were preferred for their smoother texture, enhanced flavor release, and overall palatability. Statistical modelling identified texture-related parameters as the most influential predictors of consumer liking.

Keywords: milk chocolate, rheology, tribology, texture, sensory, consumer

**SÜT ÜRÜNLERİNİN ZENGİNLEŞTİRİLMESİNDE DOĞAL FONKSİYONEL KATKI
MADDESİ OLARAK NAR İŞLEME YAN ÜRÜNLERİNİN KULLANILABİLME
POTANSİYELİ**

**POTENTIAL USAGE OF POMEGRANATE PROCESSING BY-PRODUCTS AS A
NATURAL FUNCTIONAL ADDITIVE IN FORTIFICATION OF DAIRY PRODUCTS**

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ÖZET

Nar (*Punica granatum* L.), tropik ve subtropikal iklim kuşağında yetişen, zengin besin içeriği ve sağlığa faydaları nedeniyle dünya çapında tüketilen popüler bir meyvedir. Narın meyve suyuna işlenmesi sonrasında meyvenin neredeyse yarısı endüstriyel atığa (kabuklar ve çekirdekler) ayrılmakta ve bunların bertaraf edilmesi bir çevre sorunu haline gelmiştir. Olgun bir nar meyvesi yaklaşık 6-10 cm çapında ve ortalama 200 g ağırlığında olup genellikle %43-50 kabuk, %40-46 nar suyu ve %10-11 çekirdek içermektedir. Meyvenin ana atık kısmını oluşturan nar kabukları; kompleks polisakkaritler, mineraller, vitaminler, fenolik asitler (gallik asit, ellagik asit, kafeik asit, vb.), flavonoidler (kateşin, gallokateşin, epikateşin, vb.), antosiyaninler ve hidrolize tanenler (punicalagin, gallotanninler, vb.) gibi doğal antioksidan bileşikler bakımında zengin ve değerli bir kaynaktır. Ayrıca, nar kabukları önemli miktarda A, B₁, B₂, C ve E (α - tokoferol) vitaminlerini içerir. Nar kabuğuna kıyasla nar çekirdeği, yüksek protein (%13.70) ve yağ (%29.60) içeriğiyle dikkat çekicidir. Nar çekirdeği yağında punik asit, linoleik asit, oleik asit, stearik asit ve palmitik asit bulunan başlıca yağ asitleridir. Nar içerdiği biyoaktif bileşikler sayesinde antimikrobiyal, antioksidan, antitümör, antikanser, antiinflamatuar, antidiyabetik ve diğer sağlık geliştirici özelliklere sahiptir. Bu terapötik özellikler, nardaki fenolik fitokimyasalların sinerjik etkilerine atfedilmiştir. Fonksiyonel gıdaların üretiminde biyoaktif bileşiklerce zengin gıda işleme yan ürünlerinin kullanımı artarak gelişen yenilikçi bir yaklaşımdır. Son yıllarda nar işleme atıklarından/yan ürünlerinden değerli bileşiklerin geri kazanımına ve bunların gıda sektöründe doğal katkı olarak kullanımına yönelik araştırmalar giderek artmıştır. Bu uygulamalar gıda endüstrisinde fonksiyonel özellikleri artırılmış yenilikçi süt ürünlerinin geliştirilmesi için yeni perspektifler oluşturmıştır. Süt ürünlerinin zenginleştirilmesinde farklı formlarda (toz/un, ekstrakt, yağ, vb.) kullanılan nar işleme yan ürünlerinin ve/veya atıklarının (kabuk, çekirdek, posa, çekirdek yağı, vb.), ürünlere fonksiyonel özellikler ve teknolojik faydalar sağladığı belirlenmiştir. Bu çalışmada, nar işleme yan ürünlerinin besin değerine ve yüksek biyoaktivitesine dikkat çekerek, doğal fonksiyonel katkı olarak süt ve ürünlerinin (yoğurt, dondurma, peynir, tereyağı, fermente süt, vb.) zenginleştirilmesinde kullanılabilme potansiyeli ortaya konulmuştur.

Anahtar Kelimeler: Nar, Gıda atıkları, Nar işleme yan ürünleri, Fonksiyonel katkı, Biyoaktif bileşikler, Fonksiyonel süt ürünleri.

ABSTRACT

Pomegranate (*Punica granatum* L.) is a popular fruit grown in tropical and subtropical climates, and it is consumed worldwide due to its rich nutritional content and numerous health benefits. After processing pomegranate into juice, nearly half of the fruit is separated into industrial waste (peels and seeds), and disposing of this waste has become an environmental problem. A ripe pomegranate fruit is approximately 6-10 cm in diameter and weighs approximately 200 g, and generally contains 43-50% peel, 40-46% pomegranate juice, and 10-11% seeds. Pomegranate peels, which constitute the main waste portion of the fruit, are a rich and valuable source of natural antioxidant compounds such as complex polysaccharides, minerals, vitamins, phenolic acids (gallic acid, ellagic acid, caffeic acid, etc.), flavonoids (catechin, gallocatechin, epicatechin, etc.), anthocyanins, and hydrolyzable tannins (punicalagin, gallotannins, etc.). Additionally, it contains significant amounts of vitamins A, B₁, B₂, C, and E (α -tocopherol). Pomegranate seeds are notable for their high protein (13.70%) and fat (29.60%) content compared to pomegranate peel. The punic acid, linoleic acid, oleic acid, stearic acid, and palmitic acid found in pomegranate seed oil are the main fatty acids. Pomegranate has antimicrobial, antioxidant, antimutagenic, anticancer, anti-inflammatory, antidiabetic, and other health-promoting properties thanks to the bioactive compounds it contains. These therapeutic properties have been attributed to the synergistic effects of phenolic phytochemicals in pomegranate. The use of food processing by-products rich in bioactive compounds in the production of functional foods is an increasingly innovative approach. In recent years, research has increasingly focused on recovering valuable compounds from pomegranate processing waste/by-products and using them as natural additives in the food industry. These applications have generated new perspectives for developing innovative dairy products with increased functional properties in the food industry. It has been determined that pomegranate processing by-products and/or wastes (peel, seeds, pulp, seed oil, etc.), used in different forms (powder/flour, extract, oil, etc.) in the fortification of dairy products, provide functional properties and technological benefits to the products. In this study, by drawing attention to the nutritional value and high bioactivity of pomegranate processing by-products, the potential of their use as natural functional additives in the enrichment of milk and dairy products (yogurt, ice cream, cheese, butter, fermented milk, etc.) was revealed.

Keywords: Pomegranate, Food waste, Pomegranate processing by-products, Functional additives, Bioactive compounds, Functional dairy products.

**TEREYAĞININ OKSİDASYON STABİLİTESİ VE FONKSİYONEL ÖZELLİKLERİ
ÜZERİNDE SENTETİK ANTİOKSİDANLARA ALTERNATİF OLARAK DOĞAL
BİTKİSEL KATKILARIN ROLÜ**

**THE ROLE OF NATURAL PLANT-BASED ADDITIVES AS AN ALTERNATIVE TO
SYNTHETIC ANTIOXIDANTS ON THE OXIDATION STABILITY AND FUNCTIONAL
PROPERTIES OF BUTTER**

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ÖZET

Tereyağı, hoş aroması, kolay sindirilmesi, A vitamini ve/veya β -karoten ve esansiyel yağ asitleri içermesi ve enerji kaynağı olması nedeniyle insan beslenmesinde önemli bir süt ürünüdür. Tereyağının üretimi ve depolanması sırasındaki koşullara ve zamana bağlı olarak görülen lipit oksidasyonu, ürünün besin değerinin, lezzetinin, dokusunun ve görünümünün bozulmasına neden olarak kalite de düşmeye neden olur ve ürünün raf ömrünü sınırlandırır. Bu durum, tüketici tarafından ürünün reddedilmesine, tüketiminin azalmasına ve ekonomik kayıplara neden olur. Süt yağı tipik olarak bileşiminde; yüksek oranda doymuş yağ asitlerini (% 60-70), tekli doymamış yağ asitlerini (% 25-30) ve düşük miktarda çoklu doymamış yağ asitlerini (~% 5) içermektedir. Tereyağı (çeşide göre %80-99) gibi yağ oranı yüksek gıdalarda lipid oksidasyonunu kontrol etmek için oksijene maruziyetinin azaltılması, mevcut yağ asitlerinin doymamışlık derecesinin düşürülmesi ve serbest radikal temizleyici antioksidanların kullanılması gibi çeşitli yöntemler bulunmaktadır. Bu teknikler arasında antioksidanların kullanımı, oksidasyonu geciktirdiği ve gıdaların raf ömrünü uzattığı için en yaygın olanıdır. Gıda endüstrisinde lipit oksidasyonunu önlemek için doğal veya sentetik antioksidanlar kullanılmaktadır. Sentetik antioksidanların [bütillenmiş hidroksianisol (BHA, E320), bütillenmiş hidroksitoluen (BHT, E321), tersiyer bütıl hidrokuinon (THBQ, E319), propil galatlar (PG, E310), vb.] sağlık üzerindeki olumsuz etkileri, tüketicileri ve araştırmacıları doğal antioksidanlara yöneltmiştir. Bu nedenle, son yıllarda bitkisel kaynaklı antioksidanlar üzerine yapılan araştırmalar artmıştır. Literatür araştırmalarında, doğal bitkisel katkıların (sarımsak, çörek otu, kekik, yeşil çay, adaçayı, biberiye, tarçın, karanfil, sumak, zencefil, kimyon, susam, makroalg, üzüm kabuğu, hurma çekirdeği, kayısı, fıstık kabuğu, nar kabuğu, zeytin posası, vb.) tereyağının besinsel ve fonksiyonel özellikleri artırmanın yanı sıra sentetik antioksidanlara alternatif olarak başarılı bir şekilde kullanılabileceği görülmüştür. Araştırmalar, farklı şekillerde (esansiyel yağ, toz, ekstrakt, vb.) tereyağına katılan doğal bitkisel katkıların sentetik antioksidanlara eş değer ve/veya daha yüksek bir antioksidan etki göstererek tereyağının oksidatif stabilitesini ve raf ömrünü artırdığını ortaya koymuştur. Bu çalışmada, tereyağı üretiminde sentetik antioksidanlara alternatif olarak doğal bitkisel katkıların kullanılabilme potansiyeline dikkat çekilmiştir.

Anahtar Kelimeler: Tereyağı, Oksidasyon, Raf ömrü, Gıda katkı maddesi, Sentetik antioksidanlar, Bitkisel katkıları.

ABSTRACT

Butter is an important dairy product in human nutrition due to its pleasant aroma, easy digestibility, vitamin A and/or β -carotene, and essential fatty acid content, as well as being a source of energy. Lipid oxidation, which occurs depending on the conditions and time during the production and storage of butter, causes a decline in quality by impairing the nutritional value, flavor, texture, and appearance of the product, resulting in a limited shelf life. This leads to the consumer rejecting the product, reduced consumption, and economic losses. Milk fat typically contains a high proportion of saturated fatty acids (60-70%), monounsaturated fatty acids (25-30%), and a low amount of polyunsaturated fatty acids (~5%). There are various methods for controlling lipid oxidation in foods with high fat content, such as butter (80-99% depending on the type), including reducing exposure to oxygen, lowering the degree of unsaturation of existing fatty acids, and using free radical scavenging antioxidants. Among these techniques, the use of antioxidants is the most common, as they delay oxidation and extend the shelf life of foods. In the food industry, natural or synthetic antioxidants are used to prevent lipid oxidation. The adverse health effects of synthetic antioxidants [butylated hydroxyanisole (BHA, E320), butylated hydroxytoluene (BHT, E321), tertiary butyl hydroquinone (TBHQ, E319), propyl gallates (PG, E310), etc.] have led consumers and researchers to turn to natural antioxidants. For this reason, research on plant-derived antioxidants has increased in recent years. Literature studies have shown that natural plant-based additives (garlic, caraway, thyme, green tea, sage, rosemary, cinnamon, cloves, sumac, ginger, cumin, sesame, macroalgae, grape skin, date seed, apricot, peanut shell, pomegranate peel, olive pomace, etc.) can successfully be used as alternatives to synthetic antioxidants, as well as to enhance the nutritional and functional properties of butter. Studies have shown that natural plant based additives added to butter in various forms (essential oil, powder, extract, etc.) increase the oxidative stability and shelf life of butter by exhibiting antioxidant effects similar to and/or higher than synthetic antioxidants. This study draws attention to the potential use of natural plant-based additives as alternatives to synthetic antioxidants in butter production.

Keywords: Butter, Oxidation, Shelf life, Food additive, Synthetic antioxidants, Plant-based additives.

**GELENEKSEL GIDALARIN FONKSİYONEL VE KÜLTÜREL AÇIDAN GASTRONOMİ
TURİZMİNE KATKISI**

**THE CONTRIBUTION OF TRADITIONAL FOODS TO GASTRONOMIC TOURISM FROM
A FUNCTIONAL AND CULTURAL PERSPECTIVE**

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ÖZET

Kıbrıs mutfağı, tarih boyunca farklı kültürel etkileşimlerin bir araya gelmesiyle biçimlenmiş ve bu süreç adanın gastronomisine özgün bir kimlik kazandırmıştır. Bu durum, geleneksel gıdaların yalnızca günlük yaşamda değil, aynı zamanda toplumsal kimlik, kültürel hafıza ve kuşaklar arası aktarım açısından da özel bir değer taşımasına yol açmıştır. Hellim, kolokas, molehiya ve samarella gibi ürünler, besin değerleri ve sağlık yararlarının yanı sıra fonksiyonellikleriyle de dikkat çekmektedir. Bu bağlamda, geleneksel gıdalar turizm ve gastronomi perspektifinden değerlendirildiğinde, hem kültürel kimliğin korunmasına hem de destinasyon pazarlamasına katkı sağlayan fonksiyonel bir unsur olarak öne çıkmaktadır. Bu gıdalar, gastronomi turizmi yaratma ve bölgesel markalaşma süreçlerinde stratejik bir rol üstlenmektedir. Ayrıca, bu gıdaların tanıtımı ve sunumu, ziyaretçilere adanın kültürel ve gastronomi değerlerini deneyimleme fırsatı sunarak turizm sektörüne doğrudan katkı sağlamaktadır. Çalışmada ulusal ve uluslararası akademik makalelerden oluşan kapsamlı bir literatür taraması yapılmıştır. Literatür incelendiğinde, geleneksel gıdaların kültürel ve fonksiyonel katkıları bakımından destinasyon, markalaşma mekanizması ve gastronomi turizmi geliştirme yaklaşımında değerli bir araç olduğu görülmektedir. Ayrıca, fonksiyonel turizm uygulamaları (örneğin, erişilebilirlik, seyahat kolaylığı, sürdürülebilirlik katkısı) açısından da bu gıdaların önemli bir rol oynayabileceği düşünülmektedir. Sonuç olarak, Kıbrıs mutfağı yalnızca korunması gereken bir kültürel miras değil, aynı zamanda

gastronomi turizmi açısından güçlü bir çekim unsuru ve geleceğe dönük önemli fırsatlar barındıran bir değer olarak değerlendirilmektedir.

Anahtar Kelimeler: Kıbrıs Mutfağı, Geleneksel Gıdalar, Gastronomi Turizmi, Sürdürülebilirlik, Fonksiyonel Gıda.

ABSTRACT

Cypriot cuisine has been shaped by the convergence of different cultural influences throughout history, a process that has given the island's gastronomy a unique identity. This has led to traditional foods having a special value not only in daily life but also in terms of social identity, cultural memory and intergenerational transmission. Products such as hellim, kolokas, molehiya and samarella are noteworthy not only for their nutritional value and health benefits but also for their functionality. In this context, when traditional foods are evaluated from a tourism and gastronomy perspective, they emerge as a functional element that contributes to both the preservation of cultural identity and destination marketing. These foods play a strategic role in creating gastronomic tourism and regional branding processes. Furthermore, the promotion and presentation of these foods directly contribute to the tourism sector by offering visitors the opportunity to experience the island's cultural and gastronomic values. The study includes a comprehensive literature review of national and international academic articles. The literature review reveals that traditional foods are a valuable tool in terms of their cultural and functional contributions to destination, branding mechanisms, and gastronomy tourism development approaches. Furthermore, it is thought that these foods could play an important role in terms of functional tourism applications (e.g. accessibility, ease of travel, contribution to sustainability). Consequently, Cypriot cuisine is considered not only a cultural heritage that must be preserved, but also a powerful attraction for gastronomic tourism and a valuable asset offering significant opportunities for the future.

Keywords: Cypriot Cuisine, Traditional Foods, Gastronomic Tourism, Sustainability, Functional Food.

**LEVERAGING IoT SCALABILITY IN SMART WAREHOUSING FOR POST-HARVEST
FOOD WASTE REDUCTION: MODELS, EVIDENCE, AND IMPLEMENTATION**

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ABSTRACT

Post-harvest food waste is a major challenge worldwide. This issue is especially prevalent in warehousing, where spoilage, poor temperature and humidity control, and inefficient handling cause significant losses. This paper looks into how scalable Internet of Things (IoT) setups in smart warehousing can help lower post-harvest food waste. It combines literature from 2020 to 2025 with quantitative data from various case studies to estimate the potential effects of implementing IoT solutions. The key findings show that post-harvest losses in developing countries for perishable produce can reach 50-60%, particularly for fruits and vegetables, without proper storage. In contrast, losses of around 20-30% happen for grains and pulses when using traditional storage methods. Research indicates that with better post-harvest technologies, such as temperature and humidity sensors and moisture control, losses for pulses and grains fell by about 22% in Uganda for beans. There were also annual average crop losses of around 25.8% in Ethiopia, with losses for fruits and vegetables surpassing 33%. IoT-based smart warehousing has the potential to reduce these losses by 40-60%, depending on the scale, infrastructure, and type of crop. However, barriers like high initial costs for infrastructure, unreliable connectivity, power supply issues, and the need for trained staff remain challenges. The paper suggests scalable models that combine edge and cloud setups, modular sensor installations, and public-private partnerships. It concludes that with the right policies, investments, and local adjustments, IoT scalability in smart warehousing can significantly improve food security, boost the economy, and promote sustainability.

Keywords: IoT Scalability, Smart Warehousing, Post-Harvest Food Waste, Cold-Chain Management.

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THE INFLUENCE OF FOOD CULTURE ON IDENTITY, HEALTH, AND COMMUNITY CONNECTIONS

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ABSTRACT

In recent years, the crucial role food culture plays in shaping identity, health, and community connections has gained significant attention. Food is more than just a source of sustenance; it represents cultural heritage, fosters social bonds, and has a profound impact on health outcomes. This study examines how food practices serve as a means of expressing cultural identity and forming social connections, while also impacting health. A thorough review of existing research highlights the link between food practices and cultural heritage, showing how traditional foods serve as anchors for identity. Recipes and cooking methods are often passed down through generations, creating a sense of belonging and continuity. Shared meals, common in many cultures, help nurture both the body and social connections, creating an atmosphere of inclusion and connection among diverse groups. Observational studies of communal dining practices reveal that these gatherings are crucial for fostering a sense of community, serving as social equalizers that facilitate cultural exchange and mutual support. Interviews with community members provide more detailed insights into local food dynamics, revealing how food choices reflect cultural identities. Key stakeholders like farmers and chefs stress the importance of culturally significant foods for health and well-being, while also addressing the challenges of globalization that threaten traditional practices. Notably, dietary habits are changing due to the rise of processed foods, which are linked to higher rates of obesity and other health issues. However, the study notes the resilience of food cultures, highlighting how communities adapt to modern challenges by promoting traditional cooking practices and communal meals. Initiatives that support the inclusion of conventional foods, such as cooking classes and local food festivals, are emerging as crucial recommendations. Ultimately, the research highlights the importance of food culture for public health and social cohesion, advocating for strategies that recognize the complex interplay between food, culture, and community.

Keywords: Food Culture, Identity , Health , Community , Traditions , Social Bonds, Globalization, Obesity, Culinary Heritage, Public Health.

**COĞRAFI İŞARETLİ ÜRÜNLER YOLUYLA GASTRONOMİ TURİZMİNİN
GELİŞTİRİLMESİ: GÜNEYDOĞU ANADOLU BÖLGESİ ÖRNEĞİ**
**DEVELOPING GASTRONOMY TOURISM THROUGH GEOGRAPHICALLY
IMPLICATED PRODUCTS: THE EXAMPLE OF SOUTHEASTERN ANATOLIA REGION**

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ÖZET

Gastronomi turizmi, destinasyonların yalnızca doğal ve kültürel varlıklarıyla değil, özgün mutfak kültürleri aracılığıyla da rekabet avantajı elde etmesini sağlayan önemli bir turizm alanı olarak literatürde ön plana çıkmaktadır. Bu turizm türü, turistlerin destinasyon tercihlerini şekillendiren temel motivasyon unsurlarından biri olup, yerel yiyecek ve içecek deneyimleri aracılığıyla hem kültürel mirasın korunmasına hem de bölgesel ekonomik kalkınmaya katkı sağlamaktadır. Coğrafi işaretli (Cİ) ürünler, belirli bir bölgeye özgü nitelikleri ve geleneksel üretim teknikleri ile kalite güvence mekanizması sunmakta ve yerel kültürel değerlerin sürdürülebilir şekilde korunmasına aracılık etmektedir. Türkiye, coğrafi işaretli ürünler açısından yüksek bir çeşitliliğe sahip olup, özellikle Güneydoğu Anadolu Bölgesi; Gaziantep baklavası, Urfa kebabı, Diyarbakır burma kadayıfı, Siirt fıstığı ve Mardin sembusek gibi tanınmış ürünlerle gastronomi turizminin gelişimine önemli katkılar sağlamaktadır. Ancak bölgedeki Cİ ürünlerin turizm faaliyetlerine entegrasyonu sınırlı kalmakta ve çoğu destinasyon bu ürünlerin turistik çekicilik olarak kullanımı ve pazarlanması konusunda yeterli stratejik planlamaya sahip değildir. Ayrıca, coğrafi işaretli ürünlerin kültürel değerleri ve sürdürülebilir kullanımının turizm bağlamında sistematik olarak değerlendirilmediği görülmektedir. Bu çalışma, Güneydoğu Anadolu Bölgesi'ndeki coğrafi işaretli ürünlerin gastronomi turizmi bağlamında kültürel, ekonomik ve turistik değerlerini bilimsel bir yaklaşımla analiz ederek literatüre özgün katkı sunmayı amaçlamaktadır. Araştırmada doküman analizi yöntemi kullanılmış ve Türkiye Patent ve Marka Kurumu (TÜRKPATENT) veri tabanından 10-15 Eylül 2025 tarihleri arasında elde edilen bilgiler temel alınarak değerlendirme yapılmıştır. Çalışma, bölgenin gastronomi turizmi potansiyelinin ortaya konmasına ve sürdürülebilir turizm stratejilerinin geliştirilmesine rehberlik etmeyi hedeflemektedir.

Anahtar Kelimeler: Gastronomi turizmi, coğrafi işaretli ürünler, Güneydoğu Anadolu, sürdürülebilir turizm.

ABSTRACT

Gastronomy tourism stands out in the literature as a significant tourism field that enables destinations to gain competitive advantage not only through their natural and cultural assets but also through their unique culinary cultures. This type of tourism is one of the primary motivators shaping tourists' destination preferences, contributing to both the preservation of cultural heritage and regional economic development through local food and beverage experiences. Geographically indicated (GI) products, with their regional characteristics and traditional production techniques, offer a quality assurance mechanism and serve as a vehicle for the sustainable preservation of local cultural values. Turkey boasts a high

diversity of GI products, and the Southeastern Anatolia Region, in particular, contributes significantly to the development of culinary tourism with well-known products such as Gaziantep baklava, Urfa kebab, Diyarbakır burma kadayıf, Siirt pistachios, and Mardin sembusek. However, the integration of GI products into tourism activities in the region remains limited, and many destinations lack sufficient strategic planning for the use and marketing of these products as tourist attractions. Furthermore, it appears that the cultural values and sustainable use of geographically indicated products have not been systematically evaluated in the context of tourism. This study aims to contribute to the literature by analyzing the cultural, economic, and touristic values of geographically indicated products in the Southeastern Anatolia Region within the context of gastronomy tourism using a scientific approach. Document analysis was used in the research, and the evaluation was based on information obtained from the Turkish Patent and Trademark Office (TURKPATENT) database between September 10-15, 2025. The study aims to reveal the region's gastronomy tourism potential and guide the development of sustainable tourism strategies.

Keywords: Gastronomy tourism, geographically indicated products, Southeastern Anatolia, sustainable tourism.

**INNOVATIVE NON-THERMAL TECHNOLOGIES FOR IMPROVING THE SAFETY AND
NUTRITIONAL QUALITY OF INFANT FOODS**

**BEBEK GIDALARINDA GÜVENLİK VE BESLEYİCİ KALİTEYİ ARTIRMAYA YÖNELİK
YENİLİKÇİ TERMAL OLMAYAN TEKNOLOJİLER**

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ABSTRACT

The safety of infant and young children's foods is of paramount importance due to their vulnerability during rapid growth and development. Conventional thermal treatments are effective in ensuring microbial safety; however, they often lead to nutrient degradation, loss of sensory properties, and the formation of process-induced toxicants such as acrylamide, furan, and 5-hydroxymethylfurfural (HMF). These drawbacks have prompted the food industry to explore innovative and sustainable alternatives.

In recent years, non-thermal processing technologies have emerged as promising approaches to balance food safety with nutritional and sensory quality. High-pressure processing (HPP), pulsed electric fields (PEF), ultrasound (US), and radio frequency (RF) applications have been shown to inactivate pathogens effectively while preserving thermosensitive nutrients. Evidence from recent studies highlights that these techniques reduce contaminant formation in infant formulas and complementary foods, extend shelf life, and improve visual and sensory attributes compared to conventional methods.

Nevertheless, the successful industrial application of these technologies depends on rigorous safety assessments and regulatory approval. Agencies such as the FDA and EFSA require comprehensive risk evaluations to ensure their safe use, particularly in products consumed by sensitive populations like infants and toddlers.

In conclusion, non-thermal processing technologies represent a promising pathway for enhancing the safety, nutritional value, and quality of infant and baby foods. However, further pilot-scale studies and harmonized regulatory frameworks are essential for their broader adoption and consumer acceptance worldwide.

Keywords: Infant Foods, Food Safety, Non-Thermal Technologies, High-Pressure Processing, Pulsed Electric Fields

ÖZET

Bebek ve küçük çocuk gıdalarının güvenliği, bu yaş grubunun hızlı büyüme ve gelişim sürecindeki hassasiyetleri nedeniyle büyük önem taşımaktadır. Geleneksel ısı işlemler, mikrobiyal güvenliği sağlamada etkili olmakla birlikte, besin öğelerinin kaybına, duyu niteliklerinin bozulmasına ve

akrilamid, furan, 5-hidroksimetilfurfural (HMF) gibi süreç kaynaklı toksik bileşiklerin oluşumuna yol açabilmektedir. Bu sınırlılıklar, gıda endüstrisini daha yenilikçi ve sürdürülebilir alternatiflere yöneltmiştir.

Son yıllarda öne çıkan termal olmayan işleme teknolojileri, gıdaların besin içeriğini ve duyuşal özelliklerini koruyarak mikrobiyal güvenliğı sağlamada önemli avantajlar sunmaktadır. Yüksek basınçlı işleme (HPP), darbeli elektrik alan (PEF), ultrason (US) ve radyo frekansı (RF) uygulamaları, patojenlerin inaktivasyonunda etkili olurken aynı zamanda besin öğelerinin korunmasına katkı sağlamaktadır. Yapılan çalışmalar, bu yöntemlerin bebek mamaları ve tamamlayıcı gıdalarda kontaminant oluşumunu azalttığını, raf ömrünü korurken ürünlerin görsel ve duyuşal kalitesini iyileştirdiğini ortaya koymuştur.

Ancak bu teknolojilerin endüstriyel ölçekte yaygın olarak kullanılabilmesi için düzenleyici otoriteler tarafından yapılacak güvenlik değerdendirmeleri ve standardizasyon çalışmaları kritik öneme sahiptir. FDA ve EFSA gibi kuruluşlar, özellikle bebek ve küçük çocuk gıdaları gibi hassas tüketici gruplarında, bu teknolojilerin güvenli kullanımına ilişkin kapsamlı risk değerdendirmeleri talep etmektedir.

Sonuç olarak, termal olmayan işleme teknolojileri, bebek ve küçük çocuk gıdalarında güvenlik, kalite ve besleyici değerd açısından umut verici çözümler sunmaktadır. Ancak bu yöntemlerin küresel ölçekte kabul görebilmesi için daha fazla pilot ölçekli araştırmaya ve düzenleyici uyumlaştırmaya ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Bebek Gıdaları, Gıda Güvenliğı, Non-Thermal Teknolojiler, Yüksek Basınçlı İşleme, Darbeli Elektrik Alan

***PRUNUS PERSICA* (ŞEFTALİ)'NİN BESİN DEĞERİ & FİTOKİMYASAL İÇERİĞİ VE
SAĞLIK ÜZERİNE ETKİLERİ**

**NUTRITIONAL VALUE & PHYTOCHEMICAL CONTENT OF *PRUNUS PERSICA*
(PEACH) AND ITS EFFECTS ON HEALTH**

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ÖZET

Şeftali, çeşitli gıda ürünlerinde yaygın olarak kullanılır ve yüksek miktarda tüketilir. Püre, bebek maması, meyve suyu, reçel, çay ve yoğurt gibi ürünlerin formülasyonlarında kullanılmak üzere tercih edilmektedir. Ayrıca şeftaliler çeşitli kozmetik ürünlerinin formülasyonlarında kullanılır. Literatür verilerine göre *Prunus persica* (şeftali); fenolik bileşikler (fenolik asitler, flavonoidler, vb.), vitamin (özellikle C ve E), mineral ve uçucu bileşikler bakımından zengin bir kaynağa sahiptir. Yapılan farmakolojik çalışmalar, bu bileşenlerin antioksidan, antimikrobiyal, antialerjik, antitümör, antidiyabetik, antikolinergik, antiürolititik ve dermoprotektif etkiler gösterdiğini ortaya koymaktadır. Elde edilen bulgular, şeftalinin yalnızca besin olarak değil; aynı zamanda fonksiyonel gıda, farmasötik ürün ve fitoterapötik ajan kaynağı olarak da değerlendirilebileceğini göstermektedir. Bununla birlikte, mevcut verilerin çoğunluğu *in vitro* düzeyde olup, biyoyararlanım, toksisite, etkileşim ve klinik etkinlik açısından daha kapsamlı *in vivo* araştırmalara ihtiyaç vardır. Bu nedenle, şeftali ve türevlerinin sağlık alanındaki potansiyel kullanımının güvenilir şekilde desteklenebilmesi için ileri düzey farmakolojik ve klinik çalışmalara ağırlık verilmesi büyük önem taşımaktadır.

Anahtar Kelimeler: *Prunus persica* L.; fitokimyasallar; antioksidan; fenolik bileşikler; farmakolojik aktivite; dermokozmetik; fonksiyonel gıda.

ABSTRACT

Peaches are widely used in a variety of food products and are consumed in high quantities. They are preferred in formulations such as purees, baby food, juice, jam, tea, and yogurt. Peaches are also used in various cosmetic formulations. According to literature, *Prunus persica* (peach) is a rich source of phenolic compounds (phenolic acids, flavonoids, etc.), vitamins (especially C and E), minerals, and volatile compounds. Pharmacological studies have revealed that these compounds exhibit antioxidant, antimicrobial, antiallergic, antitumor, antidiabetic, anticholinergic, antiurolithiatic, and dermoprotective properties. The findings suggest that peaches can be considered not only as food but also as a source of functional foods, pharmaceutical products, and phytotherapeutic agents. However, the majority of the available data are *in vitro*, and more comprehensive *in vivo* studies are needed to assess bioavailability, toxicity, interactions, and clinical efficacy. Therefore, it is crucial to prioritize advanced

pharmacological and clinical studies to reliably support the potential health benefits of peaches and their derivatives.

Keywords: *Prunus persica L.*; phytochemicals; antioxidant; phenolic compounds; pharmacological activity; dermocosmetic; functional food.

POSTBİYOTİKLERE GENEL BİR BAKIŞ: GÜNCEL KAVRAMLAR VE UYGULAMALAR
A GENERAL OVERVIEW OF POSTBIOTICS: CURRENT CONCEPTS AND APPLICATIONS

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ÖZET

Sağlıklı gıdalara yönelik artan tüketici talebi, çeşitli fonksiyonel faydalara sahip yeni biyoaktif bileşiklerin geliştirilmesini teşvik etmiştir. Bu bağlamda, son yıllarda fonksiyonel gıda bileşenleri arasında giderek daha fazla önem kazanan postbiyotikler ön plana çıkmaktadır. Canlı veya parçalanmış bakteriler tarafından salınan metabolitler ve hücre duvarı bileşenleri olan postbiyotikler, iyi bilinen sağlık etkileriyle tanınmaktadır; devam eden araştırmalar, etkileşimlerini, üretim süreçlerini, endüstriyel ölçeklenebilirliklerini, işlenmesini ve güvenlik değerlendirmelerini kapsamlı bir şekilde incelemektedir. Organik asitler, bakteriyosinler, enzimler, kısa zincirli yağ asitleri ve diğer antimikrobiyal bileşenleri içeren postbiyotikler, yalnızca biyokoruma sağlamakla kalmaz, aynı zamanda gıdalarda patojen mikroorganizmaların büyümesini ve biyofilm oluşumunu engelleyerek raf ömrünün uzamasına da katkıda bulunur. Bu özellikler, gıda güvenliği ve kalite standartları açısından önemli avantajlar sağlamanın yanı sıra ürünlerin fonksiyonel değerini de artırır. Artan bilimsel ve ticari ilgi, postbiyotiklerin fizyolojik ve fonksiyonel özelliklerini destekleyen kapsamlı çalışmalara ve klinik kanıtlara yol açmıştır. Ayrıca, bağırsak mikrobiyotasıyla etkileşimleri, bağışıklık tepkisini düzenleme potansiyelleri, metabolik sağlık üzerindeki olumlu etkileri ve gıda formülasyonlarına dahil edilme yöntemleri giderek daha fazla araştırılmaktadır. Bu bulgular, postbiyotiklerin gıda ve ilaç endüstrilerindeki potansiyel uygulamalarını vurgulamakta ve biyoaktivite ve güvenliklerinin daha kapsamlı bir şekilde belgelendirilmesine ve düzenleyici çerçevelerin geliştirilmesine olan ihtiyacı açıkça ortaya koymaktadır.

Anahtar Kelimeler: Gıda, Sağlık, Probiyotikler, Postbiyotikler.

ABSTRACT

The growing consumer demand for health-promoting foods has encouraged the development of new bioactive compounds with various functional benefits. In this context, postbiotics, which have gained increasing importance among functional food ingredients in recent years, are coming to the fore. Postbiotics, which are metabolites and cell wall components released by live or fragmented bacteria, are recognized for their well-known health effects; ongoing research comprehensively examines their interactions, production processes, industrial scalability, processing, and safety assessments. Containing

organic acids, bacteriocins, enzymes, short-chain fatty acids, and other antimicrobial components, postbiotics not only provide bioprotection but also contribute to extending shelf life by inhibiting the growth of pathogenic microorganisms and biofilm formation in foods. These properties offer significant advantages in terms of food safety and quality standards while also enhancing the functional value of products. Growing scientific and commercial interest has led to comprehensive studies and clinical evidence supporting the physiological and functional properties of postbiotics. Furthermore, their interactions with the gut microbiota, potential to modulate the immune response, positive effects on metabolic health, and methods of incorporation into food formulations are increasingly being researched. These findings highlight the potential applications of postbiotics in the food and pharmaceutical industries, clearly demonstrating the ongoing need for more comprehensive documentation of their bioactivity and safety, as well as the development of regulatory frameworks.

Keywords: Food, Health, Probiotics, Postbiotics.

**SÜRDÜRÜLEBİLİR GASTRONOMİ KAPSAMINDA ANTALYA İLİ COĞRAFI İŞARETLİ
ÜRÜNLERİNİN MUTFAK SANATLARI ÖĞRENCİLERİ TARAFINDAN BİLİNLİRLİĞİNİ
ARTIRMAYA YÖNELİK ÇALIŞMA**

**INCREASING THE AWARENESS OF ANTALYA PROVINCE GEOGRAPHICAL
INDICATIVE PRODUCTS BY CULINARY ARTS STUDENTS WITHIN THE SCOPE OF
SUSTAINABLE GASTRONOMY**

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ÖZET

Bu çalışmanın temel amacı, sürdürülebilir gastronomi kapsamında Antalya iline ait coğrafi işaretli ürünlerin mutfak sanatları önlisans öğrencileri tarafından bilinirliğinin artırılmasını sağlamaktır. Bu proje TÜBİTAK 2209-A programından destek alınarak gerçekleştirilmiştir. Çalışma proje danışmanının daha önce gerçekleştirdiği araştırmasına dayanmaktadır. Araştırma sınırlılıkları çerçevesinde gerçekleştirilen alan yazın incelemeleri doğrultusunda, sürdürülebilir gastronomi kapsamında coğrafi işaretli ürünlere yönelik çeşitli çalışmaların bulunduğu, ancak bu ürünlerin önlisans düzeyindeki öğrencilere tanıtılması ve farkındalık kazandırılmasına yönelik çalışmalar oldukça sınırlı olduğu görülmüştür. Bu doğrultuda, proje sorumlusu öğrenciler tarafından proje danışmanının onayı doğrultusunda çeşitli tanıtım etkinlikleri ve uygulamalar belirlenen tarihlerde gerçekleştirilmiştir. Proje sonuçlarının bilimsel yayına dönüşmesi yaygın etkisini artırarak, gastronomi alanında eğitim alan öğrencilere, araştırmacılara ve ilgili kurumlara katkı sağlamaktadır. Coğrafi işaretli ürünlerin gastronomi eğitiminde kullanımının sağlanması bu projenin sürdürülebilir etkisini artırmakta, bölgesel kalkınmanın yanı sıra ulusal ölçekte ekonomik fayda sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Sürdürülebilir gastronomi, coğrafi işaret, mutfak sanatları, farkındalık, yerel ürünler

ABSTRACT

The main purpose of this study is to increase the awareness of geographically indicated products of Antalya province among culinary arts associate degree students within the scope of sustainable gastronomy. The secondary purpose of the study is to examine whether students' perceptions of some geographically indicated products belonging to Antalya province differ in line with demographic variables. This project was carried out with support from TÜBİTAK 2209-A program. In line with the literature review carried out within the framework of research limitations, it has been seen that there are various studies on geographically indicated products within the scope of sustainable gastronomy, but studies on introducing these products to associate degree students and raising awareness are quite

limited. In this regard, various promotional activities and practices were carried out by the project responsible students on the determined dates, in line with the approval of the project advisor. The transformation of project results into scientific publications increases their widespread impact and contributes to students, researchers and relevant institutions studying in the field of gastronomy. Ensuring the use of geographically indicated products in gastronomy education increases the sustainable impact of this project and is thought to provide economic benefits on a national scale as well as regional development.

Key Words: Sustainable gastronomy, geographical indication, culinary arts, awareness, local products

NATÜREL ZEYTİNYAĞI OLEOJELİNİN KIZARTMA PERFORMANSI VE DEPOLAMA STABİLİTESİ

FRYING PERFORMANCE AND STORAGE STABILITY OF EXTRA VIRGIN OLIVE OIL-BASED OLEOGEL

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ÖZET

Bu çalışmada, natürel sızma zeytinyağı ve candelilla mumu kullanarak elde edilen oleojellerin kızartma performansı ve depolama stabilitesi incelenmiştir. Oleojellerin kızartma ortamı olarak kullanımı zeytinyağı ile karşılaştırmalı olarak değerlendirilmiştir. Bunun için dilimlenmiş patatesler 180°C'de 3 dakika boyunca kızartılmış ve bu döngü yeni yağ eklenmeden 20 defa tekrar edilmiştir. 0., 5., 10., 15. ve 20. döngüde kızartma ortamlarından örnekler alınarak serbest yağ asitliği (SYA), peroksit (PV), p-anisidin (p-AV), konjuge dien (K232) ve konjuge trien (K270) değerleri ölçülmüş, kızartılan örneklerde ise yağ emilim analizleri yapılmıştır. Kızartma uygulamalarında oleojelde kızartılan patateslerin yağ emilim oranı, zeytinyağında kızartılanlara göre %29 daha az bulunmuştur. Kızartma süresince yapılan kimyasal analizler, oleojelde PV, p-AV, K232 ve K270 değerlerinin zeytinyağına kıyasla daha düşük seviyelerde seyrettiğini ve oksidatif bozulmanın daha sınırlı olduğunu ortaya koymuştur. Ayrıca, serbest yağ asitliği değerlerinde de zeytinyağı ile oleojel arasında anlamlı bir fark gözlenmemiştir (p>0,05). Bu sonuçlar, oleojelin kızartma koşullarında daha yüksek oksidatif stabilite sağladığını ve geleneksel sıvı yağla kıyasla yağ emilimini azaltma potansiyelini ortaya koymuştur.

Depolama stabilitesi için yağ ve oleojel örnekleri oda sıcaklığında, karanlık ve aydınlık olmak üzere iki farklı ortam koşullarında 90 gün boyunca depolanmıştır. 0., 30., 60. ve 90. depolama gününün sonunda yağ bağlama kapasitesi (%YBK) ve oksidasyon analizleri yapılmıştır. Elde edilen sonuçlar, oleojellerin natürel sızma zeytinyağına göre daha yüksek oksidatif kararlılık gösterdiğini belirlemiştir. Kimyasal analizler, jel yapının ve karanlık koşullarda depolamanın oksidatif bozulmayı önemli ölçüde azalttığını göstermiştir. XRD ve FTIR spektroskopisi verileri, depolama süresi ve ışık maruziyetinin oleojelin kristal yapısı ve kimyasal bileşimi üzerinde anlamlı bir değişim olmadığını göstermiştir.

Elde edilen sonuçlar, candelilla mumu ve natürel sızma zeytinyağı oleojelinin hem kızartma ortamı olarak kullanımında yüksek oksidatif stabilite sağladığını hem de depolama sırasında yapısal bütünlüğünü koruduğunu ortaya koymuştur. Bu özellikler, oleojelin hem kızartma uygulamalarında hem de depolama sürecinde oksidatif stabilite ve yapısal bütünlük sağlayarak gıda endüstrisinde kullanılabilirliğini ortaya koymaktadır.

Anahtar Kelimeler: Oleojel, natürel sızma zeytinyağı, candelilla mumu

ABSTRACT

In this study, the frying performance and storage stability of oleogels prepared using extra virgin olive oil and candelilla wax were investigated. The use of oleogels as a frying medium was evaluated in comparison with olive oil. For this purpose, sliced potatoes were fried at 180 °C for 3 minutes, and this cycle was repeated 20 times without the addition of fresh oil. Samples were collected from the frying media at the 0th, 5th, 10th, 15th, and 20th cycles to determine free fatty acidity (FFA), peroxide value (PV), p-anisidine value (p-AV), conjugated dienes (K232), and conjugated trienes (K270). In the fried samples, oil absorption was also analyzed. Frying trials revealed that potatoes fried in oleogel absorbed 29% less oil compared to those fried in olive oil. Chemical analyses during frying indicated that PV, p-AV, K232, and K270 values were lower in oleogels than in olive oil, suggesting reduced oxidative deterioration. Moreover, no significant difference ($p>0.05$) was observed between olive oil and oleogel in terms of free fatty acidity. These findings demonstrated that oleogels provided higher oxidative stability under frying conditions and exhibited the potential to reduce oil absorption compared with conventional liquid oil.

For storage stability, oil and oleogel samples were stored at room temperature under two different conditions, dark and light, for 90 days. At the end of the 0th, 30th, 60th, and 90th storage days, oil binding capacity (%OBC) and oxidation analyses were performed. The results indicated that oleogels exhibited higher oxidative stability compared to extra virgin olive oil. Chemical analyses revealed that the gel structure and storage under dark conditions significantly reduced oxidative deterioration. XRD and FTIR spectroscopy data showed that neither storage time nor light exposure caused significant changes in the crystalline structure or chemical composition of the oleogels. The overall findings demonstrated that the oleogel formulated with candelilla wax and extra virgin olive oil not only provided higher oxidative stability as a frying medium but also preserved its structural integrity during storage. These properties highlight the potential applicability of oleogels in the food industry by ensuring oxidative stability and structural integrity in both frying operations and storage.

Keywords: Oleogel, extra virgin olive oil, candelilla wax

GIDA SANAYİİNDE KAHVE ATIKLARININ DEĞERLENDİRİLMESİ
EVALUATION OF COFFEE WASTE IN THE FOOD INDUSTRY

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ÖZET

Kahve, dünya genelinde en yaygın tüketilen içeceklerden biri olup, küresel üretimi son yıllarda 178 milyon 60 kilo çuvala ulaşmıştır. Küresel üretimde *Coffea arabica* yaklaşık %75, *C. canephora* (Robusta) ise yaklaşık %24'lük paya sahiptir. Kahve meyvesi; çekirdek, çekirdek zarı, parşömen tabaka, musilaj, posa ve dış kabuktan oluşmaktadır. Kahve işleme süreçlerinde posa, telve ve çekirdek zarı gibi önemli miktarda organik atık ortaya çıkmaktadır. Yalnızca kahve posası üretimi yılda yaklaşık 6 milyon ton olup, bu atıkların büyük kısmı hâlen yakma veya depolama yöntemleri ile bertaraf edilmektedir. Kahve atıkları; içeriklerindeki polisakarit, protein, fenolik bileşikler ve diğer biyoaktif maddeler nedeniyle gıda endüstrisi ve diğer sektörlerde değerli hammadde potansiyeline sahiptir. Bu atıkların biyoyakıt veya tarımsal kompost olarak değerlendirilmesi, hammadde kullanımını ve sera gazı emisyonlarını azaltarak çevresel sürdürülebilirliği desteklemektedir. Kompost formunda toprağa uygulanan kahve atıkları, su tutma kapasitesini artırmakta, sulama ihtiyacını azaltmakta ve toprak verimliliğini yükseltmektedir. Ayrıca kahve kabuğundan üretilen aktif karbon, endüstriyel atık sulardaki fenolik kirleticileri gidererek su kalitesinin iyileştirilmesine katkı sağlamaktadır. Ekonomik açıdan, kahve atıklarından biyoyakıt, besin takviyesi ve biyoambalaj gibi katma değerli ürünlerin elde edilmesi, hammadde maliyetlerini düşürmekte, yeni gelir olanakları ve girişimcilik fırsatları yaratmaktadır. Bu durum, hem çevresel hem ekonomik fayda sağlamakta, hem de toplumsal refah ve sürdürülebilir kalkınma hedeflerine katkıda bulunmaktadır.

Anahtar Kelimeler: Kahve üretimi, kahve atıkları, fenolik bileşikler, sürdürülebilir kalkınma.

**FONKSİYONEL GIDA OLARAK ARI ÜRÜNLERİ İÇEREN YUMUŞAK ŞEKER VE
PASTİL FORMÜLASYONLARININ GELİŞTİRİLMESİ VE DUYUSAL ANALİZİ**
**DEVELOPMENT AND SENSORY EVALUATION OF SOFT CANDY AND LOZENGE
FORMULATIONS CONTAINING BEE PRODUCTS AS FUNCTIONAL FOODS**

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ÖZET

Arı sütü bazlı gıdalar, sahip oldukları benzersiz besinsel özellikler nedeniyle son yıllarda giderek daha fazla ilgi görmektedir. Arı sütü; proteinler, 10-hidroksi-2-dekanoik asit (10-HDA) gibi yağ asitleri, vitaminler ve mineraller bakımından zengin bir matris sunarken, propolis yüksek fenolik bileşik içeriğiyle güçlü antioksidan özellik göstermekte ve polen esansiyel amino asitler ile mikro besin öğeleri açısından değerli bir kaynak oluşturmaktadır. Bununla birlikte bu biyoaktif bileşiklerin doğrudan tüketiminde stabilite ve duyuşal kabul sorunları sınırlayıcıdır. Bu çalışmada arı sütü ve diğer arı ürünlerinin fonksiyonel şekerleme formülasyonlarına ilavesinin duyuşal kabul üzerine etkileri incelenmiştir. Bu amaçla üç farklı yumuşak şekerleme (arı sütü; arı sütü+propolis; arı sütü+propolis+polen) ve bir pastil (arı sütü+propolis) üretilmiş ve on panelist ile görünüş-renk, kıvam, aroma-koku, lezzet, ağızda bıraktığı his ve satın alma niyeti parametreleri değerlendirilmiştir. İstatistiksel analizler varyans analizi ve çoklu karşılaştırma testleri ile gerçekleştirilmiştir. Bulgular, tüm duyuşal parametrelerde en yüksek skorların arı sütü+propolis pastilinde elde edildiğini, satın alma niyetinin de en yüksek bu üründe olduğunu ortaya koymuştur. En düşük kabul ise arı sütü+propolis+polen içeren yumuşak şekerlemede belirlenmiştir. Sonuç olarak, arı sütü ve propolisin besinsel ve biyoaktif içeriğinin fonksiyonel gıda formülasyonlarında tüketici kabulünü artırabileceği ve apiterapi alanındaki Ar-Ge çalışmalarına katkı sağlayabileceği belirlenmiştir.

Anahtar kelimeler: Arı sütü, Polen, Propolis, Fonksiyonel gıda, Duyusal analiz, Şekerleme formülasyonları, Apiterapi

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ABSTRACT

Royal jelly-based foods have garnered increasing scientific attention in recent years owing to their unique nutritional composition. Royal jelly provides a matrix rich in proteins, fatty acids such as 10-hydroxy-2-decenoic acid (10-HDA), vitamins, and minerals, whereas propolis exhibits strong antioxidant capacity due to its high phenolic content, and pollen represents a valuable source of essential amino acids and micronutrients. Nevertheless, the direct consumption of these bioactive compounds is limited by issues related to stability and sensory acceptance. In this study, the impact of incorporating royal jelly and other bee products into functional confectionery formulations on consumer sensory perception was evaluated. Three types of soft candies (royal jelly; royal jelly + propolis; royal jelly + propolis + pollen) and one lozenge (royal jelly + propolis) were produced. A trained panel of ten assessors evaluated appearance–color, texture, aroma–odor, taste, mouthfeel, and purchase intent. Data were statistically analyzed using analysis of variance (ANOVA) and multiple comparison tests. The results demonstrated that the royal jelly + propolis lozenge achieved the highest scores across all sensory attributes, as well as the greatest purchase intent. In contrast, the lowest acceptance was recorded for the soft candy containing royal jelly + propolis + pollen. In conclusion, the incorporation of royal jelly and propolis can enhance consumer acceptance of functional food formulations, thereby supporting the development of apitherapy-oriented R&D studies.

Keywords: Royal jelly, Bee pollen, Propolis, Functional food, Sensory evaluation, Confectionery formulations, Apitherapy

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**DİSFAJİYE YÖNELİK FONKSİYONEL GIDALARIN TASARIMINDA 3D BASKI
TEKNOLOJİLERİ**

**3D PRINTING TECHNOLOGIES IN THE DESIGN OF FUNCTIONAL FOODS FOR
DYSPHAGIA**

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ÖZET

Disfaji, besin, sıvı veya tükürüğün ağız boşluğundan mideye taşınmasında yaşanan zorluk olarak tanımlanmakta olup; nörolojik bozukluklar, yapısal anormallikler, onkolojik tedaviler, akut durumlar ve yaşa bağlı değişiklikler başlıca nedenleri arasında yer almaktadır. Yaşam kalitesini önemli ölçüde düşüren bu durum, uygun şekilde yönetilmediğinde malnütrisyon, dehidratasyon ve aspirasyon pnömonisi gibi ciddi komplikasyonlara yol açabilmektedir. Günümüzde püre veya kıvam arttırılmış sıvılar disfaji diyetlerinde yaygın olarak kullanılmakta, ancak bu ürünler çoğu zaman besin ögesi açısından yetersiz ve duyuşal açıdan iştah açıcı olmaktan uzaktır. 3D gıda baskısı, disfaji yaşayan bireylerin beslenme gereksinimlerini karşılamada umut vadeden yenilikçi bir yaklaşım olarak öne çıkmaktadır. Yenilebilir bileşenlerin katmanlı üretim sürecine dayanan bu teknoloji, ürünlerin tekstürü, besinsel içeriği ve görselliği üzerinde yüksek düzeyde hassasiyet sağlamaktadır. Özellikle sebzelerin, bitkisel proteinlerin, fonksiyonel ekstraktların, vitamin ve minerallerin entegrasyonu sayesinde besinsel açıdan dengeli, lifçe zengin ve protein destekli ürünler üretilebilmekte; bu sayede disfaji hastalarında sık görülen malnütrisyon riski azaltılabilmektedir. Ayrıca porsiyonların kişiselleştirilebilmesi, yaşlı bireylerin günlük enerji ve mikro besin ihtiyaçlarının daha etkin karşılanmasına olanak tanımaktadır. 3D baskı, reolojik parametrelerin (sertlik, koheziflik, adeziflik, viskozite) düzenlenmesiyle IDDSI standartlarına uyumlu, yumuşak, pürüzsüz ve kolay yutulabilir gıdaların geliştirilmesini sağlamaktadır. Hidrokolloidler (ksantan gam, κ -karragenan, guar gam, keçiyoynuzu gamı vb.) ve proteinler (bezelye, soya, peynir altı suyu proteini, jelatin) sayesinde ürünlerin akma gerilimi, elastikiyet ve viskozitesi optimize edilerek hem güvenli yutma hem de yapısal bütünlük sağlanmaktadır. Ayrıca, kontrollü gözeneklilik ve homojen mikroyapı ile ağızda his (mouthfeel) özellikleri iyileştirilmekte; görsel açıdan çekici ve çeşitli şekillerin üretilmesiyle gıda kabulü ve besin alımı artırılabilir. Bu derleme, disfajiye yönelik 3D baskılı gıdaların kullanımına ilişkin güncel literatürü özetlemekte; özellikle formülasyon stratejileri, güvenlik, besinsel zenginleştirme ve kullanıcı bakış açılarına odaklanmaktadır.

Anahtar Kelimeler: Disfaji, 3D gıda baskısı, fonksiyonel gıda, doku modifikasyonu, hidrokolloidler, malnütrisyon

ABSTRACT

Dysphagia is defined as the difficulty in transporting food, liquids, or saliva from the oral cavity to the stomach, with neurological disorders, structural abnormalities, oncological treatments, acute conditions, and age-related changes being the main causes. This condition significantly reduces quality of life and, if not properly managed, may lead to serious complications such as malnutrition, dehydration, and aspiration pneumonia. Currently, pureed or thickened liquids are widely used in dysphagia diets; however, these products are often nutritionally inadequate and lack sensory appeal. 3D food printing has emerged as a promising innovative approach to meeting the nutritional needs of individuals with dysphagia. Based on the layered production of edible components, this technology provides high precision in controlling the texture, nutritional composition, and visual appearance of foods. Through the incorporation of vegetables, plant proteins, functional extracts, vitamins, and minerals, nutritionally balanced, fiber-rich, and protein-enriched products can be developed, thereby reducing the risk of malnutrition, which is common in dysphagia patients. Moreover, the possibility of portion customization allows the daily energy and micronutrient requirements of elderly individuals to be more effectively met. By adjusting rheological parameters (hardness, cohesiveness, adhesiveness, viscosity), 3D printing enables the development of IDDSI-compliant foods that are soft, smooth, and easy to swallow. With the use of hydrocolloids (xanthan gum, κ -carrageenan, guar gum, locust bean gum, etc.) and proteins (pea, soy, whey protein, gelatin), mechanical properties such as yield stress, elasticity, and viscosity can be optimized, ensuring both safe swallowing and structural integrity. In addition, controlled porosity and homogeneous microstructure improve mouthfeel and bolus formation, while the production of visually appealing and varied shapes increases food acceptance and intake. This review summarizes the current literature on the use of 3D-printed foods for dysphagia, focusing particularly on formulation strategies, safety, nutritional enhancement, and user perspectives.

Keywords: Dysphagia, 3D food printing, functional foods, texture modification, hydrocolloids, malnutrition

**AÇIKTA SATIŞA SUNULAN ÇİĞ SÜT VE BEYAZ PEYNİRLERİN KİMYASAL VE
MİKROBİYOLOJİK ÖZELLİKLERİ: KİLİS İLİ ÖRNEĞİ**

**CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF RAW MILK AND WHITE
CHEESE SOLD OPENLY: SAMPLE OF KİLİS**

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ÖZET

Süt memeli hayvanların meme bezlerinden salgılanmakta ve her yaş grubu insanın beslenmesinde önem taşımaktadır. Bu çalışmada Kilis ili piyasasında satışa sunulan çiğ inek ve keçi sütleri ile beyaz peynirlerin genel kalite özellikleri belirlenmiştir. Bu kapsamda kuru madde, yağsız kuru madde, kül, tuz, özgül ağırlık, alkol testi ve titrasyon asitliği analizleri yapılmıştır. Mikrobiyolojik analizlerde ise süt ve peynirlerde toplam mezofilik aerobik (TMAB), laktik asit bakterileri ve koliform grubu bakterilerin sayısı belirlenmiş olup ayrıca peynirlerde maya-küf sayımı da gerçekleştirilmiştir. Keçi sütlerinin kuru madde ve yağsız kuru madde içerikleri inek sütüne göre daha yüksek bulunmuştur. Çiğ sütlerin önemli kalite kriteri olan asitlik değeri laktik asit cinsinden %0.17-0.21 aralığında belirlenmiş ve alkol testinde de pıhtılaşma görülmemiştir. Özgül ağırlık değerleri ise keçi sütlerinde 1.035 ve 1.036, inek sütlerinde 1.032 ve 1.033 olarak tespit edilmiştir. Peynirlerde kuru maddede tuz oranı en yüksek %4.35 olarak belirlenmiş ve tebliğe uygun bulunmuştur. Keçi sütüne (4.10-4.26 log kob/mL) kıyasla inek sütünde (6.50-6.58 log kob/mL) daha fazla sayıda TMAB bulunmuştur. Koliform grubu bakteriler örnekler arasında sadece keçi sütlerinde tespit edilmemiştir. Peynirlerde kalite indikatörü olan koliform grubu bakteri sayısı en yüksek 4.44 log kob/mL olarak bulunmuştur. Ürünlerin kimyasal ve mikrobiyolojik kalitesini korumak için gıda zincirindeki kontaminasyonların ve saklama koşullarının büyük önem taşıdığı ortaya konulmuştur.

Anahtar Kelimeler: Çiğ süt, beyaz peynir, kalite, koliform, TMAB.

ABSTRACT

Milk is secreted from the mammary glands of mammals and is important in the nutrition of people of all age groups. In this study, the general quality characteristics of raw cow and goat milk and white

cheese sold in the Kilis province market were determined. In this context, analyses of dry matter, non-fat dry matter, ash, salt, specific gravity, alcohol test, and titration acidity were performed. In microbiological analyses, the number of total mesophilic aerobes (TMAB), lactic acid bacteria, and coliform group bacteria in milk and cheese was determined, and yeast and mold counts were also performed on cheese. The dry matter and non-fat dry matter contents of goat milk were found to be higher than those of cow milk. The acidity value, an important quality criterion for raw milk, was determined to be in the range of 0.17-0.21% in terms of lactic acid, and no coagulation was observed in the alcohol test. The specific gravity values were determined to be 1.035 and 1.036 for goat milk and 1.032 and 1.033 for cow milk. The salt content in dry matter in cheeses was determined to be at most 4.35% and was found to be in compliance with the notification. Compared to goat milk (4.10-4.26 log cfu/mL), cow milk (6.50-6.58 log cfu/mL) contained a higher number of TMAB. Coliform group bacteria were not detected in goat milk samples. The coliform group bacteria count, which is a quality indicator for cheese, was found to be as high as 4.44 log cfu/mL. It has been demonstrated that contamination in the food chain and storage conditions are of great importance in maintaining the chemical and microbiological quality of products.

Keywords: Raw milk, white cheese, quality, coliform, TMAB.

**PEYNİR TÜKETİMİNDEN KAYNAKLANAN BİYOJENİK AMİN MARUZİYETİNİN
YAPAY ZEKÂ İLE DEĞERLENDİRİLME POTANSİYELİ**
**THE POTENTIAL OF ARTIFICIAL INTELLIGENCE IN ASSESSING BIOGENIC AMINE
EXPOSURE FROM CHEESE CONSUMPTION**

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ÖZET

Peynir, kaliteli proteinler, yağlar, kalsiyum ve vitaminler de dahil olmak üzere yüksek besin değeri nedeniyle dünya çapında en çeşitli ve yaygın olarak tüketilen süt ürünlerinden biridir. Peynir üretiminin kritik aşamalarından biri, çeşitli biyokimyasal reaksiyonların peynirin kendine özgü lezzet ve aromasını geliştirdiği, aynı zamanda biyoaktif bileşiklerin oluştuğu olgunlaşma sürecidir. Bu süreçte biyojenik aminler, esas olarak amino asitlerin dekarboksilasyonu yoluyla üretilmekte ve insan kardiyovasküler ile sinir sistemleri üzerinde doğrudan veya dolaylı etkiler gösterebilmektedir. Özellikle tiramin ve histamin, peynirde en fazla toksik etki gösteren biyojenik aminler arasında yer almakta ve yüksek seviyelerde gıda kaynaklı zehirlenmelere yol açabilmektedir. Peynirin çeşitliliği ve yaygın tüketimi göz önüne alındığında, biyojenik amin maruziyetinin değerlendirilmesi halk sağlığı ve gıda güvenliği açısından hayati önem taşımaktadır. Geleneksel gıda güvenliği risk değerlendirme yöntemleri -çoğunlukla deterministik ve nüfus temelli olmaları nedeniyle- bireysel değişkenliği ve maruziyetteki belirsizlikleri yeterince yakalayamamaktadır. Bu bağlamda, yapay zekâ (YZ), özellikle makine öğrenimi ve istatistiksel modelleme teknikleri, birden fazla değişkeni aynı anda işleme olanağı sunmakta ve böylece daha kişiselleştirilmiş, öngörücü ve dinamik risk değerlendirmeleri sağlayabileceği düşünülmektedir. Biyojenik amin maruziyetini tahmin etmek için YZ'nin uygulanması, gıda güvenliği risk analizinde umut verici yeni bir yaklaşım sunmaktadır. Ancak, bu alanda daha fazla araştırma ve uygulama çalışmasına ihtiyaç vardır. YZ tabanlı modellerin gelecekteki gelişiminin, risk değerlendirme süreçlerinin hızını, doğruluğunu ve özgüllüğünü artırarak halk sağlığının korunmasına katkıda bulunabileceği öngörülmektedir.

Anahtar Kelimeler: Peynir, Biyojenik Aminler, Yapay Zekâ, Gıda Güvenliği, Risk Değerlendirmesi, Makine Öğrenimi.

ABSTRACT

Cheese is one of the most diverse and widely consumed dairy products worldwide due to its high nutritional value, including quality proteins, fats, calcium, and vitamins. One of the critical stages in cheese production is the ripening process, during which various biochemical reactions develop the cheese's unique flavor and aroma while generating bioactive compounds. During this process, biogenic amines are primarily produced through the decarboxylation of amino acids and may exert direct or

indirect effects on the human cardiovascular and nervous systems. In particular, tyramine and histamine are among the biogenic amines with the most significant toxic effects in cheese, and at high levels, they can even cause foodborne intoxications. Considering the diversity and widespread consumption of cheese, assessing biogenic amine exposure is of vital importance for public health and food safety. Traditional food safety risk assessment methods -mostly deterministic and population-based- fail to fully capture individual variability and uncertainties in exposure. In this context, artificial intelligence (AI), particularly machine learning and statistical modeling techniques, offers the ability to process multiple variables simultaneously and is thought to provide more personalized, predictive, and dynamic risk assessments. The application of AI to predict biogenic amine exposure presents a promising new approach in food safety risk analysis. However, further research and practical applications are needed. The future development of AI-based models is expected to enhance the speed, accuracy, and specificity of risk assessment processes, thereby contributing to the protection of public health.

Keywords: Cheese, Biogenic Amines, Artificial Intelligence, Food Safety, Risk Assessment, Machine Learning.

**NAR SUYU İŞLEME PROSESLERİNDE GELENEKSEL YÖNTEMLERDEN GELECEĞE:
YENİLİKÇİ YÖNTEMLER**

**FROM TRADITIONAL METHODS TO FUTURE APPROACHES IN POMEGRANATE
JUICE PROCESSING: INNOVATIVE METHODS**

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ÖZET

Nar suyu içerdiği fenolik bileşenler ile öne çıkan yüksek antioksidan aktiviteye sahip fonksiyonel bir içecektir. Nar suyu içerdiği biyoaktif bileşenler ile bağışıklık sistemini güçlendirmekte ve kalp damar sağlığına iyi gelmektedir. Fakat nar suyunun biyoaktif bileşenleri, duyuşal özellikleri ve raf ömrü çeşitli proses yöntemlerinden etkilenmektedir ve biyoaktif bileşenlerin proses sırasında korunması büyük öneme sahiptir. Proses yöntemlerinin başında geleneksel ısı işlem uygulamaları gelmektedir. Isıl işlem mikroorganizmaları inaktive edebilmekle beraber sıcaklığa duyarlı gıdalarda fizikokimyasal ve duyuşal kalite hasarına yol açan bir gıda işleme yöntemidir. Tüketiciler ise son yıllarda meyve sularının daha doğal bir lezzet ve renge sahip olmasını ve raf ömrünün uzun olmasını tercih etmekteyler. Tüketicilerin bu tür ürünlere artan ilgisi ve ısı işlemlerin gıdanın duyuşal özelliklerinde ve besin içeriğinde oluşturduğu olumsuzlukları ortadan kaldırmak için termal olmayan bazı gıda muhafaza yöntemlerine ihtiyaç duyulmaktadır. Yenilikçi termal olmayan gıda muhafaza yöntemlerine yüksek basınç ve atımlı elektrik alan uygulamaları örnek verilebilir. Yenilikçi gıda işleme yöntemleri ısı işlem ile karşılaştırıldığında, nar sularında mikrobiyal ve enzimlerin inaktivasyonunu sağlayarak, besin değerlerini ve kalite özelliklerini koruyan ve nar suyu kalitesini en az düzeyde etkileyen yöntemlerdir. Nar sularına uygulanan bu yenilikçi yöntemler ile hem mikrobiyal inaktivasyon sağlanırken hem de meyve suyunda bulunan fenolik bileşenlerin korunması sağlanmaktadır. Böylece nar suyunun rengi, tadı ve aroması daha iyi korunmaktadır. Nar suyu prosesinde atımlı elektrik alan, ultrasonikasyon ve yüksek basınç gibi yenilikçi yöntemlerin kullanımı hem ürün kalitesini artırmakta hem de tüketicilerin nar suyuna olan ilgisini artırmaktadır.

Anahtar Kelimeler: Atımlı elektrik alan, Nar suyu, Yenilikçi yöntemler, Yüksek basınç

ABSTRACT

Pomegranate juice is a functional beverage with high antioxidant activity, primarily due to its phenolic compounds. The bioactive compounds it contains strengthen the immune system and promote cardiovascular health. However, the bioactive components, sensory properties, and shelf life of pomegranate juice are affected by various processing methods, and preserving these bioactive components during processing is crucial. Traditional heat treatment is a primary processing methods. While heat treatment can inactivate microorganisms, it also causes damage to the physicochemical and sensory qualities of heat-sensitive foods. In recent years, consumers have preferred fruit juices with a more natural flavor and color, as well as a longer shelf life. With increasing consumer interest in these products and to eliminate the negative effects of heat treatment on the sensory properties and nutritional content of foods, non-thermal food preservation methods are needed. Examples of non-thermal food preservation methods include high pressure and pulsed electric field. Compared to heat treatment, these innovative food processing methods inactivate microorganisms and enzymes in pomegranate juice, preserving its nutritional value and quality, while minimizing its impact on juice quality. These innovative methods applied to pomegranate juice ensure both microbial inactivation and the preservation of phenolic compounds in the juice. This allows for better preservation of the juice's color, flavor, and aroma. The use of innovative methods such as pulsed electric fields, ultrasonication, and high pressure in pomegranate juice processing not only improves product quality but also increases consumer interest in pomegranate juice.

Keywords: Pulsed electric field, Pomegranate juice, Innovative methods, High pressure.

SPORCULARDA SÜRDÜRÜLEBİLİR BESLENMENİN ÖNEMİ
THE IMPORTANCE OF SUSTAINABLE NUTRITION FOR ATHLETES

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ÖZET

Yeterli ve dengeli beslenme, sağlığın korunması ve yaşamın sürdürülebilmesi için temel bileşenlerden biridir. Sporcularda ise genetik yapı ve uygun antrenmanla birlikte beslenme, performansın belirleyici unsurlarından biri olarak öne çıkmaktadır. Son yıllarda sporcu beslenmesi yalnızca fiziksel performansın artırılması ve toparlanma süreçlerinin desteklenmesi ile sınırlı kalmayıp, aynı zamanda çevresel sürdürülebilirlik, etik sorumluluk ve uzun vadeli sağlık hedeflerini de içeren çok boyutlu bir alan hâline gelmiştir. Sürdürülebilir beslenme, bireylerin enerji ve besin ögesi ihtiyaçlarını karşılarken çevreye zarar vermeyen, kültürel olarak kabul edilebilir ve ekonomik açıdan ulaşılabilir beslenme modellerini kapsamaktadır. Bu bağlamda, sebze, meyve, tam tahıllar, zeytinyağı ve balık gibi besinlere dayanan Akdeniz diyeti; yüksek besin kalitesi sunarken düşük çevresel etki yaratmasıyla öne çıkmaktadır. Güncel araştırmalar, Akdeniz diyetine uyum gösteren sporcularda vücut kompozisyonu, kas gücü ve kardiyovasküler dayanıklılık gibi performans göstergelerinde anlamlı gelişmeler sağlandığını ortaya koymaktadır. Ayrıca bu diyetin antioksidan açısından zengin yapısı, egzersize bağlı oksidatif stresin azaltılmasına ve toparlanma süreçlerinin hızlanmasına katkıda bulunmaktadır.

Sporcular, sedanter bireylere kıyasla daha yüksek enerji ve protein gereksinimine sahiptir. Hayvansal kaynaklı besinlerin protein açısından daha yüksek miktar ve kalite sunması, sporcuların beslenme modellerinin çevresel etkilerini artırabilmektedir. Bu nedenle, sporcu beslenmesinde hem fizyolojik gereksinimlerin karşılanması hem de sürdürülebilirlik ilkelerinin gözetilmesini sağlayacak stratejilerin geliştirilmesi önem kazanmaktadır.

Bu çalışmada, sürdürülebilir beslenme kavramının sporcularda sağladığı bireysel ve çevresel faydalar ele alınmakta; Akdeniz diyetinin sporcu performansı ve sağlığı üzerindeki etkileri güncel literatür ışığında değerlendirilmektedir.

Anahtar Kelimeler: Sporcu beslenmesi, sürdürülebilirlik, Akdeniz diyeti, performans

ABSTRACT

Adequate and balanced nutrition is one of the fundamental components for maintaining health and sustaining life. In athletes, nutrition, together with genetic factors and appropriate training, emerges as a key determinant of performance. In recent years, sports nutrition has evolved beyond solely enhancing physical performance and supporting recovery processes, encompassing a multidimensional framework that also includes environmental sustainability, ethical responsibility, and long-term health objectives. Sustainable nutrition refers to dietary models that meet individuals' energy and nutrient requirements while minimizing environmental impact, being culturally acceptable, and economically accessible. Within this context, the Mediterranean diet, which emphasizes vegetables, fruits, whole grains, olive oil, and fish, stands out for providing high nutritional quality with low environmental impact. Current research indicates that athletes adhering to the Mediterranean diet demonstrate significant improvements in performance indicators such as body composition, muscle strength, and cardiovascular endurance. Furthermore, the diet's antioxidant-rich composition contributes to reducing exercise-induced oxidative stress and accelerates recovery processes.

Compared to sedentary individuals, athletes have higher energy and protein requirements. Since animal-based foods generally provide higher amounts and quality of protein, dietary patterns among athletes may increase environmental impact. Therefore, developing strategies in sports nutrition that address both physiological needs and sustainability principles is of critical importance.

This study discusses the individual and environmental benefits of sustainable nutrition for athletes and evaluates the effects of the Mediterranean diet on athletic performance and health in light of current literature.

Keywords: Sports nutrition, sustainability, Mediterranean diet, performance

KARDİYOVASKÜLER HASTALIKLARDA ANTIÖKSİDANLARIN ÖNEMİ
THE IMPORTANCE OF ANTIOXIDANTS IN CARDIOVASCULAR DISEASES

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ÖZET

Kardiyovasküler hastalıklar (KVH), dünya genelinde morbidite ve mortalitenin başlıca nedenleri arasında yer almakta ve yaşam kalitesini ciddi şekilde etkilemektedir. Son yıllarda KVH'nin etiyolojisinde oksidatif stres kavramı önemli bir yer edinmiştir. Oksidatif stres, serbest radikallerin ve reaktif oksijen türlerinin (ROS) üretiminin, vücudun antioksidan savunma mekanizmalarını aşması sonucu oluşan bir durumdur. Bu durum, damar endotelinde hasara yol açarak, inflamasyonun ve aterosklerotik süreçlerin gelişimini tetikler. Antioksidanlar ise ROS'u azaltarak veya antioksidan savunma sisteminin etkinliğini artırarak oksidatif stresi hafifletir ve arter duvarları içinde oluşan aterosklerotik lezyonların gelişimi ve ilerlemesinde rol oynayan serbest radikallerin zararlı etkilerini önler. Ancak yüksek doz takviyeler, bazı çalışmalarda koruyucu etki göstermemekte veya olumsuz sonuçlar doğurabilmektedir; bu durum, bireysel farklılıklar ve diyet örüntüsünün önemini vurgulamaktadır. Bu bağlamda, vitaminler (A, C, E), mineraller (selenyum, çinko), polifenoller (flavonoidler, resveratrol, likopen), koenzim Q10 ve omega-3 yağ asitleri gibi çeşitli kaynaklardan sağlanan antioksidanlar; kardiyovasküler hastalıkların önlenmesi ve yönetiminde giderek daha fazla önem kazanmaktadır.

Antioksidan yönünden zengin beslenme, kardiyovasküler sağlığın korunmasında ve hastalık riskinin azaltılmasında temel bir stratejidir. Tek bir takviye ya da mucizevi molekülden ziyade, antioksidan yönünden zengin besinlerin yer aldığı dengeli bir beslenme modeli, düzenli fiziksel aktivite ve sağlıklı yaşam alışkanlıklarıyla desteklendiğinde kardiyovasküler sağlık üzerinde çok daha güçlü ve kalıcı faydalar sağlamaktadır. Bu nedenle, gelecekte bireylerin yaşam tarzı değişiklikleriyle bütünleşmiş beslenme yaklaşımlarına odaklanılması, hem klinik uygulamalar hem de halk sağlığı açısından öncelikli bir hedef olmalıdır.

Bu çalışma, antioksidanların biyokimyasal mekanizmalarını ve kardiyovasküler sağlık üzerindeki olası etkilerini güncel literatür ışığında değerlendirerek, bu bileşiklerin KVH riskini azaltmadaki potansiyel rolünü ortaya koymayı amaçlamaktadır.

Anahtar Kelimeler: Kardiyovasküler hastalıklar, antioksidanlar, oksidatif stres, beslenme

ABSTRACT

Cardiovascular diseases (CVDs) are among the leading causes of morbidity and mortality worldwide and have a significant impact on quality of life. In recent years, the concept of oxidative stress has gained an important role in the etiology of CVDs. Oxidative stress occurs when the production of free radicals and reactive oxygen species (ROS) exceeds the body's antioxidant defense mechanisms. This condition leads to damage in the vascular endothelium, triggering the development of inflammation and atherosclerotic processes. Antioxidants mitigate oxidative stress by reducing ROS or enhancing the efficacy of the antioxidant defense system, thereby preventing the harmful effects of free radicals involved in the development and progression of atherosclerotic lesions within arterial walls. However, high-dose supplementation has not shown protective effects in some studies or may even lead to adverse outcomes; this highlights the importance of individual differences and dietary patterns. In this context, antioxidants obtained from various sources—such as vitamins (A, C, E), minerals (selenium, zinc), polyphenols (flavonoids, resveratrol, lycopene), coenzyme Q10, and omega-3 fatty acids—are increasingly recognized as important in the prevention and management of cardiovascular diseases.

An antioxidant-rich diet is a fundamental strategy for maintaining cardiovascular health and reducing disease risk. Rather than relying on a single supplement or a “miracle” molecule, a balanced dietary pattern that includes antioxidant-rich foods—when combined with regular physical activity and healthy lifestyle habits—provides stronger and more lasting benefits for cardiovascular health. Therefore, future efforts should prioritize dietary approaches integrated with lifestyle modifications, which represent a key target for both clinical practice and public health.

This study aims to evaluate the biochemical mechanisms of antioxidants and their potential effects on cardiovascular health in light of current literature, thereby elucidating the possible role of these compounds in reducing the risk of CVDs.

Keywords: Cardiovascular diseases, antioxidants, oxidative stress, nutrition

MORİNGAOLİEFERA'NIN SU KEFİRİ ÜRETİMİNDE KULLANIMI ÜZERİNE
ARAŞTIRMA

RESEARCH ON THEUSE OF MORİNGAOLİEFERA IN WATER KEFİR PRODUCTION

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ÖZET

Probiyotiklerin önemli kaynakları olan süt kefir ve su kefirine olan ilgi, COVID-19 pandemisinden sonra daha da artmıştır. Probiyotik bakterilerin, insan sindirim sistemini düzenlemesinin ve bağışıklık sistemini desteklemesinin yanı sıra sağlık üzerine olumlu etkilerinin olduğu bilimsel araştırmalarda tespit edilmiştir. İçerdikleri probiyotiklerin yanı sıra fermantasyonla oluşan metabolitler de sağlıklı yaşama önemli katkılar sağlamaktadır. Su kefir özellikle hayvansal ürünlere alerjisi/intoleransı ve vegan beslenme anlayışında olan bireyler için önemli bir kaynaktır. Su kefir tipik olarak *Lactobacillus* spp., ve *Lactococcus* spp. olmak üzere çeşitli laktik asit bakterileri, asetik asit bakterilerini ve *Saccharomyces* spp. gibi mayaları içerir. *Moringa oleifera* bitkisi son yıllarda besin içeriğiyle ön plana çıkmıştır; yaprakları; β -karoten, C vitamini, E vitamini ve polifenollerin zengin kaynaklarından. *Moringa* bitkisinin diğer bileşenleri flavonoidler, fenolik asitler, alkaloidler, glukosinolatlar, izotiyosiyanatlar, tanenler, saponinler, oksalatlar ve fitatlar olarak bildirilmiştir. Bu araştırmada *Moringaoleifera* yaprakları, su kefir kültürü ile fermente edilip fonksiyonel bir ürün elde edilmesi, fermantasyon parametrelerinin ve uygunluğunun belirlenmesi ve bu ürünün kullanım olanaklarının sistematik olarak araştırılması amaçlanmıştır. Elde edilen fermente ürünün mikrobiyal içeriği, likit kromatografik yöntemle organik asit ve fenolik bileşenler profili tespit edilmiştir. Fermente ürünün enerji içeriği 3 kcal/100g, karbonhidrat içeriği 0,64 g/100 g ve diyet lif içeriği <0,65g/100g olduğu tespit edilmiştir. Bunların yanı sıra benzoik asit (0,84 ppm), klorojenik asit (7,26 ppm), kafeik asit (0,32 ppm), kumarik asit (0,23 ppm) ve ferulik asit (0,19 ppm) gibi önemli fenolik bileşikler içermektedir.

Anahtar Kelimeler: Moringaoliefera, su kefir, probiyotik, antioksidan, fenolikler

ABSTRACT

In recent years, the growing interest in functional foods has highlighted the need for even traditionally produced food products to provide additional health benefits. Scientific research has identified that probiotic bacteria have numerous positive effects on health, in addition to regulating the human digestive system and supporting the immune system. Interest in milk kefir and water kefir, which are important sources of probiotics, has increased even more after the COVID-19 pandemic. In addition to the probiotics they contain, the metabolites formed by fermentation so make important contributions to healthy living. Water kefir is an important plant-based source of probiotics. It is a type of kefir that differs from milk kefir in terms of its chemical structure, physical appearance, and microbial content. It is an important source, especially for individuals with allergies/intolerances to animal products and those

following a vegan diet. Water kefir typically contains various lactic acid bacteria, including members of the Firmicutes group such as *Lactobacillus spp.* and *Lactococcus spp.* acetic acid bacteria, and yeasts such as *Saccharomyces spp.* In food processing, fermentation is the process of converting carbohydrates to organic acids and other products such as acetaldehyde and aceto in using microorganisms (yeasts or bacteria). The leaves of *Moringa oleifera* are rich sources of β -carotene, vitamin C, vitamin E, and polyphenols. Other components of the *Moringa* plant have been reported to include flavonoids, phenolic acids, alkaloids, glucosinolates, isothiocyanates, tannins, saponins, oxalates, and phytates. The aim of this study was to ferment *Moringa oleifera* leaves with water kefir culture to obtain a functional product, to determine the fermentation parameters and suitability, and to systematically investigate the possible uses of this product. The energy content of the fermented product was found to be 3 kcal/100g, the carbohydrate content 0.64 g/100 g, and the dietary fiber content <0.65g/100g. In addition, it contains important phenolic compounds such as benzoic acid (0.84 ppm), chlorogenic acid (7.26 ppm), caffeic acid (0.32 ppm), coumaric acid (0.23 ppm), and ferulic acid (0.19 ppm).

Keywords: *Moringa oleifera*, water kefir, probiotics, antioxidant, phenolics

**GÜNEŞTE KURUTULMUŞ ÇEŞİTLİ MEYVE DİLİMLERİNİN REHİDRASYON
KİNETİKLERİNİN DEĞERLENDİRİLMESİ**
INVESTIGATION OF THE REHYDRATION KINETICS OF SUN-DRIED FRUIT SLICES

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ÖZET

Bitkilerin her türlü yenebilen kısmı sebze ve meyve grubu altında toplanmaktadır. Bileşimlerinin önemli kısmı sudur. Bu nedenle sebze ve meyveler günlük enerji, yağ ve protein gereksinmesine çok az katkıda bulunurlar. Bununla beraber, mineraller, vitaminler, posa ve diğer antioksidan özellikte olan biyoaktif bileşenler bakımından zenginlerdir. Gıda israfı, artan nüfus ve azalan doğal kaynaklar bağlamında kamu sağlığını, çevreyi ve ekonomiyi etkileyen önemli bir sorundur. İsrar temel olarak gıdada bulunan nem ve mikrobiyal organizmaların varlığından kaynaklanmaktadır. Meyveler yaklaşık %80-99 oranında serbest su içermektedir ve bu durum onları oldukça çabuk bozulabilir hâle getirmektedir. Hasat öncesi ve hasat sonrası işlemlerin yetersizliği ve uygun pazarlama ve işleme altyapısının bulunmaması nedeniyle bu ürünlerde yüksek oranlarda kayıplar meydana gelmektedir. Bu durum hasattan tüketiciye kadar olan tüm aşamalarda ileri gıda muhafaza tekniklerini gerekli kılmaktadır. Gıda güvenliği ve sürdürülebilirlik konularında artan endişeler göz önüne alındığında, meyve, sebze ve bunların yan ürünlerinin gelişmiş kurutma teknolojileri ile değerlendirilebileceği belirtilmiştir. Kurutma, gıda maddelerinin su aktivitesini azaltarak meyve ve sebzeler gibi çabuk bozulabilen ürünlerin raf ömrünü uzatabilen kilit bir işlemdir. Kurutma ile nem ve su aktivitesi içerikleri belirli bir miktarın altına düşürülen gıdalar, kimyasal, enzimatik ve mikrobiyolojik bozulmaya karşı daha dayanıklı hâle gelmekte ve böylece gıdanın raf ömrü uzamaktadır. Ayrıca ürün ağırlığındaki azalma nedeniyle kurutma işlemi, depolama ve nakliye maliyetlerini de azaltmaktadır. Kurutulmuş meyve ve sebzelerin gıda israfını önlemek için sürdürülebilir bir kaynak olmasının yanı sıra gastrointestinal sağlık, kardiyovasküler sağlık ve diyet kalitesi üzerinde olumlu etkileri vardır. Kurutulmuş gıda maddelerinin çoğunun doğrudan tüketilmeden önce rehidrasyon işlemine tabi tutulması gerekmektedir. Rehidrasyon işlemi, bu gıdalara nemi geri kazandırarak onları lezzetli ve tüketilebilir hâle getirmeyi amaçlamaktadır. Kurutulmuş ürünlerin en önemli kalite kriteri rehidrasyon yeteneğidir. Rehidrasyon yeteneği, ürünün kullanılması sırasında verilen su ile eski haline dönüşebilme düzeyi olarak ifade edilmektedir. Şöyle ki kurutulmuş bir ürün, suda bekletilince taze halde içerdiği kadar su alarak eski haline ve şekline dönüşürse mükemmel nitelikte olduğu kabul edilmektedir. Bu amaçla rehidrasyon modellemeleri yapılmakta ve kurutulmuş ürünün rehidrasyonu için optimum koşullar belirlenmektedir. Kurutulmuş ürünlerin; raf ömürlerinin uzun olması; fiyatlarının uzun bir süre sabit kalabilmesi; sabit bir standartta üretiliyor olmaları; sağlıklı atıştırmalık alternatifleri olmaları; daha çabuk ve kolay hazırlanabilen ürünler olmaları ve Türk mutfak kültüründe zaten ayrı bir yerlerinin olması sebebiyle bu ürünlerin optimum kalite

koşullarında üretilmesi ve satışa sunulması gerekmektedir. Bu amaçla bu çalışmada güneşte kurutulmuş ananas (*Ananas comosus*), Santa Maria armudu (*Pyrus spp.*), mürdüm eriği (*Prunus domestica* subsp. *insitia*) ve Trabzon hurması (*Diospyros kaki*) meyvelerinin farklı sıcaklık koşullarında rehidrasyon kinetikleri incelemek ve rehidrasyon kinetiğini temsil etmek için modelleme çalışmaları yapmak amaçlanmıştır.

Anahtar Kelimeler: Rehidrasyon, Rehidrasyon Kinetiği, Gıda İsrafi, Sürdürülebilirlik

ABSTRACT

All edible parts of plants are grouped under the category of vegetables and fruits. A significant part of their composition is water. Therefore, vegetables and fruits contribute very little to daily energy, fat and protein requirements. However, they are rich in minerals, vitamins, fibre and other bioactive compounds with antioxidant properties. Food waste is a major problem affecting public health, the environment and the economy in the context of a growing population and declining natural resources. Waste is mainly caused by the presence of moisture and microbial organisms in food. Fruits contain approximately 80-99% free water, which makes them highly perishable. Inadequate pre-harvest and post-harvest handling, coupled with the lack of appropriate marketing and processing infrastructure, leads to high losses in these products. This necessitates advanced food preservation techniques at all stages from harvest to consumer. Given growing concerns about food safety and sustainability, it has been suggested that fruits, vegetables and their by-products can be utilised through advanced drying technologies. Drying is a key process that extends the shelf life of perishable products such as fruits and vegetables by reducing the water activity of foodstuffs. Foods whose moisture and water activity contents are reduced below a certain level through drying become more resistant to chemical, enzymatic, and microbiological spoilage, thereby extending the shelf life of the food. Furthermore, due to the reduction in product weight, the drying process also reduces storage and transportation costs. In addition to being a sustainable resource for preventing food waste, dried fruits and vegetables have positive effects on gastrointestinal health, cardiovascular health, and diet quality. Most dried food products must undergo a rehydration process before they can be consumed directly. The rehydration process aims to restore moisture to these foods, making them palatable and consumable. The most important quality criterion for dried products is their rehydration capacity. Rehydration ability is defined as the extent to which the product can return to its original state when water is added during use. In other words, a dried product is considered to be of excellent quality if, when soaked in water, it absorbs as much water as it contained when fresh and returns to its original state and shape. For this purpose, rehydration modelling is carried out and the optimum conditions for rehydrating dried products are determined. Dried products must be produced and marketed under optimum quality conditions due to their long shelf life; their prices remaining stable for a long time; their production to a consistent standard; their status as healthy snack alternatives; their being quicker and easier to prepare; and their already having a special place in Turkish cuisine. To this end, this study examines the rehydration kinetics of sun-dried pineapple (*Ananas comosus*), Santa Maria pear (*Pyrus spp.*), damson plum (*Prunus domestica* subsp. *insitia*), and persimmon (*Diospyros kaki*) fruits under different temperature conditions and to conduct modelling studies to represent the rehydration kinetics.

Keywords: Rehydration, Rehydration Kinetics, Food Waste, Sustainability

**GIDA EGEMENLİĞİ HAKKININ ULUSLARARASI HUKUKA GİRİŞİ: KÖYLÜLERİN VE
KIRSALDA ÇALIŞAN DİĞER KİŞİLERİN HAKLARINA İLİŞKİN BİRLEŞMİŞ
MİLLETLER BİLDİRGESİ**

**THE ENTRY OF THE RIGHT TO FOOD SOVEREIGNTY INTO INTERNATIONAL
HUMAN RIGHTS LAW: THE UNITED NATIONS DECLARATION ON THE RIGHTS OF
PEASANTS AND OTHER PEOPLE WORKING IN RURAL AREAS**

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ÖZET

Gıda egemenliği hakkı ilk kez, 1996 yılında, Roma’da Birleşmiş Milletler Gıda ve Tarım Örgütü (FAO) tarafından düzenlenen *Dünya Gıda Zirvesi* esnasında söz konusu Zirve’ye paralel olarak gerçekleştirilen *Sivil Toplum Forumu*’nda uluslararası bir çiftçi ve köylü örgütü olan *La via Campesina* tarafından öne sürülmüştür. Bu Zirve’de gıda egemenliği “*her ulusun kültürel ve üretimsel çeşitliliğe saygı göstererek kendi temel gıdalarını üretme kapasitesini koruma ve geliştirme hakkı*” olarak tanımlanmıştır. 2007-2008 yılları arasında küresel çapta yaşanan gıda krizi, özellikle küçük ölçekli üretim yapan köylü ve çiftçileri derinden etkilemiş ve bu bağlamda gıda egemenliği hakkı uluslararası kamuoyunda daha çok öne çıkmaya başlamıştır. 2007 yılında Mali’nin Nyéléni kentinde toplanan *Uluslararası Gıda Egemenliği Forumu*’nda gıda egemenliği, “*halkların ekolojik açıdan sürdürülebilir yöntemlerle üretilmiş, sağlıklı ve kültürel olarak uygun gıdaya erişim ve kendi gıda sistemlerini belirleme hakkı*” olarak tanımlanmıştır. 1996 yılında ilk kez ortaya çıkmasından itibaren küresel ölçekte geniş kitlelerce benimsenen, ulusal yasalar ve anayasalara alınan bu hak, 2018 yılında Birleşmiş Milletler (BM) tarafından kabul edilen *Köylülerin ve Kırsalda Çalışan Diğer Kişilerin Haklarına İlişkin BM Bildirgesi* (Bildirge) ile ilk kez uluslararası insan hakları hukukunda kendine yer bulmuştur. Söz konusu bildirgenin 15. maddesinde düzenlenen gıda egemenliği hakkının; kültürel açıdan uygun, ekolojik olarak sürdürülebilir yöntemlerle üretilmiş, sağlıklı ve yeterli miktarda gıdaya erişim ile gıda ve tarım politikalarına ilişkin karar alma süreçlerine katılım olanaklarının sağlanması olmak üzere iki boyutu bulunmaktadır. Gıda egemenliği hakkı devletlere saygı gösterme, koruma ve yerine getirme ödevleri yükleyen bir hak olarak Bildirge’de kendine yer bulmuş ve uluslararası insan hakları hukukuna dâhil olmuştur.

Anahtar Kelimeler: Gıda Egemenliği Hakkı, La via Campesina, Köylülerin ve Kırsalda Çalışan Diğer Kişilerin Haklarına İlişkin BM Bildirgesi, FAO.

**PROJECT MANAGEMENT FOR SUSTAINABILITY: STRATEGIC PLANNING AND
EFFECTIVE USE OF RESOURCES**

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ABSTRACT

This article provides a comprehensive analysis of how sustainability principles can be systematically embedded into project management practices to ensure long-term value creation, environmental responsibility, and social well-being. It argues that sustainability-oriented project management goes beyond traditional success metrics—time, cost, and scope—by integrating environmental, social, and economic objectives into every phase of the project life cycle. The study highlights strategic planning as a critical foundation for achieving these goals, demonstrating how early decision-making, risk anticipation, and resource optimization can significantly enhance project outcomes. Practical approaches such as life cycle assessment (LCA), circular economy models, and resource efficiency strategies are explored as essential tools for reducing ecological footprints, minimizing waste, and promoting the reuse and recycling of materials. Moreover, the paper emphasizes the importance of stakeholder engagement, transparent communication, and participatory decision-making, which not only foster public trust and social acceptance but also contribute to more resilient and adaptive project designs. The role of international standards and frameworks—such as ISO 21500, PMI guidelines, and the United Nations Sustainable Development Goals (SDGs)—is examined as a means to standardize sustainability practices, enable effective performance measurement through key performance indicators (KPIs), and enhance global accountability.

By combining theoretical perspectives with practical methodologies, this study demonstrates how sustainability-driven project management can transform challenges such as climate change, resource scarcity, and regulatory pressures into opportunities for innovation, economic growth, and societal progress. Ultimately, embedding sustainability into project governance reshapes the very definition of project success: projects are no longer measured solely by their immediate deliverables but by their capacity to generate enduring environmental benefits, strengthen social cohesion, and create long-term economic value for future generations.

Keywords: Sustainable project management, strategic planning, resource efficiency, circular economy, stakeholder management, ISO 21500, SDG, green project management.

**BARIYATRİK CERRAHİ ÖNCESİNDE KETOJENİK DİYET UYGULAMASI:
METABOLİK VE KLİNİK YANSIMALAR**
**KETOGENIC DIET APPLICATION BEFORE BARIATRIC SURGERY: METABOLIC AND
CLINICAL IMPLICATIONS**

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ÖZET

Obezite, dünya genelinde giderek artan prevalansı ve kardiyovasküler hastalıklar, tip 2 diyabet, hipertansiyon, dislipidemi ve uyku apnesi gibi ciddi komorbiditelerle ilişkili olması nedeniyle önemli bir halk sağlığı sorunudur. Bariyatrik cerrahi, morbid obez bireylerde uzun süreli kilo kaybı sağlamada ve obeziteye bağlı komplikasyonları azaltmada en etkili yöntemlerden biridir. Bununla birlikte, cerrahi başarının artırılması ve komplikasyonların azaltılması için ameliyat öncesi dönemde uygulanan beslenme düzenlemeleri kritik öneme sahiptir. Ameliyattan önce kilo vermeye yönelik çeşitli yaklaşımlar vardır. Bunlar arasında glukagon benzeri peptit-1 reseptör agonistleri ile farmakoterapi veya gastrik balon yerleştirme ile birleştirilmiş hipokalorik diyet yer almaktadır. Klinik uygulamada, diyet muhtemelen en yaygın yaklaşımdır. Bariyatrik cerrahi geçiren hastalara önerilebilecek çeşitli diyetler vardır. Bu diyetler düşük kalorili diyet, çok düşük kalorili diyet, Akdeniz diyeti, ketojenik diyet ve sıvı bazlı diyetleri içerir. Ancak, en etkili diyet yaklaşımı konusunda net bir fikir birliği yoktur. Son yıllarda, ketojenik diyetler özellikle **çok düşük kalorili ketojenik diyet** protokolleri, bariyatrik cerrahi öncesi dönemde yaygın olarak araştırılmaktadır. Ketojenik diyet karbonhidratın 30–50 g/gün ile sınırlandırıldığı, proteinin vücut ağırlığına göre 1,2–1,5 g/kg/gün olduğu tutulduğu bir beslenme planıdır. Bu diyetin temel mekanizması, düşük karbonhidrat alımına bağlı olarak **besinsel ketozis** gelişmesi ve enerji kaynağı olarak keton cisimlerinin kullanılmaya başlanmasıdır. Keton cisimleri, iştahın azalmasına, erken tokluk hissine, oksidatif stresin azalmasına ve inflamatuvar sitokinlerin baskılanmasına katkı sağlamaktadır.

Yapılan klinik çalışmalarda, preoperatif ketojenik diyet uygulamalarının; vücut ağırlığında, Vücut kitle indeksi (VKİ)'nde, bel çevresinde, visseral yağ dokusunda ve özellikle karaciğerin sol lateral lob hacminde belirgin azalmaya yol açtığı gösterilmiştir. Bu etkiler cerrahi alanın daha kolay görünmesine ve operasyon süresinin kısılmasına katkıda bulunur. Ayrıca, ketojenik diyetin glisemik kontrolü iyileştirdiği, insülin direncini azalttığı, lipid profilini düzenlediği ve obstrüktif uyku apnesi, astım, KOAH gibi obeziteyle ilişkili solunum hastalıklarının seyrinde de olumlu etkiler sunduğu bildirilmiştir. Bununla birlikte, VLCKD'nin uygulanması sırasında dikkat edilmesi gereken potansiyel yan etkiler de vardır. Gastrointestinal semptomlar, baş ağrısı, kas güçsüzlüğü, ağız kokusu ve nadiren elektrolit bozuklukları görülebilir. Literatürde geçmişte selenyum eksikliğine bağlı kardiyak komplikasyonlar rapor edilmiş olduğundan, güncel ketojenik protokollerde mutlaka mineral ve vitamin desteği önerilmektedir.

Sonuç olarak, bariyatrik cerrahi öncesinde uygulanan ketojenik diyetler; kilo kaybı, karaciğer hacminin küçülmesi, metabolik parametrelerde iyileşme ve cerrahi kolaylık açısından etkili ve güvenli bir seçenek olarak öne çıkmaktadır. Ancak bu diyetlerin mutlaka uzman denetiminde uygulanması, hasta uyumunun yakından takip edilmesi ve olası yan etkilerin izlenmesi gereklidir. Uzun vadeli güvenilirliği ve etkinliğin daha iyi anlaşılması için geniş örneklemli, randomize kontrollü klinik çalışmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: bariyatrik cerrahi; obezite cerrahi; ketojenik diyet; obezite; beslenme

ABSTRACT

Obesity is a significant public health issue due to its increasing prevalence worldwide and its association with serious comorbidities such as cardiovascular disease, type 2 diabetes, hypertension, dyslipidemia, and sleep apnea. Bariatric surgery is one of the most effective methods for achieving long-term weight loss in morbidly obese individuals and reducing obesity-related complications. However, nutritional interventions during the preoperative period are critical for improving surgical success and reducing complications. There are various approaches to weight loss before surgery. These include pharmacotherapy with glucagon-like peptide-1 receptor agonists or a hypocaloric diet combined with gastric balloon placement. In clinical practice, diet is probably the most common approach. There are several diets that can be recommended to patients undergoing bariatric surgery. These diets include low-calorie diets, very low-calorie diets, the Mediterranean diet, ketogenic diets, and liquid-based diets. However, there is no clear consensus on the most effective dietary approach. In recent years, ketogenic diets, particularly very low-calorie ketogenic diet protocols, have been extensively studied in the preoperative period of bariatric surgery. A ketogenic diet is a nutrition plan in which carbohydrates are limited to 30–50 g/day and protein is maintained at 1.2–1.5 g/kg/day based on body weight. The fundamental mechanism of this diet is the development of nutritional ketosis due to low carbohydrate intake and the initiation of ketone body utilization as an energy source. Ketone bodies contribute to decreased appetite, early satiety, reduced oxidative stress, and suppression of inflammatory cytokines.

Clinical studies have shown that preoperative ketogenic diet applications lead to significant reductions in body weight, BMI, waist circumference, visceral fat tissue, and especially the volume of the left lateral lobe of the liver. These effects contribute to easier visualization of the surgical field and shorter operation times. Furthermore, the ketogenic diet has been reported to improve glycemic control, reduce insulin resistance, regulate lipid profiles, and have positive effects on the course of obesity-related respiratory diseases such as obstructive sleep apnea, asthma, and COPD. However, there are potential side effects to be aware of when implementing a VLCKD. Gastrointestinal symptoms, headaches, muscle weakness, bad breath, and rarely electrolyte imbalances may occur. Since cardiac complications related to selenium deficiency have been reported in the literature in the past, mineral and vitamin supplementation is strongly recommended in current ketogenic protocols.

In conclusion, ketogenic diets administered prior to bariatric surgery are an effective and safe option in terms of weight loss, reduction in liver volume, improvement in metabolic parameters, and surgical ease. However, these diets must be administered under expert supervision, patient compliance must be closely monitored, and possible side effects must be tracked. Large-scale, randomized controlled clinical trials are needed to better understand their long-term reliability and effectiveness.

Keywords: bariatric surgery; obesity surgery; ketogenic diet; obesity; nutrition

THE POTENTIAL USE OF EDIBLE FLOWERS IN CEREAL-BASED PRODUCTS

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ÖZET

Yenilebilir çiçekler, sahip oldukları fenolik bileşikler, flavonoidler, uçucu yağlar ve renk pigmentleri sayesinde gıda endüstrisinde doğal katkı maddeleri ve fonksiyonel bileşenler olarak giderek daha fazla ilgi görmektedir. Son yıllarda yapılan çalışmalar, bu çiçeklerin tahıl bazlı ürünlerde (ekmek, kek, kurabiye, makarna, glutensiz ürünler vb.) kullanımının besinsel değer, antioksidan kapasite ve duyuşal özellikler üzerinde önemli etkiler yarattığını ortaya koymaktadır. Hibiskus, lavanta, gül, yasemin, papatya ve portakal çiçeği gibi türlerden elde edilen tozların tahıl ürünlerine ilavesi; toplam fenolik içeriği artırmakta, serbest radikal giderme kapasitesini geliştirmekte ve ürünlerin renk profilini zenginleştirmektedir. Ayrıca, çiçek tozları su ve yağ tutma kapasitesi, rehidrasyon oranı gibi fonksiyonel özellikler açısından da katkı sağlayabilmektedir. Bununla birlikte, duyuşal kabul ve optimum kullanım seviyelerinin belirlenmesi, standardizasyon ve mevzuat düzenlemeleri gibi konular hâlâ araştırma gerektirmektedir. Yenilebilir çiçeklerin tahıl ürünlerinde değerlendirilmesi, hem tüketici sağlığını destekleyen fonksiyonel gıdaların geliştirilmesine hem de doğadan elde edilen sürdürülebilir kaynakların kullanımına önemli katkılar sunmaktadır.

Anahtar Kelimeler: Yenilebilir çiçekler, tahıl ürünleri, fenolik bileşikler, antioksidan aktivite, fonksiyonel gıdalar

ABSTRACT

Edible flowers are attracting increasing attention in the food industry as natural additives and functional ingredients due to their content of phenolic compounds, flavonoids, essential oils, and pigments. Recent studies have demonstrated that their incorporation into cereal-based products (bread, cakes, cookies, pasta, gluten-free products, etc.) can significantly influence nutritional value, antioxidant capacity, and sensory properties. The addition of powders obtained from species such as hibiscus, lavender, rose, jasmine, chamomile, and orange blossom has been shown to increase total phenolic content, enhance radical scavenging activity, and enrich the color profile of final products. In addition, flower powders may contribute to functional characteristics such as water- and oil-holding capacity and rehydration ratio. However, further research is still required to clarify issues such as consumer acceptance, optimization of usage levels, standardization, and regulatory considerations. The utilization of edible

flowers in cereal-based products offers a promising strategy not only for developing functional foods that support consumer health but also for promoting sustainability through the valorization of natural resources.

Keywords: Edible flowers, cereal-based products, phenolic compounds, antioxidant activity, functional foods

**PROTEIN HYDROLYSATES AS FUNCTIONAL FOODS AND THEIR EFFECTS ON
HEALTH**

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ABSTRACT

Proteins are not only essential structural components of the human body but also contribute to health through bioactive peptides released during digestion. These peptides have attracted increasing attention in recent years, particularly in the field of functional foods, due to their potential health benefits. Protein hydrolysates, obtained through enzymatic breakdown of proteins into smaller peptides, exhibit various biological activities such as antioxidant, anticancer, antidiabetic, and anti-inflammatory effects. Numerous studies have demonstrated the positive health impacts of peptides derived from both dairy and plant-based proteins. For example, milk-derived peptides have been reported to reduce hypertension, while soy-derived peptides show apoptotic effects on cancer cells. Bioactive peptides derived from enzymatic hydrolysis have shown significant health benefits. Studies have demonstrated that enzymatic hydrolysis of casein using trypsin and chymotrypsin results in peptides with ACE-inhibitory properties, which contribute to blood pressure regulation (Mokhtari, Rezaei, Kazemi Fard, & Dirandeh, 2023). Similarly, hydrolysates derived from pea protein via Alcalase treatment have been found to enhance glucose uptake and improve insulin sensitivity, suggesting potential applications in diabetes management (Ding, Liang, Yang, Sun, & Lin, 2020). In another study; whey protein-derived hydrolysates have also been reported to exert anti-inflammatory effects by modulating cytokine production, particularly by suppressing pro-inflammatory markers such as TNF- α and IL-6 (Brandelli, Daroit, & Corrêa, 2015). These findings highlight the role of enzymatically hydrolyzed peptides in functional foods, offering promising applications in health promotion and disease prevention. These compounds help reduce cellular damage, support immune functions, and may play roles in disease prevention. Moreover, fermented foods such as kefir and yogurt, which are rich in probiotics, have been shown to improve gut health by balancing the intestinal microbiota. This review highlights the health-promoting potential of bioactive peptides and protein-derived compounds. Understanding the mechanisms behind their bioactivity may open new avenues for designing targeted nutritional strategies that support overall health and well-being.

Keywords: Enzymatic hydrolysis, bioactive peptides, antioxidant, anticancer, functional foods.

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GIDALARDA YENİLİKÇİ MUHAFAZA TEKNİKLERİ
INNOVATIVE PRESERVATION TECHNIQUES IN FOODS

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ÖZET

Gıda endüstrisi, artan nüfus ve iklim değişikliğinin yarattığı zorluklarla başa çıkarken, gıda güvenliğini ve kalitesini korumak için sürekli yeni muhafaza yöntemleri geliştirmektedir. Geleneksel teknikler olan ısıtma işlemi, soğutma, dondurma ve kurutma hâlâ yaygın olarak kullanılsa da, bu yöntemlerin besin değeri ve duyu özelliklerinde yol açabileceği kayıplar, alternatif teknolojilere olan ilgiyi artırmıştır. Bu derleme, gıda muhafazasında kullanılan geleneksel yöntemleri ve geleceğe dönük sürdürülebilir yaklaşımları ele almaktadır. Günümüz tüketicileri, minimal işlenmiş ve besin değeri yüksek ürünleri tercih etmektedir. Bu nedenle, gıda bilimi ve teknolojisindeki gelişmeler, ısıtma olmayan teknolojiler, aktif ve akıllı ambalajlama, yenilebilir film ve kaplamalar ile modifiye atmosfer paketleme gibi yenilikçi yaklaşımlara odaklanmaktadır. Bu teknolojiler, gıdaların tazeliğini ve duyu özelliklerini korurken, mikrobiyal inaktivasyon sağlayarak raf ömrünü güvenli bir şekilde uzatmayı hedeflemektedir. Isıtma olmayan teknolojiler, gıdaların besin bileşenlerini korurken patojen mikroorganizmaları etkisiz hâle getirmektedir. Vurgulu Elektriksel Alan (PEF), Yüksek Hidrostatik Basınç (YHB), Ultrases ve Ultraviyole (UV-C) ışık bu alanda öne çıkan yöntemlerdir. Ohmik ısıtma ise geleneksel yöntemlere kıyasla daha hızlı ve homojen ısınma sağlayarak ürün kalitesini artırmaktadır. Bu teknolojilerle birlikte, gıda ile doğrudan etkileşime giren aktif ambalajlar ve sensör tabanlı akıllı ambalajlar, ürünün kalitesini gerçek zamanlı izleyerek raf ömrünü uzatmakta ve gıda güvenliğini desteklemektedir. Biyopolimerlerden üretilen yenilebilir film ve kaplamalar, gıda üzerinde fiziksel bir bariyer oluşturmanın yanı sıra antimikrobiyal ve antioksidan özellikleri sayesinde güvenliğini artırmakta ve çevresel etkileri azaltmaktadır. Ayrıca, modifiye ve kontrollü atmosfer uygulamaları ile ambalaj veya depolama ortamındaki gaz bileşiminin kontrolü sağlanarak, özellikle taze meyve ve sebzelerin solunumları yavaşlatılmakta, bozulmaları önlenmekte ve raf ömrü uzatılmaktadır. Bu modern ve sürdürülebilir yaklaşımlar, gıda güvenliği ve israfını azaltma gibi küresel hedeflere ulaşmada kritik bir rol oynamaktadır.

Anahtar Kelimeler: Gıda muhafazası, Isıtma olmayan teknolojiler, Aktif ve akıllı ambalajlama, Yenilebilir film ve kaplamalar, Modifiye atmosfer paketleme

ABSTRACT

The food industry, while coping with the challenges posed by a growing population and climate change, is continuously developing innovative preservation methods to ensure food safety and quality. Although traditional techniques such as thermal processing, refrigeration, freezing, and drying are still widely applied, the potential losses in nutritional value and sensory attributes associated with these methods have increased the interest in alternative technologies. This review highlights both conventional food preservation techniques and sustainable approaches for the future. Modern consumers increasingly demand minimally processed products with high nutritional quality. Accordingly, recent advancements in food science and technology have focused on non-thermal technologies, active and intelligent packaging, edible films and coatings, and modified atmosphere packaging. These innovations aim to extend shelf life safely by inactivating microorganisms while maintaining freshness and sensory properties. Non-thermal technologies are particularly advantageous in preserving nutritional components while effectively inactivating pathogenic microorganisms. Pulsed Electric Field (PEF), High Hydrostatic Pressure (HHP), Ultrasound, and Ultraviolet (UV-C) light have emerged as key applications in this field. Ohmic heating, compared to conventional methods, provides faster and more uniform heating, thereby enhancing product quality. In addition, active packaging that interacts directly with food, as well as sensor-based intelligent packaging systems, extend shelf life and contribute to food safety by enabling real-time monitoring of product quality. Edible films and coatings derived from biopolymers serve not only as physical barriers but also enhance safety through antimicrobial and antioxidant properties, while simultaneously reducing environmental impacts. Moreover, modified and controlled atmosphere applications regulate the gaseous composition of packaging or storage environments, slowing respiration, preventing spoilage, and extending the shelf life of fresh produce. Collectively, these modern and sustainable preservation approaches are of critical importance in achieving global objectives such as enhancing food safety and reducing food waste.

Keywords: Food preservation, Non-thermal technologies, Active and intelligent packaging, Edible films and coatings, Modified atmosphere packaging

KARAHİNDİBA(TARAXACUM OFFICINALE): BİYOAKTİF BİLEŞENLERİ VE FARMAKOLOJİK ETKİLERİ

DANDELION (TARAXACUM OFFICINALE): BIOACTIVE COMPONENTS AND PHARMACOLOGICAL EFFECTS

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ÖZET

Bu çalışma, geleneksel tıpta uzun süredir kullanılan karahindiba (*Taraxacum officinale*) bitkisinin farmakolojik etkilerini ve potansiyel terapötik kullanım alanlarını literatür ışığında değerlendirmeyi amaçlamaktadır. Karahindiba, papatyagiller familyasına ait çok yıllık otsu bir bitki olup, yüzyıllardır geleneksel tıpta yaygın şekilde kullanılmaktadır. Yapılan araştırmalar, bitkinin içerdiği flavonoidler, fenolik asitler, triterpenoidler, steroller, seskiterpenoidler ve inülin gibi biyoaktif bileşikler sayesinde geniş bir farmakolojik etki yelpazesine sahip olduğunu göstermektedir. Karahindiba bitkisi, özellikle antioksidan, antienflamatuar, antibakteriyel, antikanser, antidiyabetik ve hepatoprotektif etkileri ile ön plana çıkmaktadır. Ayrıca diüretik, koleretik, antiviral, antiülser ve prebiyotik özelliklere sahip olduğu literatürde rapor edilmiştir. Çalışmalar, karahindibanın metabolik hastalıkların tedavisinde destekleyici olabileceğini ortaya koymaktadır. Bitkinin pankreas lipaz inhibitör etkisi sayesinde obeziteye karşı koruyucu olabileceği, insülin duyarlılığını artırarak tip 2 diyabetin kontrolünde rol oynayabileceği belirtilmektedir. Karaciğer ve safra kesesi rahatsızlıklarında iyileştirici etkiler göstermesi, ayrıca kolesterol ve trigliserit seviyelerini düzenleyici etkileri de dikkat çekicidir. Karahindiba özütlerinin, hem bağışıklık sistemini güçlendirdiği hem de bağırsak sağlığını destekleyerek probiyotik bakterilerin gelişimini teşvik ettiği görülmüştür. Bunun yanında, mide ülserine karşı koruyucu etkiler sunduğu, inflammatuar bağırsak hastalıklarında tedavi edici bir rol oynayabileceği de deneysel verilerle desteklenmektedir. Sonuç olarak, karahindiba içerdiği fitokimyasallar sayesinde çok yönlü biyolojik aktiviteler göstermekte ve modern fitoterapide doğal bir tedavi ajanı olarak değerlendirilebilecek niteliktedir. Ancak bu etkilerin klinik düzeyde doğrulanabilmesi için daha fazla çalışmaya ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Karahindiba, *Taraxacum Officinale*, Fitoterapi, Antioksidan, Antienflamatuar

ABSTRACT

This research aims to evaluate the pharmacological effects and potential therapeutic applications of the dandelion (*Taraxacum officinale*) plant, which has been used in traditional medicine for a long time, in light of the literature. Dandelion is a perennial herbaceous plant belonging to the Asteraceae family and

has been widely used in traditional medicine for centuries. Studies have shown that the plant has a wide range of pharmacological effects due to its bioactive compounds, including flavonoids, phenolic acids, triterpenoids, sterols, sesquiterpenoids, and inulin. The dandelion plant stands out for its antioxidant, anti-inflammatory, antibacterial, anticancer, antidiabetic, and hepatoprotective effects. It has also been reported in the literature to possess diuretic, choleric, antiviral, antiulcer, and prebiotic properties. Research suggests that dandelion may be supportive in the treatment of metabolic diseases. It is noted that the plant may be protective against obesity due to its pancreatic lipase inhibitory effect and may play a role in controlling type 2 diabetes by increasing insulin sensitivity. Its healing effects in liver and gallbladder disorders, as well as its cholesterol and triglyceride level regulating effects, are also noteworthy. Dandelion extracts have been found to both strengthen the immune system and support gut health by promoting the growth of probiotic bacteria. In addition, experimental data supports that it offers protective effects against stomach ulcers and may play a therapeutic role in inflammatory bowel diseases. In conclusion, dandelion exhibits multifaceted biological activities due to its phytochemical content and possesses qualities that make it a viable natural therapeutic agent in modern phytotherapy. However, further research is needed to confirm these effects at the clinical level.

Keywords: Dandelion, *Taraxacum Officinale*, Phytotherapy, Antioxidant, Antiinflammatory

B6(PİRİDOKSİN) VİTAMİNİ VE MİKROBİYOTA İLİŞKİSİ
RELATIONSHIP BETWEEN VITAMIN B6 (PYRIDOXINE) AND MICROBIOTAS

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ÖZET

İnsan mikrobiyotası; bakteri, virüs, mantar ve çeşitli ökaryotik mikroorganizmalardan oluşan kompleks bir topluluktur ve insan sağlığı üzerinde çok yönlü etkilere sahiptir. Mikrobiyota, özellikle bağırsak bölgesinde yoğunlaşmakta ve bağışıklık sistemi, metabolik denge, sindirim gibi birçok temel fizyolojik süreci düzenlemektedir. Mikrobiyal hücreler, insan hücrelerinden sayıca fazla olup, genetik materyal açısından da insan genomundan oldukça üstündür. Bu durum, insan ve mikrobiyal genetik bütünlüğünün “hologenom” kavramı altında değerlendirilmesini gerekli kılmıştır. Bağırsak mikrobiyotası, doğum öncesinde oluşmaya başlar ve yaşamın ilk üç yılında şekillenerek bireyin yaşam boyu sürecek sağlık durumunu etkiler. Doğum şekli, beslenme, antibiyotik kullanımı gibi faktörler mikrobiyota gelişiminde belirleyicidir. Beslenme, özellikle B vitaminleri gibi mikro besin öğeleri aracılığıyla mikrobiyota üzerinde düzenleyici etkiye sahiptir. B6 vitamini (piridoksin), birçok metabolik reaksiyonda görev yapan suda çözünebilir bir vitamindir ve bağışıklık, sinir sistemi, enerji üretimi gibi alanlarda önemli rol oynar. İnsan vücudu bu vitamini sentezleyemediğinden, temel olarak diyetle alınır; ancak bir kısmı bağırsak mikrobiyotası tarafından sentezlenebilir. Son araştırmalar, B6 vitamini eksikliğinin mikrobiyal çeşitliliği azalttığını ve bağırsak sağlığını olumsuz etkilediğini göstermektedir. Ayrıca, bazı bakteri türlerinin bu vitamini sentezleyememesi, dışarıdan alınan B6 vitamininin mikrobiyal dengeyi doğrudan etkileyebileceğini ortaya koymaktadır. Mikrobiyota ile B6 vitamini arasındaki çift yönlü ilişki, hem sistemik sağlık hem de gastrointestinal denge açısından önemlidir. B6 vitamini düzeyleri, mikrobiyotanın kompozisyonunu ve işlevini belirleyebilirken, aynı zamanda bazı bakteriler bu vitaminin sentezine veya metabolizmasına katkı sağlayabilir. Bu nedenle, sağlıklı bir mikrobiyota için yeterli B6 vitamini alımı önerilmekte, ancak bu ilişkinin tam olarak anlaşılabilmesi için daha kapsamlı bilimsel çalışmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Beslenme, mikrobiyota, vitamin-mikrobiyota etkileşimi, B6 vitamini

ABSTRACT

The human microbiome is a complex community consisting of bacteria, viruses, fungi, and various eukaryotic microorganisms, and it has multifaceted effects on human health. The microbiome is concentrated primarily in the gut region and regulates many fundamental physiological processes such as the immune system, metabolic balance, and digestion. Microbial cells outnumber human cells and

are also genetically superior to the human genome. This situation necessitates the evaluation of human and microbial genetic integrity under the concept of “hologenome.” The gut microbiome begins to form before birth and takes shape during the first three years of life, affecting the individual's lifelong health status. Factors such as mode of delivery, nutrition, and antibiotic use are decisive in the development of the microbiota. Nutrition has a regulatory effect on the microbiota, particularly through micronutrients such as B vitamins. Vitamin B6 (pyridoxine) is a water-soluble vitamin involved in many metabolic reactions and plays an important role in areas such as immunity, the nervous system, and energy production. Since the human body cannot synthesize this vitamin, it is primarily obtained through diet; however, a portion can be synthesized by the gut microbiota. Recent studies have shown that vitamin B6 deficiency reduces microbial diversity and negatively affects gut health. Additionally, the inability of certain bacterial species to synthesize this vitamin indicates that exogenous vitamin B6 may directly affect microbial balance. The bidirectional relationship between the microbiota and vitamin B6 is important for both systemic health and gastrointestinal balance. Vitamin B6 levels can determine the composition and function of the microbiota, while some bacteria can contribute to the synthesis or metabolism of this vitamin. Therefore, adequate vitamin B6 intake is recommended for a healthy microbiota, but more comprehensive scientific research is needed to fully understand this relationship.

Keywords: Nutrition, microbiota, vitamin-microbiota interaction, vitamin B6

**COMPARISON OF PHYSICOCHEMICAL AND ANTIOXIDANT PROPERTIES BETWEEN
RAW AND HEAT-TREATED ALMOND MILK ANALOGUES**

**ÇİĞ VE ISIL İŞLEM GÖRMÜŞ BADEM SÜTÜ ANALOGLARININ FİZİKOKİMYASAL VE
ANTIOKSİDAN ÖZELLİKLERİNİN KARŞILAŞTIRILMASI**

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ÖZET

Bu çalışma, ısıtma işleminin badem sütü analoglarının besin bileşimi, fizikokimyasal özellikleri ve antioksidan kapasitesi üzerindeki etkilerini değerlendirmeyi amaçlamıştır. Çiğ badem içleri, oda sıcaklığında 16 saat boyunca 1:3 (ağırlık/ağırlık) oranında suda bekletilmiş, kabukları soyulmuş ve öğütülmüştür. Öğütülmüş bademler, 1:6 (ağırlık/ağırlık) oranında su ile karıştırılarak süzölmüş ve elde edilen süzölmü badem sütü analogu olarak kullanılmıştır. Kontrol olarak kullanılan çiğ badem sütü analoguna ek olarak, örnekler 70°C ve 85°C'de 60 saniye süreyle pastörize edilmiştir. Analizler; kuru madde, yağ, protein, kül, karbonhidrat, pH, titrasyon asitliği, viskozite, renk parametreleri (L*, a*, b*, beyazlık indeksi), toplam fenolik madde ve toplam antioksidan kapasite (DPPH, ABTS, CUPRAC, FRAP) üzerine gerçekleştirilmiştir. İstatistiksel analizler, protein, kül, ABTS ve FRAP değerlerinde örnekler arasında anlamlı fark olmadığını (P > 0,05), diğer tüm parametrelerde ise önemli farklılıklar olduğunu (P < 0,05) göstermiştir. Kuru madde, yağ ve protein en yüksek 85°C'de ısıtma işlem görmüş örnekte saptanırken, karbonhidrat içeriği çiğ badem sütü analogunda daha yüksek bulunmuştur. Viskozite ve titrasyon asitliği değerleri de 85°C'de ısıtma işlem uygulanan örnekte artış göstermiş olup, bu durum nispeten daha yüksek kuru madde içeriği ile uyumluluk göstermiştir. Toplam fenolik madde miktarı en yüksek 70°C'de ısıtma işlem görmüş örnekte, en düşük ise çiğ badem sütü analogunda belirlenmiştir. Buna karşın, toplam antioksidan aktivite en yüksek çiğ badem sütü analogunda gözlenmiştir. Bu bulgular, ısıtma işleminin badem sütü analoglarının hem teknolojik hem de fonksiyonel özelliklerini önemli ölçüde etkilediğini göstermektedir.

Anahtar Kelimeler: Badem sütü, vegan süt, bitkisel süt, süt benzeri

ABSTRACT

This study investigated the effects of heat treatment on the nutritional composition, physicochemical properties, and antioxidant capacity of almond milk analogues. Raw almond kernels were soaked in water (1:3, w/w) at room temperature for 16 h, dehulled, ground, and then mixed with water (1:6, w/w) prior to filtration to obtain the almond milk analogue. In addition to the raw almond milk analogue as a control, the samples were pasteurized at 70°C and 85°C for 60 seconds. Analyses included dry matter,

fat, protein, ash, carbohydrate, pH, titratable acidity, viscosity, color parameters (L^* , a^* , b^* , whiteness index), total phenolic content, and total antioxidant capacity (DPPH, ABTS, CUPRAC, FRAP). Statistical analysis revealed no significant differences ($P > 0.05$) among samples for protein, ash, ABTS, and FRAP, while all other parameters differed significantly ($P < 0.05$). Dry matter, fat, and protein contents were highest in the 85°C-treated sample, whereas carbohydrate content was highest in the raw almond milk analogue. Viscosity and titratable acidity were also increased in the 85°C-treated sample, consistent with its higher dry matter content. The highest total phenolic content was observed in the 70°C-treated sample, whereas the lowest was found in the raw almond milk analogue. In contrast, the raw almond milk analogue exhibited the highest overall antioxidant activity. These findings demonstrate that heat treatment markedly affects both the technological and functional attributes of almond milk analogues.

Keywords: Almond milk, vegan milk, plant milk, milk analogue

THE ROLE OF UAV AND REMOTE SENSING IN MODERN AGRICULTURE AND FOOD SUSTAINABILITY

MODERN TARIMDA VE GIDA SÜRDÜRÜLEBİLİRLİĞİNDE İHA VE UZAKTAN ALGILAMANIN ROLÜ

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ABSTRACT

The escalating global population and the pressing challenges of climate change have made sustainable agriculture and food security paramount. In this context, innovative technologies are crucial for optimizing agricultural practices and ensuring the long-term viability of our food systems. This study explores the significant contributions of Unmanned Aerial Vehicles (UAVs) and remote sensing technologies to the advancement of food sustainability and modern agriculture. We provide a comprehensive overview of numerous studies that have successfully implemented these technologies for a wide range of applications, including crop monitoring, yield estimation, pest and disease detection, and water management. A key focus of our review is the application of various imaging indices, such as the Normalized Difference Vegetation Index (NDVI), which are instrumental in assessing crop health and vigor. Furthermore, we delve into other advanced methodologies and data processing techniques that transform raw data into actionable insights for farmers and agronomists. This paper also aims to highlight the indispensable role that high-quality spatial and remote sensing data plays, forming the backbone of modern analytics in this rapidly evolving field. We demonstrate how expertise in spatial data analysis is vital for the successful integration of these technologies into the agriculture and food technology sectors, thereby underscoring the interdisciplinary collaboration required to address the future challenges of food production.

Keywords: Unmanned Aerial Vehicles, Remote Sensing, Sustainable Agriculture, Spatial Data, Food Sustainability, Precision Agriculture

ÖZET

Artan dünya nüfusu ve iklim değişikliğinin getirdiği zorluklar, sürdürülebilir tarımı ve gıda güvenliğini her zamankinden daha önemli hale getirmiştir. Bu bağlamda, tarımsal uygulamaları optimize etmek ve gıda sistemlerimizin uzun vadeli sürdürülebilirliğini sağlamak için yenilikçi teknolojiler kritik bir öneme sahiptir. Bu çalışma, İnsansız Hava Araçları (İHA) ve uzaktan algılama teknolojilerinin gıda sürdürülebilirliğinin ve modern tarımın gelişimine yaptığı önemli katkıları incelemektedir. Çalışmada, bu teknolojileri ürün izleme, verim tahmini, zararlı ve hastalıklı ürün tespiti ve su yönetimi gibi çok

çeşitli uygulamalar için başarıyla kullanan çok sayıda çalışmaya dair kapsamlı bir genel bakış sunulmaktadır. Çalışmanın temel odak noktalarından biri, bitki sağlığını ve canlılığını değerlendirmede etkili olan Normalize Edilmiş Fark Bitki Örtüsü İndeksi (NDVI) gibi çeşitli görüntüleme indisleri ile yapılan uygulamalardır. Ayrıca, ham veriyi çiftçiler, ziraat ve gıda mühendisleri için eyleme geçirilebilir bilgilere dönüştüren diğer ileri metodolojiler ve veri işleme teknikleri de derinlemesine incelenmektedir. Bu çalışma aynı zamanda, hızla gelişen bu alanda modern analitiğin bel kemiğini oluşturan yüksek kaliteli mekansal ve uzaktan algılama verilerinin oynadığı vazgeçilmez rolü vurgulamayı amaçlamaktadır. Mekansal veri analizi uzmanlığının, bu teknolojilerin tarım ve gıda teknolojisi sektörlerine başarılı bir şekilde entegre edilmesi için ne kadar hayati olduğunu göstererek gıda üretiminin gelecekteki zorluklarının üstesinden gelmek adına gereken disiplinlerarası iş birliği gerekliliği ve önemi ortaya konulmaktadır.

Anahtar Kelimeler: İnsansız Hava Araçları, Uzaktan Algılama, Sürdürülebilir Tarım, Mekansal Veri, Gıda Sürdürülebilirliği, Hassas Tarım

**VEİODAN TARİFE: GASTRONOMİ ANALİZİ İÇİN GÖRSEL DİL MODELLERİNDEN
YARARLANMA**

**FROM VIDEO TO RECIPE: LEVERAGING VISION LANGUAGE MODELS FOR
CULINARY ANALYSIS**

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ÖZET

Görsel dil modelleri (VLM'ler), pek çok alanda dönüşümü tetiklediği gibi gıda araştırmaları ve gıda biliminde de her geçen gün kendine daha fazla kullanım alanı bulmaktadır. Her ne kadar VLM'lerin doğal dil işleme yetenekleri oldukça güçlü olsa da özellikle video yorumlamada dil/kültür önyargısı ve yanlış bilgi üretme riski devam etmektedir. Bu çalışmada, Türkçe dil desteğine sahip açık ağırlıklı büyük VLM'ler kullanılarak kültüre özgü yemek videolarından tarif çıkarımı görevindeki performansı incelenmiştir. Çalışma kapsamında yürütülen deneylerde, sosyal medyada yer alan 1 dakikanın altındaki videolardan yararlanılarak tarif üretme, malzeme listesinin çıkarımı ve pişme süresinin tahmin edilme kabiliyetleri değerlendirilmiştir. Elde edilen bulgular, VLM'lerin yemek adı sınıflandırmasını çok doğru bir şekilde yaptığı, malzemelerin bir bölümünü de doğru biçimde yakalayabildiğini; ancak tarifin bütün adımlarını kapsayan eksiksiz ve güvenilir bir tarif üretmede hâlâ geliştirilmesi gerektiğini göstermektedir. Özellikle kısa süreli videolarda hazırlık ve pişirme sürecindeki ayrıntılar ya yanlış ya da atlanabilmekte, miktar tahminleri ise yanlış veya belirsiz kalmaktadır. Buna rağmen, Türkçe dil desteği olan açık ağırlıklı VLM'ler gastronomide tarif çıkarımı, beslenme analizi ve video içeriklerinin otomatik işlenmesi için önemli bir başlangıç noktası sunmaktadır. Gelecek çalışmalarda, VLM'lerde bulunan "düşünme" kipinin etkinleştirilmesi ve alma ile artırılmış üretim (RAG) yaklaşımlarının entegrasyonu ile daha doğru, ayrıntılı ve kültürel bağlama uygun tarif ve beslenme analizlerinin yapılabileceği değerlendirilmektedir.

Anahtar Kelimeler: gıda araştırmaları, yapay zekâ teknolojileri ve yönetimi, görsel dil modeli (VLM), video analizi, tarif çıkarımı.

ABSTRACT

Visual language models (VLMs) are increasingly driving transformation across multiple domains, including food research and food science, where their applications are steadily expanding. Despite their strong natural language processing capabilities, these models still face persistent challenges, particularly in video interpretation, where cultural and linguistic bias and the risk of misinformation remain significant. This study investigates the performance of open-weight large VLMs with Turkish language support in extracting recipes from culturally specific cooking videos. Experiments were conducted using social media videos under one minute in length to evaluate the models' ability to generate recipes, extract ingredient lists, and estimate cooking times. The findings reveal that while VLMs can accurately classify dish names and correctly identify part of the ingredient list, they still fall short in producing complete and reliable step-by-step recipes. In particular, short videos often lead to misinterpreted or

omitted details of preparation and cooking processes, and quantity estimations tend to be inaccurate or ambiguous. Nevertheless, open-weight VLMs with Turkish support provide an important starting point for recipe extraction, nutritional analysis, and the automated processing of culinary video content. Future work may benefit from activating the “reasoning” mode of VLMs and integrating retrieval-augmented generation (RAG) approaches to enable more precise, detailed, and culturally grounded recipe and nutrition analysis.

Keywords: food research, artificial intelligence technologies and management, visual language model (VLM), video analysis, recipe extraction.

VALORIZATION OF ORANGE PEEL AND KIWI POMACE THROUGH DIFFERENT DRYING AND INFUSION: EFFECTS ON BIOACTIVE PROPERTIES AND BEVERAGE FORMULATION

PORTAKAL KABUĞU VE KİVİ POSASININ FARKLI KURUTMA VE İNFÜZYON YÖNTEMLERİYLE DEĞERLENDİRİLMESİ: BİYOAKTİF ÖZELLİKLER VE İÇECEK FORMÜLASYONU

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ABSTRACT

This study investigated the valorization of orange peel (a by-product of orange juice production) and kiwi pomace (a by-product of kiwi juice production) through drying and infusion-based beverage formulation. The raw materials were dried using hot air at 60 °C and 70 °C, as well as microwave drying at 240 W and 400 W. The dried samples were ground into powders, and their physicochemical and bioactive properties, including color parameters, water-holding capacity, Carr index, Hausner ratio, total phenolic content (TPC), and antioxidant activity (AA), were analyzed. Among orange peel powders, microwave drying at 240 W provided favorable results in terms of physicochemical properties and bioactive properties (TPC: 1005.24 mg GAE 100 g⁻¹ DM and AA :4.45 mmol TE 100 g⁻¹ DM), whereas kiwi pomace powders exhibited superior TPC (187.01 mg GAE 100 g⁻¹ DM) and AA (3.77 mmol TE 100 g⁻¹ DM) at 400 W.

In the second phase, functional beverages were formulated by infusing a 3% mixture of orange peel and kiwi pomace powders (ratios: 2O-1K and 2K-1O) using hot infusion (80 °C, 10 min) and cold infusion (4 °C, 15 h). The cold infusion of the 2O-1K mixture yielded the highest TPC (3143.89 mg GAE L⁻¹) and AA (10.08 mmol TE L⁻¹), while hot infusion of the same mixture resulted in significantly lower values (1516.11 mg GAE L⁻¹ and 7.72 mmol TE L⁻¹, respectively). These findings demonstrate that drying methods strongly influence the functional potential of fruit by-product powders, and cold infusion enhances the extraction efficiency of bioactive compounds in formulated beverages. Additionally, the results demonstrate that increasing the proportion of orange peel in the mixture enhanced both TPC and AA values, indicating its stronger contribution to the antioxidant potential of the beverages.

The study highlights the potential of orange peel and kiwi pomace as functional food ingredients, contributing to sustainable waste valorization and the development of antioxidant-rich beverages.

Keywords: By product, Valorization, Infusion, Drying, Beverage, Functional Properties

ÖZET

Bu çalışma, portakal suyu üretim yan ürünü olan portakal kabukları ile kivi suyu üretim yan ürünü olan kivi posasının kurutma ve infüzyon temelli içecek formülasyonunda değerlendirilmesini araştırmıştır. Hammaddeler, 60 °C ve 70 °C'de sıcak hava ile, ayrıca 240 W ve 400 W mikrodalga gücünde kurutulmuştur. Kurutulan örnekler toz haline getirilmiş ve renk parametreleri, su tutma kapasitesi, Carr indeksi, Hausner oranı, toplam fenolik madde (TFM) ve antioksidan aktivite (AA) gibi fizikokimyasal ve biyoaktif özellikleri incelenmiştir. Portakal kabuğu tozları arasında, 240 W mikrodalga kurutma fizikokimyasal ve biyoaktif özellikler (TFM: 1005,24 mg GAE 100 g⁻¹ KM and AA :4,45 mmol TE 100 g⁻¹ KM) açısından en uygun sonucu verirken; kivi posası tozları 400 W koşulunda daha yüksek TFM (187,01 mg GAE 100 g⁻¹ KM) ve AA (3,77 mmol TE 100 g⁻¹ KM) değerleri göstermiştir.

Çalışmanın ikinci aşamasında, %3 oranında portakal kabuğu ve kivi posası karışımı (oranlar: 2P-1K ve 2K-1P) kullanılarak sıcak infüzyon (80 °C, 10 dk) ve soğuk infüzyon (4 °C, 15 saat) yöntemleriyle fonksiyonel içecekler hazırlanmıştır. 2P-1K karışımının soğuk infüzyonu en yüksek TFM (3143,89 mg GAE L⁻¹) ve AA (10,08 mmol TE L⁻¹) değerlerini vermiş, aynı karışımın sıcak infüzyonunda ise anlamlı derecede düşük değerler (1516,11 mg GAE L⁻¹ ve 7,72 mmol TE L⁻¹) elde edilmiştir. Bu sonuçlar, kurutma yöntemlerinin meyve yan ürün tozlarının fonksiyonel potansiyelini önemli ölçüde etkilediğini ve soğuk infüzyonun biyoaktif bileşiklerin ekstraksiyon verimliliğini artırdığını göstermektedir. Ayrıca, sonuçlar karışımda portakal kabuğu oranının artmasının hem TFM hem de AA değerlerini yükselttiğini, dolayısıyla içeceğin antioksidan potansiyeline daha fazla katkı sağladığını ortaya koymuştur.

Sonuç olarak, portakal kabuğu ve kivi posasının fonksiyonel gıda bileşenleri olarak değerlendirilme potansiyeline sahip olduğu; bu yaklaşımın sürdürülebilir atık değerlendirmeye katkı sağladığı ve antioksidan açısından zengin içeceklerin geliştirilmesine imkân sunduğu ortaya konmuştur.

Anahtar Kelimeler: Yan Ürün, Yeniden Değerlendirme, İnfüzyon, Kurutma, İçecek, Fonksiyonel Özellikler

**BAZI GIDA PATOJENLERİNİN KONTROLÜ İÇİN *STREPTOMYCES* sp. UZ08'DEN ELDE
EDİLEN ANTİBAKTERİYAL BİLEŞİKLERİN TANIMLANMASI**
**IDENTIFICATION OF THE ANTIBACTERIAL COMPOUNDS FROM *STREPTOMYCES* sp.
UZ08 FOR THE CONTROL OF SOME FOOD PATHOGENS**

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ÖZET

Streptomyces cinsi, patojenik mikroorganizmaların biyo-kontrolünde umut vadeden bir aday olarak geniş bir biyoteknolojik potansiyele sahiptir. Bu cinsin bazı türlerinin patojenlere karşı gıda korumasında kullanılması, enzimler, antibiyotikler ve siderofor gibi çok çeşitli çözünür biyoaktif sekonder metabolitler ve uçucu organik bileşikler üretme potansiyeline bağlıdır. Bu çalışmada, *Streptomyces* sp. UZ08'in izolasyonu, tanımlanması ve antibakteriyal metabolik profili belirlenerek, bazı gıda patojeni bakterilere karşı antagonistik aktivitesi *in vitro* olarak değerlendirilmiştir. Toprakta izole edilen aktinobakteri 16S rRNA'ya dayalı olarak tanımlanmıştır. Fermentasyon çalışmaları sonucu üretim ortamından ekstraksiyon ile elde edilen ham ekstrakt, *in vitro* olarak *Bacillus cereus* ve *Escherichia coli* O157:H7'e sırasıyla 10 ila 17 mm çapında inhibisyon ile antibakteriyel aktivite sergilemiştir. Ham ekstraktın kimyasal metabolit profili, yüksek performanslı sıvı kromatografisi-yüksek çözünürlüklü elektrosprey iyonizasyon kütle spektrometrisi kullanılarak tespit edilmiş ve antibakteriyal bileşikler mevcut literatüre dayalı olarak tanımlanmıştır. Sonuçta, *Streptomyces* sp. UZ08'in Desferrioxamine D₂ ve Desferrioxamine E gibi demir şelatlayan sideroforları ve Feigrisolide C gibi antibakteriyal sekonder metaboliti ürettiği saptanmıştır. Bu araştırma; *Streptomyces* sp. UZ08'den elde edilen biyoaktif ekstrakt ve bileşiklerinin saflaştırılması durumunda gıdalarda bulunabilen bazı patojenik bakterilerin biyolojik kontrolünde kimyasal koruyuculara alternatif olabileceğini göstermektedir.

Anahtar Kelimeler: Antibakteriyal bileşik, biyolojik kontrol, gıda güvenliği, LC-HRESIMS, sekonder metabolit, *Streptomyces* sp.

ABSTRACT

The genus *Streptomyces* has broad biotechnological potential, being a promising candidate for the biocontrol of pathogenic microorganisms. Some species of this genus possess food protection against pathogens due to their potential to produce a wide variety of soluble bioactive secondary metabolites and volatile organic compounds, including enzymes, antibiotics, and siderophores. In this study, the isolation, identification, and antibacterial metabolic profile of *Streptomyces* sp. UZ08 were determined,

and its antagonistic activity against some food pathogenic bacteria was evaluated *in vitro*. The actinobacterium isolated from the soil was identified based on its 16S rRNA sequence. The crude extract obtained by extraction from the production medium following fermentation studies exhibited antibacterial activity *in vitro* against *Bacillus cereus* and *Escherichia coli* O157:H7, inhibiting them at 10- and 17-mm diameters, respectively. The chemical metabolite profile of the crude extract was determined using high-performance liquid chromatography-high-resolution electrospray ionisation mass spectrometry, and antibacterial compounds were identified based on the available literature. It was determined that *Streptomyces* sp. UZ08 produces iron-chelating siderophores, such as Desferrioxamine D2 and Desferrioxamine E, as well as antibacterial secondary metabolites, including Feigrisolide C. This study suggests that purification of the bioactive extract and its compounds obtained from *Streptomyces* sp. UZ08 may serve as an alternative to chemical preservatives in the biological control of some pathogenic bacteria in foods.

Keywords: Antibacterial compound, biological control, food safety, LC-HRESIMS, secondary metabolite, *Streptomyces* sp.

İŞLENMİŞ VE İŞLENMEMİŞ GIDALARI KATEGORİZE ETME YÖNTEMLERİ
METHODS FOR CATEGORIZING PROCESSED AND UNPROCESSED FOODS

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ÖZET

Gıdaların işlenme düzeyine göre sınıflandırılması, günümüzde beslenme araştırmalarında, halk sağlığı politikalarında ve gıda endüstrisinin stratejik planlamalarında giderek daha fazla önem kazanmaktadır. Özellikle kronik hastalıkların artışı, obezite ve metabolik sendrom gibi sağlık sorunlarının gıda tüketim alışkanlıklarıyla doğrudan ilişkilendirilmesi, işlenmiş ve işlenmemiş gıdaların doğru tanımlanmasını gerekli kılmaktadır. Ayrıca, gıda güvenliği, sürdürülebilirlik ve tüketici bilgilendirme çalışmaları da bu sınıflandırmalardan doğrudan etkilenmektedir. Bu çalışmada öncelikle en yaygın kullanılan NOVA sınıflandırma sistemi incelenmiş, gıdaları dört ana gruba ayıran bu yaklaşımın temel prensipleri açıklanmıştır. NOVA sistemi, özellikle ultra-işlenmiş gıdaları (UPF) tanımlamadaki başarısı nedeniyle yaygın kabul görse de, bazı gıdaların sınır kategorilerde yer alması araştırmacılar için belirsizlik yaratabilmektedir. Bunun yanı sıra, Gıda İşleme Endeksi, Fona-Willett ölçütleri ve farklı ülkelerde uygulanan alternatif sınıflandırma sistemleri karşılaştırılmıştır. Bu yöntemler, katkı maddesi kullanımı, gıdanın yapısal bütünlüğündeki değişim, teknolojik işlem basamakları ve raf ömrü uzatma yöntemleri gibi kriterlere dayandırılmıştır. Sınıflandırma sistemlerinin uygulamada yarattığı güçlükler de ele alınmıştır. Özellikle etiket bilgilerine dayalı değerlendirmelerde, gıda bileşenlerinin ayrıntılı biçimde beyan edilmemesi veya ülkeler arasındaki mevzuat farklılıkları, standartlaştırmayı zorlaştırmaktadır. Ayrıca, “yarı işlenmiş” ya da “minimal işlenmiş” ürünler gibi gri alanlar, bilimsel karşılaştırmalarda tutarsızlıklara yol açmaktadır. Sonuç olarak, mevcut yöntemlerin güçlü ve zayıf yönleri belirlenmiş; daha tutarlı, disiplinlerarası ve evrensel kabul görebilecek bir sınıflandırma sisteminin gerekliliği vurgulanmıştır. Bu tür standartlar, hem akademik çalışmaların karşılaştırılabilirliğini artıracak hem de beslenme politikalarının daha etkin oluşturulmasına katkı sağlayacaktır.

Anahtar Kelimeler: işlenmiş gıda, ileri işleme, tüketim alışkanlıkları

ABSTRACT

The classification of foods according to their processing level is becoming increasingly important in nutrition research, public health policies, and strategic planning in the food industry. In particular, the rise in chronic diseases and the direct link between health issues such as obesity and metabolic syndrome and food consumption habits necessitates the accurate definition of processed and unprocessed foods. Furthermore, food safety, sustainability, and consumer information initiatives are also directly affected by these classifications. This study first examines the most widely used NOVA classification system and explains the basic principles of this approach, which divides foods into four main groups. Although the NOVA system is widely accepted, particularly due to its success in defining ultra-processed foods (UPF), the placement of some foods in borderline categories can create uncertainty for researchers. In addition, the Food Processing Index, the Fona-Willett criteria, and alternative classification systems

applied in different countries were compared. These methods are based on criteria such as the use of additives, changes in the structural integrity of the food, technological processing steps, and shelf life extension methods. The difficulties created by classification systems in practice were also addressed. In particular, in assessments based on label information, the lack of detailed declaration of food ingredients or regulatory differences between countries make standardization difficult. Furthermore, gray areas such as “semi-processed” or “minimally processed” products lead to inconsistencies in scientific comparisons. Consequently, the strengths and weaknesses of existing methods have been identified, and the need for a more consistent, interdisciplinary, and universally accepted classification system has been emphasized. Such standards will both enhance the comparability of academic studies and contribute to the more effective formulation of nutrition policies.

Keywords: processed food, ultra processing, consumption habits

**VEGAN VE VEGAN OLMAYAN SÜTLERİN BESİNSEL ÖZELLİKLERİNİN
KARŞILAŞTIRILMASI**
**COMPARISON OF THE NUTRITIONAL PROPERTIES OF VEGAN AND NON-VEGAN
MILKS**

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ÖZET

Süt ve süt ürünleri, insan beslenmesinde uzun yıllardır temel protein, yağ, karbonhidrat ve mineral kaynağı olarak önemli bir rol oynamış, özellikle de kalsiyum ve fosfor gibi kemik sağlığı için kritik minerallerin en güçlü doğal kaynağı olmuştur. Ancak son yıllarda laktoz intoleransı, süt proteinlerine bağlı alerjiler, çevresel sürdürülebilirlik kaygıları ve etik tercihler gibi nedenlerle bitkisel kaynaklı süt alternatiflerinin tüketimi hızla artmıştır. Bu çalışma kapsamında, yaygın olarak tüketilen vegan sütler (soya, badem, yulaf ve hindistancevizi sütü) ile geleneksel hayvansal sütlerin besinsel profilleri karşılaştırmalı olarak incelenmiştir. Yapılan değerlendirmelerde inek sütünün tam protein içeriği ve yüksek biyolojik değerli aminoasit profili ile öne çıktığı belirlenmiştir. Ayrıca doğal kalsiyum-fosfor dengesi sayesinde mineral biyoyararlanımının güçlü olduğu saptanmıştır. Vegan sütlerde ise özellikle soya sütü proteince daha yüksek değerler sunarken, badem ve yulaf sütlerinde protein miktarının oldukça düşük seviyelerde kaldığı görülmüştür. Karbonhidrat açısından hayvansal sütlerde laktoz baskınken, bitkisel sütlerde genellikle glikoz, fruktoz veya sakkaroz kaynaklı karbonhidratların bulunduğu tespit edilmiştir. Yağ profilleri karşılaştırıldığında, hayvansal sütlerde doymuş yağ asitlerinin öne çıktığı; buna karşın bitkisel sütlerin doymamış yağ asitleri, özellikle tekli ve çoklu doymamış yağlar bakımından daha avantajlı olduğu ortaya konulmuştur. Mikro besin öğeleri açısından inek sütü doğal olarak B12 vitamini ve iyot içerirken, vegan sütlerde bu besinlerin yetersiz olduğu ve çoğunlukla endüstriyel zenginleştirme ile desteklendiği saptanmıştır. Sonuç olarak vegan ve hayvansal sütlerin besinsel özellikleri farklı avantajlar ve sınırlılıklar içermiş, özellikle vegan diyet uygulayan bireylerde protein, kalsiyum ve mikro besin dengesinin takviye ve bilinçli ürün seçimi ile sağlanması gerektiği ortaya çıkmıştır.

Anahtar Kelimeler: vegan süt, inek sütü, besinsel özellikler, besin öğeleri

ABSTRACT

Milk and dairy products have long played a vital role in human nutrition as a primary source of protein, fat, carbohydrates, and minerals, particularly serving as the most potent natural source of critical minerals for bone health, such as calcium and phosphorus. However, in recent years, the consumption of plant-based milk alternatives has rapidly increased due to reasons such as lactose intolerance, allergies to milk proteins, environmental sustainability concerns, and ethical preferences. Within the scope of this study, the nutritional profiles of commonly consumed vegan milks (soy, almond, oat, and coconut milk) were compared with those of traditional animal milks. The evaluations revealed that cow's milk stands out for its complete protein content and high biological value amino acid profile. In addition, it was

found to have strong mineral bioavailability thanks to its natural calcium-phosphorus balance. In vegan milks, soy milk in particular offered higher protein values, while almond and oat milks were found to have quite low protein levels. In terms of carbohydrates, lactose was predominant in animal milks, while plant-based milks were generally found to contain carbohydrates derived from glucose, fructose, or sucrose. When comparing fat profiles, saturated fatty acids were found to be prominent in animal milk; in contrast, plant-based milks were found to be more advantageous in terms of unsaturated fatty acids, especially monounsaturated and polyunsaturated fats. In terms of micronutrients, cow's milk naturally contains vitamin B12 and iodine, while vegan milks have been found to be deficient in these nutrients and are mostly supplemented through industrial fortification. In conclusion, the nutritional properties of vegan and animal-based milks have different advantages and limitations. It has been revealed that individuals following a vegan diet need to ensure a balance of protein, calcium, and micronutrients through supplementation and conscious product selection.

Keywords: vegan milk, cow's milk, nutritional properties, nutrients

SOĞUK PLAZMA UYGULAMASININ BİTKİ BAZLI PROTEİNLERİN TEKNOLOJİK VE FONKSİYONEL MODİFİKASYONUNA ETKİSİ

THE EFFECT OF COLD PLASMA APPLICATION ON THE TECHNOLOGICAL AND FUNCTIONAL MODIFICATION OF PLANT-BASED PROTEINS

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ÖZET

Bitki bazlı proteinlerin gıda endüstrisindeki payı, sürdürülebilirlik ve sağlık konularına yönelik artan ilgiyle birlikte yükselmektedir. Ancak, düşük çözünürlük, yetersiz emülsifikasyon ve sınırlı jelleşme özellikleri gibi teknolojik kısıtlamalar, bu proteinlerin gıda matrislerine entegrasyonu için modifikasyon gerekliliğini ortaya koymaktadır. Bu bağlamda, elektronlar, iyonlar, radikaller ve reaktif türler içeren ve termodinamik denge halinde bulunmayan iyonize bir gaz karışımı olan soğuk plazma, çevre dostu ve termal olmayan bir modifikasyon yöntemi olarak dikkat çekmektedir. Soğuk plazma, protein molekülleriyle etkileşime girerek oksidasyon, nitrasyon, sülfoksidasyon ve hidroksilasyon gibi reaksiyonlara neden olmakta; bu da proteinlerin birincil, ikincil ve tersiyer yapılarında değişikliklere yol açarak fonksiyonel özelliklerini etkilemektedir. Literatürde, soğuk plazma uygulamasının genellikle proteinlerin birincil yapısını değiştirmeksizin ikincil yapıda α -heliks içeriğini azalttığı; β -tabaka, β -dönüş ve rastgele sarmal oranlarını değiştirdiği; belirli işlem sürelerinde yüzey hidrofobitesini artırdığı ve yüzey oksijen içeriğini yükselttiği rapor edilmiştir. Ayrıca, oksidasyonun bir göstergesi olarak protein karbonil düzeyleri artarken, serbest sülfhidril gruplarında anlamlı azalmalar gözlenmiştir. Fonksiyonel özellikler açısından, soğuk plazma uygulaması soya proteini izolatının çözünürlüğünü %59,07'ye, bezelye/fıstık proteini izolatının çözünürlüğünü ise %41,4'e kadar artırmış; emülsiyon aktivitesini iyileştirmiştir. Bu etkiler, protein zincirlerinin açılması ve moleküler esnekliğin artmasıyla ilişkilendirilmiştir. Ayrıca bezelye ununda su tutma kapasitesi %113'e, yağ tutma kapasitesi ise %116'ya kadar yükselmiştir. Soğuk plazma ön işleminin, bezelye proteininin normalde yüksek sıcaklık gerektiren jel oluşturma özelliğini daha düşük sıcaklıklarda (70–90 °C) geliştirdiği ve elde edilen jellerin mekanik dayanımını artırdığı da bildirilmiştir. Önemli bir bulgu olarak, soğuk plazma işlemi zararlı enzimleri ve alerjeniteyi azaltarak soya ve bezelye proteinlerinin tripsin inhibitör aktivitesini sırasıyla %53,71 ve %42,59 oranlarına kadar düşürmüştür; bunun sonucunda *in vitro* protein sindirilebilirliğinde iyileşmeler sağlamıştır. Sonuç olarak, soğuk plazma teknolojisi; çözünürlük, emülsifikasyon, jelleşme, su/yağ tutma kapasitesi ve anti-besinsel faktörlerin azaltılması gibi fonksiyonel özellikleri geliştirme potansiyeli ile bitkisel proteinlerin gıda sistemlerine entegrasyonu için umut vadeden bir yöntemidir. Bununla birlikte, elde edilen sonuçların plazma kaynağı ve işlem parametrelerine bağlı olarak değişkenlik gösterebileceği unutulmamalıdır.

Anahtar Kelimeler: soğuk plazma, bitki bazlı proteinler, fonksiyonel özellikler, çözünürlük, emülsifikasyon, jel oluşumu, sindirilebilirlik

ABSTRACT

The share of plant-based proteins in the food industry has been increasing in parallel with the growing attention to sustainability and health. However, technological limitations such as low solubility, poor emulsification, and limited gelation properties necessitate modification for their integration into food matrices. In this context, cold plasma—an ionized gas mixture containing electrons, ions, radicals, and reactive species, and thermodynamically in a non-equilibrium state—emerges as an eco-friendly and non-thermal modification method. Cold plasma interacts with protein molecules, inducing reactions such as oxidation, nitration, sulfoxidation, and hydroxylation, which lead to alterations in the primary, secondary, and tertiary structures of proteins and consequently affect their functional properties. Literature reports that cold plasma treatment generally reduces α -helix content in secondary structure without altering the primary structure, while modifying β -sheet, β -turn, and random coil ratios. It also increases surface hydrophobicity up to a certain treatment duration and enhances surface oxygen content. Furthermore, protein carbonyl levels rise as an indicator of oxidation, whereas free sulfhydryl groups decrease significantly. In terms of functional properties, cold plasma application improved the solubility of soy protein isolate up to 59.07% and pea/peanut protein isolate up to 41.4%, along with enhanced emulsifying activity. These improvements were associated with protein chain unfolding and increased molecular flexibility. Additionally, in pea flour, water-holding capacity increased up to 113% and oil-holding capacity up to 116%. Cold plasma pretreatment was also reported to enhance the gelation ability of pea protein, which normally requires high temperatures, enabling gel formation at lower temperatures (70–90 °C) and increasing the mechanical strength of the resulting gels. A significant finding is that cold plasma reduced harmful enzymes and allergenicity by decreasing trypsin inhibitor activity of soy and pea proteins by 53.71% and 42.59%, respectively, thereby improving *in vitro* protein digestibility. In conclusion, cold plasma technology is a promising method for the integration of plant-based proteins into food systems by effectively modifying their functional properties—such as solubility, emulsification, gelation, water/oil holding capacity, and reduction of anti-nutritional factors. Nevertheless, it should be noted that the outcomes of the treatment vary depending on the plasma source and processing parameters.

Keywords: cold plasma, plant-based proteins, functional properties, solubility, emulsification, gel formation, digestibility

**YAKIN VE ORTA KIZILÖTESİ SPEKTROSKOPİ İLE AĞAÇTAN TOPLANAN
ZEYTİNYAĞINDA DİP ZEYTİNYAĞI TAĞŞIŞININ KANTİTATİF TESPİTİ**

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ÖZET

Yüksek değerli yağlar, özellikle sızma zeytinyağı, kaliteyi düşüren, tüketicileri yanıltan ve ekonomik kayıplara yol açan tağşiş sıklıkla maruz kalmaktadır. Bu hile sıklıkla, bozulmaya daha yatkın, düşmüş ve ezilmiş zeytinlerden elde edilen dip zeytinyağının kullanımıyla yapılmaktadır. Doğrudan tüketime uygun olmamasına rağmen, bu yağ ekonomik kazanç amacıyla işlenebilmektedir. Bu tağşişin tespitinde, standart analiz yöntemleri yüksek doğruluk sunsa da pahalı, zaman alıcı, uzman analistler gerektiren ve rutin ya da saha uygulamalarına uygun olmayan yöntemlerdir. Bu durum, rekabetçi piyasalarda tağşişli ürünlerin yaygınlaşmasına zemin hazırlamakta, kaliteli üreticiler ve tüketiciler açısından dezavantaj oluşturmaktadır.

Bu çalışmada, ağaçtan toplanan zeytinlerden elde edilen sızma zeytinyağında dip zeytinyağı tağşiş oranının kantitatif olarak belirlenmesi amacıyla kızılötesi (IR) spektroskopisi ile Kısmi En Küçük Kareler Regresyonu (PLSR) birlikte kullanılmıştır. Yedi farklı kaynaktan elde edilen sızma zeytinyağı ve dip yağından, öncelikle kendi içlerinde paçal yapılmış, ardından yağlar karıştırılarak %0–100 aralığında

ağırlıkça dip yağı içeren toplam 121 sızma-dip yağı karışımı (91 kalibrasyon, 30 doğrulama örneği) hazırlanmıştır. Spektral veriler masaüstü Yakın Kızılötesi (NIR), elde taşınabilir NIR ve ATR aksesuarlı masaüstü Orta Kızılötesi (Mid-IR) cihazları ile toplanmıştır. NIR cihazları için 6 mm optik yol uzunluğuna sahip transflektans aksesuarları kullanılmıştır. En yüksek performans masaüstü NIR cihazında elde edilmiştir (Residual Predictive Prediction (RPD) = 52.1). Bunu Mid-IR (RPD = 39.6) ve elde taşınabilir NIR (RPD = 32.1) izlemiştir. Tüm modeller yüksek tahmin doğruluğu göstermiştir ($r_{Pred} > 0.99$; SEP: %0.56–0.91).

Sonuçlar, IR spektroskopisi ile kemometrik yaklaşımların birlikte kullanımının sızma zeytinyağındaki dip zeytinyağı taşımasının tespitinde hızlı, güvenilir ve tahribatsız bir alternatif sunduğunu ortaya koymaktadır. Masaüstü cihazlar en yüksek doğruluğu sağlasada, elde taşınabilir NIR cihazı dahi rekabetçi zeytinyağı piyasalarında rutin kalite kontrol uygulamalarını destekleyecek yeterlilik göstermektedir.

Anahtar Kelimeler: Zeytinyağı, dip yağı, taşıma, kızılötesi spektroskopi, kemometri.

ABSTRACT

High-value oils, particularly virgin olive oil, are frequently subjected to adulteration, which reduces quality, deceives consumers, and leads to economic losses. Such fraud often involves the use of ground-picked olive oil, produced from fallen and bruised olives that are more prone to spoilage. Although unsuitable for direct consumption, this oil is nevertheless processed for economic gain. While standard analytical techniques provide high accuracy, they are costly, time-consuming, require expert analysts, and are not suitable for routine or on-site applications. This situation facilitates the spread of adulterated products in competitive markets, creating disadvantages for both quality producers and consumers.

In this study, infrared (IR) spectroscopy combined with Partial Least Squares Regression (PLSR) was employed to quantitatively determine the adulteration level of ground-picked olive oil in tree-picked olive oils. Oils from seven different sources were first blended within their own categories, then mixed to obtain 121 tree-picked–ground-picked oil blends (91 calibration and 30 validation samples) containing 0–100% ground-picked olive oil by weight. Spectral data were collected using benchtop Near-Infrared (NIR), handheld NIR, and benchtop Mid-Infrared (Mid-IR) spectrometers equipped with ATR. For the NIR devices, transmittance accessories with an optical path length of 6 mm were used. The highest performance was achieved with the benchtop NIR (Residual Predictive Deviation, RPD = 52.1), followed by Mid-IR (RPD = 39.6) and handheld NIR (RPD = 32.1). All models exhibited high predictive accuracy ($r_{Pred} > 0.99$; SEP: 0.56–0.91%).

These findings demonstrate that the combination of IR spectroscopy with chemometric approaches offers a rapid, reliable, and non-destructive alternative for detecting dip olive oil adulteration in tree-picked olive oils. Although benchtop instruments yielded the highest accuracy, even handheld NIR devices provided sufficient precision to support routine quality control in competitive olive oil markets.

Keywords: Olive oil, ground-picked olive oil, adulteration, infrared spectroscopy, chemometrics.

**SİMÜLASYON UYGULAMALARIYLA GIDA ÜRÜNLERİNİN TİCARİLEŞME
POTANSİYELİNİN DEĞERLENDİRİLMESİ**
**EVALUATING THE COMMERCIALIZATION POTENTIAL OF FOOD PRODUCTS
THROUGH SIMULATION APPLICATIONS**

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ÖZET

Gıdaların kompozisyonunu, tekstürünü ve duyu özelliklerini geliştirmek amacıyla yürütülen akademik çalışmalar sonucunda farklı özelliklere sahip birçok yeni gıda geliştirilmektedir. Ancak bu gıdaların büyük çoğunluğunun, ticari ölçekte üretilebilir olup olmadığı sistematik biçimde değerlendirilmemektedir. Bu durum, yenilikçi yaklaşımların endüstriye aktarılmasında önemli bir engel oluşturmaktadır. Bilgisayar tabanlı simülasyon yazılımları, gıdaların ticarileşme potansiyelini değerlendirmek için güçlü araçlar sunmaktadır. Bu çalışmada, gıda ürünlerinin üretim süreçlerinde kullanılan başlıca simülasyon uygulamaları ve geliştirilen ürünlerin ticarileşme potansiyelinin bu uygulamalar ile belirlenmesi ele alınmıştır. Özellikle Aspen Plus ve SuperPro Designer yazılımları, proses akışlarının modellenmesi, hammadde ve enerji dengelerinin hesaplanması ile maliyet analizlerinin yapılmasında yaygın olarak kullanılmaktadır. Ayrıca üretim sürecinde ya da üretim sonrasında karşılaşılabilecek senaryolar test edilebilmekte ve detaylı ekonomik analizler yapılabilmektedir. Yapılan çalışmalarda, geliştirilen gıda ürünlerinin ticarileşmesi sırasında yazılımlar sayesinde üretim maliyetlerinin %10 ile 20 oranında azaltılabildiği ve yatırım kararlarının daha gerçekçi şekilde değerlendirilebildiği bildirilmiştir. Sonuç olarak, simülasyon uygulamaları yalnızca proses optimizasyonu için değil, aynı zamanda gıda ürünlerinin ticarileşme potansiyelini değerlendirmek için de önemli bir yöntemdir. Akademik çalışmalar sonucunda üretilen gıdaların ticarileşme potansiyelinin simülasyon yazılımlarıyla incelenmesi yeni ürünlerin pazara giriş süresini hızlandırarak rekabet avantajı sağlayacaktır.

Anahtar Kelimeler: Süreç Simülasyonu, Yenilikçi Gıda Ürünleri, Endüstriyelleşme,

ABSTRACT

Academic studies aimed at improving the composition, texture, and sensory properties of foods have resulted in the development of many new products with different characteristics. However, many of these products are not systematically investigated in terms of their feasibility for large-scale commercial production. This represents a significant barrier to the transfer of innovative approaches into industry. Computer-based simulation software provides powerful tools for assessing the commercialization

potential of food products. In this study, the simulation software used in food production processes and the evaluation of the commercialization potential of developed products through such software. In particular, Aspen Plus and SuperPro Designer are widely employed for process flow modeling, raw material and energy balance calculations, and economic analysis. Furthermore, possible scenarios that may arise during or after production can be tested, and detailed economic analyses can be performed. Previous studies have reported that the use of such software during the commercialization of food products can reduce production costs by 10–20% and enable more realistic evaluation of investment decisions. In conclusion, simulation applications are not only used for process optimization but also serve as a critical method for assessing the commercialization potential of food products. Examining the commercialization potential of foods developed through academic research using simulation software can accelerate their market entry and provide a competitive advantage.

Keywords: Process Simulation, Innovative Food Products, Industrialization.

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

INNOVATIVE NON-THERMAL TECHNOLOGIES FOR SUSTAINABLE FOOD PROCESSING

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ABSTRACT

The food processing sector is witnessing a technological change, which is mainly a result of the demand to assure product safety, retain nutritional value and lessen the environmental footprint. Traditional thermal processing methods, though they work very well in killing microorganisms, lead to the decrease of nutrients, the loss of flavours and the use of a large amount of energy. Non-thermal processing technologies, among which the most typical are high-pressure processing (HPP), pulsed electric fields (PEF), ultrasound, cold plasma and ultraviolet (UV) treatments. The present innovative technologies provide the satisfaction of mode control, facilitating the inactivation of enzymes in such a way as to keep the sensory and nutritive attributes of the food product. Further, these consume considerably lesser energy and water, thereby enabling the adoption of sustainable practices in production. This article addresses the fundamental and the benefits of a few major non-thermal technologies with their potential to prolong the shelf life, assure food safety and alleviate the carbon footprint of processing. Additionally, several problems are dealt with in the paper, such as the difficulties of scaling up industrial production, costs, regulations and consumer acceptance. Incorporating the non-thermal methods into conventional processing can result in a double victory for the food industry: keeping quality intact while achieving sustainability targets.

Keywords: Non-thermal processing technologies; high-pressure processing; pulsed electric fields; ultrasound; cold plasma; ultraviolet treatment; food processing; nutritive attributes; food safety.

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

ECO-FRIENDLY PROCESSING TECHNOLOGIES TO REDUCE FOOD WASTE AND ENERGY USE

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ABSTRACT

The worldwide food processing sector is being pressured more and more to take on practices that are "green" in nature and that at the same time, will reduce the amount of waste produced and the energy consumed. The usually applied heat and mechanical processing methods, as efficient as they might be, are often resource-intensive and result in a large share of the pollution of the environment. Consequently, green processing technologies as high-pressure processing (HPP), pulsed electric fields (PEF), ultrasound, cold plasma and membrane filtration have started to come up as suitable options for ecologically friendly food processing. The use of these methods not only brings about the achievement of the above-said goal but also certifies the maintenance of the good quality of foods by providing all the requirements in the mentioned area in the above list, which in turn extends the lifetime of the products without sacrificing overall carbon footprints. Moreover, the exploitation of the food industry byproducts through innovative bioprocessing techniques is also a significant aspect that tremendously lowers the amount of waste generated and at the same time provides an array of products with new properties and with a higher value. This work deals with recent developments in sustainable food processing technologies and their potential for waste and energy reduction and later by the consideration of their application in existing processing lines. This work also deals upon the issues related to the size of the production, cost, regulatory compliance and consumer acceptance. By adopting all measures that promote eco-friendly methods of processing, the entire is in a position to prosper from the well-known concept of the circular economy.

Keywords: Food system; bioprocessing techniques; eco-friendly; green processing technologies; food industry; sustainable food processing technologies.

**TÜRKİYE'DE SÜRDÜRÜLEBİLİRLİK RAPORLAMA STANDARTLARI: GIDA SEKTÖRÜ
ÖRNEĞİ**

**SUSTAINABILITY REPORTING STANDARDS IN TURKEY: THE CASE OF THE FOOD
SECTOR**

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ÖZET

Sürdürülebilirlik, bugünün ihtiyaçlarını karşılamaya çalışırken gelecek kuşakların kendi gereksinimlerini karşılama imkânını riske atmayan; çevresel, sosyal ve ekonomik boyutları kapsayan bütüncül bir anlayıştır. Dünyada yaşanan küresel ve bölgesel dönüşümler, tarım ve gıda sektörlerinde de kaynakların verimli kullanımını zorunlu kılmaktadır. Özellikle hızla artan nüfusun güvenli ve yeterli gıdaya erişimini sağlamak için, çevresel, sosyal ve ekonomik değişimlerin olumsuz etkilerini en aza indirecek politikalar ve uygulamalar her geçen gün daha fazla önem kazanmaktadır.

Türkiye'deki endüstrilerin sürdürülebilirlik risk ve fırsatlarını yönetme şekilleri hakkında ortak bir dil sağlamayı amaçlayan Kamu Gözetimi Kurumu (KGK), Türkiye Sürdürülebilirlik Raporlama Standartları (TSRS)'ni yürürlüğe koymuştur. Gıda sektöründe de sürdürülebilirlik raporlaması çevresel, sosyal ve ekonomik performansların izlenmesi ve iyileştirmesi açısından önemlidir. Gıda sektöründeki firmalar TSRS kapsamında yayımladıkları raporlarında çevresel boyuta ilişkin karbon salınımı, atık yönetimi, enerji ve su kullanımı gibi konularda performans göstergelerini nicel verilere dayandırarak ortaya koymaktadır. Sosyal boyuttaki (çalışan hakları, iş sağlığı ve güvenliği, toplum sağlığına katkı) ve ekonomik boyuttaki (sürdürülebilirlik üretim yatırımları, inovatif ürün geliştirme, sürdürülebilir tedarikçi zinciri maliyet yönetimi) performans göstergeleri ise genellikle politika ve taahhütlerden oluşan nitel veriler ile raporlanarak ortaya konulmaktadır. Bu durum, gıda sektöründeki sürdürülebilirlik raporlaması yönelimlerini ortaya koymaktadır. Bu çalışmada, Türkiye'de gıda sektöründe faaliyet gösteren firmaların, 2024 yılında ilk defa zorunlu hale gelen TSRS kapsamında yayımladıkları sürdürülebilirlik raporlarını çevresel, sosyal ve ekonomik boyutlarıyla incelemektedir. Çalışmanın temel amacı, gıda sektörünün yeni düzenlemeye uyumu ve potansiyel gelişim alanlarını belirlemektir. Çalışmada, öncelikle sürdürülebilirlik ve raporlamanın önemi, uluslararası sürdürülebilirlik raporlama standartları, TSRS'nin yasal çerçevesi ve kapsamı teorik olarak ele alınmıştır. Gıda sektöründe sürdürülebilirliğinin önemi ve TSRS'nin gıda sektöründe uygulanması değerlendirilmiştir. Bu çerçeveye uyumlu olarak yayımlanan sınırlı sayıdaki gıda sektöründeki firmalarının sürdürülebilirlik

raporları incelenmiştir. Gıda işletmelerinin TSRS uyumu açısından güçlü ve zayıf yönler ortaya konulmuştur. Çalışmada, TSRS'nin gıda sektöründe standartlaşmayı teşvik etme potansiyeline dikkat çekilmiş ve sürdürülebilirlik raporlamasının geliştirilmesine yönelik öneriler verilmiştir.

Anahtar Kelimeler: Sürdürülebilirlik Raporlaması, TSRS, Gıda Sektörü, Çevresel, Sosyal ve Ekonomik

ABSTRACT

Sustainability is a holistic approach that seeks to meet the needs of the present without compromising the ability of future generations to meet their own needs, encompassing environmental, social, and economic dimensions. Global and regional transformations necessitate the efficient use of resources in the agriculture and food sectors. In particular, ensuring access to safe and sufficient food for a rapidly growing population requires policies and practices that minimize the adverse impacts of environmental, social, and economic changes, which are gaining increasing importance day by day.

The Public Oversight, Accounting and Auditing Standards Authority (KGK), aiming to establish a common language regarding how industries in Türkiye manage sustainability risks and opportunities, has enacted the Türkiye Sustainability Reporting Standards (TSRS). In the food sector, sustainability reporting is crucial for monitoring and improving environmental, social, and economic performance. Within the framework of TSRS, food companies present their environmental performance indicators—such as carbon emissions, waste management, energy, and water use—based on quantitative data. Meanwhile, performance indicators related to the social dimension (employee rights, occupational health and safety, contributions to public health) and the economic dimension (sustainability-oriented production investments, innovative product development, sustainable supply chain cost management) are mostly reported through qualitative data derived from policies and commitments. This situation reveals the reporting tendencies of the food sector in sustainability practices.

This study examines the sustainability reports published in 2024 by food companies operating in Türkiye, within the framework of TSRS, which has become mandatory for the first time. The primary aim of the study is to assess the compliance of the food sector with the new regulation and to identify potential areas for improvement. The study first discusses the importance of sustainability and reporting, international sustainability reporting standards, and the legal framework and scope of TSRS. The importance of sustainability in the food sector and the implementation of TSRS in this sector are also evaluated. In line with this framework, a limited number of sustainability reports published by food companies have been analyzed. The strengths and weaknesses of food businesses in terms of TSRS compliance have been revealed. The study highlights the potential of TSRS to promote standardization in the food sector and provides recommendations for the further development of sustainability reporting.

Keywords: Sustainability Reporting, TSRS, Food Sector, Environmental, Social and Economic

**DOMATES POSASININ (POMACE) BEYAZ PEYNİR ÜRETİMİNDE KULLANIMI:
KİMYASAL, MİKROBİYOLOJİK VE DUYUSAL ÖZELLİKLERE ETKİSİ**
**THE USE OF TOMATO POMACE IN WHITE CHEESE PRODUCTION: EFFECTS ON
CHEMICAL, MICROBIOLOGICAL, AND SENSORY PROPERTIES**

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ÖZET

Domates (*Solanum lycopersicum*) işleme endüstrisi, önemli miktarda posadan (peel, seed, pulp) oluşan yan ürün üretmektedir. Bu posalar lif, karotenoidler (özellikle likopen) ve fenolik bileşikler açısından zengin olup, atık yönetimi ve sürdürülebilirlik perspektifinden değerlendirilmesi gereken değerli kaynaklardır. Son yıllarda, gıda yan ürünlerinin peynir üretimine entegrasyonu; besin değerini artırma, fonksiyonellik kazandırma ve ürün raf ömrünü uzatma potansiyeli nedeniyle büyük önem arz etmektedir. Beyaz peynir, özellikle Türkiye’de geniş tüketimi olan bir ürün olup, domates posasının beyaz peynir formülasyonlarına eklenmesiyle oluşabilecek kimyasal, mikrobiyolojik, tekstürel ve duyuşsal değişimlerin sistematik olarak incelenmesi önem arz etmektedir. Bu çalışma, farklı oranlarda domates posası ilavesinin beyaz peynir özelliklerine etkisini değerlendirmeyi amaçlamaktadır.

Domates posası, konveksiyonlu kurutucuda 50–60 °C arası sıcaklıkta; nem %6–8’e düşene kadar (ortalama 48 saat) kurutulmuştur. Kurutulmuş posa, öğütücüde <500 µm partikül boyutu elde edilecek şekilde toz haline getirilmiştir ve 4 °C’de deneysel örnekler hazırlanana kadar bekletilmiştir. Kontrol (K), A grubu (%1 posa), B grubu (% 2 posa) ve C grubu (% 3 posa) olmak üzere 4 deneysel grup oluşturulmuştur. Domates posası beyaz peynir üretimi sırasında sütün pastörizasyonu aşamasında ilave edilmiş ve 44 C’ ye kadar soğutulan süte enzim ilave edilerek beyaz peynir üretimi yapılmıştır. Deneysel örnekler + 4 C’ de analizler yapılana kadar muhafaza edilmiştir.

Deneysel örnekler; kimyasal (antioksidan aktivite ve toplam fenolik), mikrobiyolojik (toplam psikrofil aerob bakteri sayısı, koliform bakteri sayısı, maya-küf sayısı), renk (L*, a*, b* değeri) ve duyuşsal açıdan incelenmiştir.

Deneysel örneklerde koliform bakteri sayısı tespit edilebilir düzeyin altında (< log10 kob/g) tespit edilmiştir. Posa konsantrasyonu arttıkça a değeri yükselirken b değerinin azaldığı belirlenmiştir. Duyusal açıdan değerlendirilen örneklerde C grubu örneklerinin genel beğeni açısından diğer gruplara göre daha iyi sonuçlar vermiştir.

Anahtar Kelimeler: domates atığı, beyaz peynir, kalite.

ABSTRACT

The tomato (*Solanum lycopersicum*) processing industry generates a considerable amount of by-products consisting of peel, seeds, and pulp. These pomaces are rich in dietary fiber, carotenoids (particularly lycopene), and phenolic compounds, and therefore represent valuable resources that should be evaluated from the perspectives of waste management and sustainability. In recent years, the

integration of food by-products into cheese production has gained significant importance due to their potential to enhance nutritional value, impart functionality, and extend product shelf life. White cheese, which is widely consumed especially in Turkey, is an important dairy product in which the incorporation of tomato pomace into formulations may cause chemical, microbiological, textural, and sensory changes that need to be systematically investigated. This study aims to evaluate the effects of different levels of tomato pomace addition on the properties of white cheese. Tomato pomace was dried in a convection oven at 50–60 °C until the moisture content was reduced to 6–8% (average 48 hours). The dried pomace was ground to obtain a particle size of <500 µm, and stored at 4 °C until experimental samples were prepared. Four experimental groups were formed: Control (C), Group A (1% pomace), Group B (2% pomace), and Group C (3% pomace). Tomato pomace was added during the pasteurization stage of milk, and white cheese production was carried out by adding enzyme to milk cooled to 44 °C. The experimental samples were stored at +4 °C until analyses were conducted. The experimental samples were examined in terms of chemical (antioxidant activity and total phenolic content), microbiological (total psychrophilic aerobic bacteria count, coliform bacteria count, yeast and mold count), color (L^* , a^* , b^* values), and sensory properties. The coliform bacteria count was found to be below detectable levels ($< \log_{10}$ CFU/g) in the experimental samples. As the pomace concentration increased, the a value increased while the b value decreased. In sensory evaluations, Group C samples yielded better overall acceptability scores compared to the other groups.

Keywords: tomato waste, white cheese, quality.

**GIDA GÜVENLİĞİNDE MAKİNE ÖĞRENİMİ UYGULAMALARI: MEVCUT
YAKLAŞIMLAR VE GELECEK PERSPEKTİFLERİ**

**APPLICATIONS OF MACHINE LEARNING IN FOOD SAFETY: CURRENT
APPROACHES AND FUTURE PERSPECTIVES**

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ÖZET

Gıda güvenliği, halk sağlığı açısından kritik bir konudur. Gıda kaynaklı hastalıklar, kontaminasyonlar, bozulma, taklit ve tağşiş gibi faktörler hem tüketici sağlığını tehdit etmekte hem de ekonomik zararlara neden olmaktadır. Geleneksel yöntemler genellikle laboratuvar temelli analizlere dayandığı için zaman alıcı, maliyetli ve bazı durumlarda dağıtık tedarik zinciri boyunca uygulanması zor olabilmektedir. Makine öğrenimi ise büyük veri, gelişmiş ölçüm ve sensör teknolojileri ile birleşerek gıda güvenliği kontrollerini daha hızlı, verimli ve proaktif hale getirme potansiyelini taşır. Makine öğrenimi (ML), gıda güvenliğinde kontaminasyon tespiti, raf ömrü tahmini, hazard analizi ve tedarik zinciri izlenebilirliği gibi alanlarda önemli potansiyel göstermektedir. Bu çalışmada, makine öğreniminin gıda güvenliği uygulamalarındaki ilerlemeleri, karşılaşılan zorlukları ve geleceğe dönük yönelimler yer almaktadır. Makine öğreniminde; spektroskopik yöntemler, görüntü işleme, derin öğrenme modelleri ve sensör verisi ile entegrasyon en sık rastlanan yaklaşımlar arasında yer almaktadır. Ancak veri standardizasyonu, modelin genellenebilirliği, yorumlanabilirlik ve düzenleyici uyum makine öğrenmesinin gıda güvenliğinde kullanılabilmesi açısından engel oluşturmaktadır. Makine öğrenimi yöntemleri; denetimli öğrenme, denetimsiz öğrenme, derin öğrenme ve takviyeli öğrenme olmak üzere dört alt başlıkta incelenmektedir. Denetimli öğrenme (supervised learning); patojen mikroorganizmaların sınıflandırması, mikrobiyel kontaminasyon tahmini yapılmasında kullanılmaktadır. Denetimsiz öğrenme (unsupervised learning); bilinmeyen kontaminantların tespitinde kullanılmaktadır. Derin öğrenme (deep learning); görüntü analizi, sensör verilerinin değerlendirilmesinde, takviyeli öğrenme (reinforcement learning) ise; gıda üretim süreçlerinin optimizasyonunda fayda sağlamaktadır.

Anahtar Kelimeler: makine öğrenmesi, gıda güvenliği, yapay zeka.

ABSTRACT

Food safety is a critical issue for public health. Foodborne illnesses, contamination, spoilage, adulteration, and fraud not only threaten consumer health but also cause significant economic losses. Traditional methods often rely on laboratory-based analyses, which can be time-consuming, costly, and, in some cases, difficult to apply consistently across distributed supply chains. Machine learning, when combined with big data, advanced measurement, and sensor technologies, has the potential to make food safety controls faster, more efficient, and more proactive.

Machine learning (ML) shows significant potential in areas such as contamination detection, shelf-life prediction, hazard analysis, and supply chain traceability in food safety. This study highlights the advancements of machine learning in food safety applications, the challenges encountered, and future

directions. Spectroscopic methods, image processing, deep learning models, and integration with sensor data are among the most frequently used approaches. However, issues such as data standardization, model generalizability, interpretability, and regulatory compliance remain barriers to the wider adoption of machine learning in food safety.

Machine learning methods are generally examined under four categories: supervised learning, unsupervised learning, deep learning, and reinforcement learning. Supervised learning is applied in the classification of pathogenic microorganisms and the prediction of microbial contamination. Unsupervised learning is used for the detection of unknown contaminants. Deep learning is applied in image analysis and the evaluation of sensor data, while reinforcement learning provides advantages in the optimization of food production processes.

Keywords: machine learning, food safety, artificial intelligence.

**STRUCTURAL, ELECTRONIC, AND THERMOELECTRIC PROPERTIES OF Cu_2Se
WERE INVESTIGATED USING FIRST-PRINCIPLES CALCULATIONS WITHIN THE
DFT-PBE FRAMEWORK**

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ABSTRACT

The copper selenide is now being looked at as a possible way to meet the energy needs. Therefore, in this study, the structural and thermoelectric properties of Cu_2Se were investigated using both density functional and classical Boltzmann transport models. The structural. The Perdew-Burke-Ernzerhof (PBE) was utilised to determine the band gaps. We demonstrate a prototype thermal evolution path for liquid thermal conductivity in solids. Thermal evolution of b- Cu_2Se shows large interstitial displacement of constituent atoms marked by glass-like transitions and an asymptotic liquid thermal transport. Using ab initio molecular dynamics (AIMD), we identify these transitions, and confirm them with in situ transmission electron microscopy and electron energy loss spectroscopy. The thermal disorder of the Cu^+ ions forms homopolar Cu–Cu bonds under a rigid Se framework, and at yet higher temperatures the Se framework undergoes thermal distortion. The non-equilibrium AIMD prediction of lattice thermal conductivity shows significant suppression of the phonon transport, in agreement with experiments and molecular behavior.

Keywords: DFT, Thermoelectric properties, Electronic properties.

**SINIRLAR ARASINDA PAYLAŞILAN MİRAS: TÜRK MUTFAĞI ÜRÜNLERİNİN
KÜLTÜREL SAHIPLLENME TARTIŞMALARI**

**HERITAGE SHARED ACROSS BORDERS: DISCUSSIONS ON CULTURAL
APPROPRIATION OF TURKISH CUISINE PRODUCTS**

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ÖZET

Kültürel mirasın önemli bileşenlerinden biri olan mutfak kültürü, ulusların kimlik inşasında ve kültürel diplomasi süreçlerinde belirleyici bir rol üstlenmektedir. Türk mutfağı, tarihsel süreçte farklı coğrafyalarla etkileşim içerisinde gelişmiş ve sınırları aşan bir kültürel miras olarak günümüze ulaşmıştır. Ancak bu durum, bazı yemeklerin kökenine ilişkin tartışmaları beraberinde getirmekte; özellikle baklava, yoğurt, dolma ve kahve gibi ürünlerin farklı ülkeler tarafından sahiplenilmesi, kimlik ve aidiyet kavramlarının yeniden değerlendirilmesini gerekli kılmaktadır. Bu çalışmada, Türk mutfağı ürünlerinin sahiplenilme tartışmaları kültürel miras, kimlik ve uluslararası ilişkiler bağlamında ele alınmış; mutfak kültürünün ortak miras niteliği ile ulusal aidiyet arasındaki gerilimler incelenmiştir. Nitel araştırma yöntemi benimsenerek literatür taraması ve karşılaştırmalı içerik analizi yapılmış; akademik kaynaklar, uluslararası medya içerikleri ve UNESCO Somut Olmayan Kültürel Miras Listesi'ne yönelik başvurular incelenmiştir. Bulgular, mutfak ürünlerinin yalnızca beslenme kültürünü değil, aynı zamanda ulusal kimlik ve kültürel temsil politikalarını da yansıttığını ortaya koymaktadır. Türkiye, Yunanistan, Ermenistan ve Orta Doğu ülkeleri arasında yoğunlaşan sahiplenme örnekleri, ortak tarihsel mirasın ulus-devlet perspektifiyle yeniden tanımlandığını göstermektedir. Ayrıca UNESCO başvurularının ürünlerin sembolik değerini artırdığı, ancak tartışmaları daha görünür kıldığı belirlenmiştir. Sonuç olarak, gastronomik mirasın paylaşılan bir kültürel olgu olduğu; tekil ulusal aidiyetlere indirgenmesinin kültürel çeşitliliği sınırlandırdığı görülmektedir. Bu çerçevede, mutfak ürünlerinin ortak miras boyutunu vurgulayan yaklaşımların kültürel etkileşim ve işbirliğini destekleme potansiyeli taşıdığı değerlendirilmektedir.

Anahtar Kelimeler: Gastro-Kimlik, Kültürel Miras, Türk Mutfaağı

ABSTRACT

Culinary culture, a key component of cultural heritage, plays a decisive role in the construction of national identities and cultural diplomacy processes. Turkish cuisine has developed throughout history through interaction with diverse geographies and has survived to the present day as a cultural heritage that transcends borders. However, this situation has brought about debates regarding the origins of some dishes; the appropriation of products such as baklava, yogurt, dolma, and coffee by different countries, in particular, necessitates a reevaluation of concepts of identity and belonging. This study examines the debates surrounding the appropriation of Turkish culinary products within the context of cultural heritage, identity, and international relations, examining the tensions between the shared heritage of culinary culture and national belonging. A qualitative research method was employed through a

literature review and comparative content analysis, examining academic sources, international media coverage, and applications to the UNESCO Intangible Cultural Heritage List. The findings reveal that culinary products reflect not only dietary culture but also national identity and cultural representation policies. The intensification of appropriation among Turkey, Greece, Armenia, and Middle Eastern countries demonstrates that shared historical heritage is being redefined through a nation-state perspective. It has also been determined that UNESCO applications increase the symbolic value of products but also make discussions more visible. Consequently, it appears that gastronomic heritage is a shared cultural phenomenon, and that reducing it to singular national affiliations limits cultural diversity. In this context, approaches that emphasize the shared heritage dimension of culinary products are considered to have the potential to support cultural interaction and collaboration.

Keywords: Gastro-Identity, Cultural Heritage, Turkish Cuisine

**METaverse ÇAĞINDA GASTRONOMİ: SANAL ORTAMDA YEMEK DENEYİMLERİ
VE GELECEĞE YANSIMALARI**

**GASTRONOMY IN THE AGE OF THE METaverse: VIRTUAL DINING EXPERIENCES
AND THEIR REFLECTION IN THE FUTURE**

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ÖZET

Dijitalleşmenin hızla geliştiği günümüzde metaverse kavramı, yalnızca oyun ve sosyal iletişim alanlarını değil, gastronomiyi de etkilemeye başlamıştır. Sanal ve artırılmış gerçeklik teknolojileri aracılığıyla tüketiciler, mekândan bağımsız olarak yemek deneyimlerine katılabilmekte; sanal restoranlar, dijital menüler ve üç boyutlu görselleştirmeler aracılığıyla yeni bir gastronomi anlayışı ortaya çıkmaktadır. Bu bağlamda gastronomi, kültürel kimlik ve sosyal etkileşimin bir parçası olmaktan çıkarak, sanal platformlarda etkileşimli ve çok boyutlu bir deneyim alanına dönüşmektedir. Bu doğrultuda çalışmanın amacı, metaverse çağında gastronomi deneyimlerinin nasıl yeniden şekillendiğini incelemek ve sanal ortamda gerçekleştirilen yemek deneyimlerinin geleceğe yönelik yansımalarını tartışmaktır. Literatür taramasıyla elde edilen bulgular, metaverse tabanlı uygulamaların; sanal restoranlar, artırılmış gerçeklik destekli menüler, duyuşsal simülasyonlar ve etkileşimli atölyeler aracılığıyla bireylere yenilikçi tüketim biçimleri sunduğunu göstermektedir. Ayrıca bu gelişmelerin sürdürülebilirlik, gıda israfının azaltılması, gastronomi eğitiminin çeşitlenmesi, turizmin zenginleştirilmesi ve kültürel mirasın korunarak aktarılması açısından önemli katkılar sağlama potansiyeline sahip olduğu anlaşılmaktadır. Ancak yüksek maliyetler, teknolojik altyapı yetersizlikleri, erişim eşitsizlikleri ve etik sorunlar bu dönüşümün önündeki temel sınırlılıklar olarak öne çıkmaktadır. Sonuç olarak, metaverse çağında gastronomi yalnızca bireysel tatmin ve yenilikçi tüketim alışkanlıkları yaratmakla sınırlı kalmamakta; aynı zamanda sosyal, kültürel ve ekonomik açıdan dönüşüm potansiyeli taşımaktadır. Gelecekte gastronomi eğitimi, turizmi ve kültürel mirasın aktarımına yönelik yenilikçi fırsatlar sunması beklenen bu alanın sağlıklı biçimde gelişebilmesi, teknolojik ilerlemelerin sosyal, kültürel ve etik boyutlarla birlikte bütüncül bir yaklaşımla ele alınmasına bağlı olduğu düşünülmektedir.

Anahtar Kelimeler: Metaverse, Sanal Gastronomi, Yemek Deneyimi

ABSTRACT

In today's rapidly evolving world of digitalization, the concept of the metaverse has begun to impact not only gaming and social communication but also gastronomy. Through virtual and augmented reality technologies, consumers can participate in dining experiences regardless of location, and a new understanding of gastronomy is emerging through virtual restaurants, digital menus, and 3D visualizations. In this context, gastronomy is evolving from being a component of cultural identity and social interaction to an interactive and multidimensional experience space on virtual platforms. The aim of this study is to examine how gastronomic experiences are being reshaped in the metaverse era and to discuss the future implications of virtual dining experiences. Findings from the literature review

demonstrate that metaverse-based applications offer individuals innovative consumption styles through virtual restaurants, augmented reality-supported menus, sensory simulations, and interactive workshops. Furthermore, these developments have the potential to make significant contributions to sustainability, reducing food waste, diversifying gastronomic education, enriching tourism, and preserving and transmitting cultural heritage. However, high costs, inadequate technological infrastructure, inequalities in access, and ethical issues stand out as the primary limitations to this transformation. Consequently, in the age of the metaverse, gastronomy is not limited to creating individual satisfaction and innovative consumption habits; it also holds the potential for social, cultural, and economic transformation. The healthy development of this field, which is expected to offer innovative opportunities for gastronomy education, tourism, and the transmission of cultural heritage in the future, is believed to depend on a holistic approach to technological advancements, encompassing social, cultural, and ethical dimensions.

Keywords: Metaverse, Virtual Gastronomy, Food Experience

**KARABUĞDAY VE *SPIRULINA PLATENSIS* İLAVESİ İLE ZENGİNLEŞTİRİLMİŞ
GLÜTENSİZ EKMEKLERİN ÖZELLİKLERİ**
**CHARACTERISTICS OF GLUTEN-FREE BREADS ENRICHED WITH BUCKWHEAT
AND *SPIRULINA PLATENSIS***

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ÖZET

Özellikle çölyak hastalığı ve glüten intoleransı olan bireylerde glüten, ince bağırsak yapılarının zarar görmesine, bu nedenle temel besin maddelerinin yeterince karşılanamamasına neden olmaktadır. Bu hastalar için önerilen glütensiz diyetlerde kullanılan ürünler karbonhidrat ve yağ bakımından zengin olmasına rağmen; protein, vitamin, mineral ve lif açısından yetersizdir. Bu çalışmanın amacı; glütensiz diyetle tüketilmeye uygun, besin içeriği bakımından zenginleştirilmiş, fiziksel ve mikrobiyolojik özellikleri iyileştirilmiş glütensiz ekmeğin üretilmesi ve üretilen ekmeklerin belirtilen özellikleri sağlama durumunun incelenmesidir. Araştırmada deneysel yöntem kullanılmış, mevcut glütensiz ekmeğin formülasyonlarına yer değiştirme metoduna göre karabuğday ve farklı oranlarda *Spirulina platensis* eklenerek özellikleri karşılaştırılmıştır. Ekmeklerin protein içeriklerinin iyileştirilmesi amacıyla eklenen karabuğday ve farklı oranlarda *S. platensis* etkisi incelendiğinde; karabuğday ve *S. platensis* eklenen ekmekteki protein oranının kontrol ekmeğine göre daha yüksek olduğu, genel olarak *S. platensis* oranının artmasının protein değerini iyileştirdiği tespit edilmiştir. *S. platensis* ayrıca raf ömrüne etkisinin gözlenmesi amacıyla üretilen ekmeklerin standart şartlarda küflenme durumları ve besin ortamına eklenen *S. platensis* küf gelişimine etkisi incelenmiş, küf gelişimini inhibe edici etkisi olduğu sonucuna ulaşılmıştır. Karabuğday eklenmesinin ekmeğin tekstürel yapısını olumlu etkilediği, *S. platensis* eklenmesinin ise tekstürel özellikleri önemli ölçüde etkilemediği görülmüştür. Sonuç olarak; karabuğdayın glütensiz ekmeklerde kullanılmasının ekmeğin protein içeriği ve tekstürel özelliklerini iyileştirdiği, *S. Platensis* kullanılmasının protein içeriğini iyileştirdiği ve raf ömrünü artırdığı tespit edilmiştir.

Anahtar Kelimeler: Çölyak, *Spirulina platensis*, karabuğday

ABSTRACT

Particularly in individuals with celiac disease and gluten intolerance, gluten damages the small intestine, leading to inadequate essential nutrients. While the products used in gluten-free diets recommended for these patients are rich in carbohydrates and fat, they are deficient in protein, vitamins, minerals, and fiber. The aim of this study was to produce gluten-free bread with improved physical and microbiological properties, enriched in nutritional content, and suitable for consumption on a gluten-free diet. The aim of this study was to examine the performance of the produced breads in meeting the

specified specifications. The experimental method was employed in this study, where buckwheat and *Spirulina platensis* were added to existing gluten-free bread formulations using the substitution method, and their properties were compared. When the effects of adding buckwheat and *S. platensis* at different rates to improve the protein content of breads were examined, it was determined that the protein content in breads supplemented with buckwheat and *Spirulina platensis* was higher than in control breads, and that, in general, increasing the *S. platensis* rate improved the protein value. To further investigate the effect of *S. platensis* on shelf life, mold growth in breads produced under standard conditions and the effect of *S. platensis* added to the nutrient medium on mold growth were examined. It was concluded that it had an inhibitory effect on mold growth. The addition of buckwheat was found to have a positive effect on the textural structure of the bread, while the addition of *S. platensis* did not significantly affect textural properties. In conclusion, the use of buckwheat in gluten-free breads improved the protein content and textural properties of the bread, while the addition of *S. platensis* improved the protein content and extended shelf life.

Keywords: Celiac, *Spirulina platensis*, buckwheat

**BİTKİ BAZLI SÜT ALTERNATİFLERİ VE BİYOERİŞİLEBİLİRLİKLERİNİN
DEĞERLENDİRİLMESİ**
**NUTRITIONAL QUALITY, BIOACCESSIBILITY, AND HEALTH EFFECTS OF PLANT-
BASED MILK ALTERNATIVES**

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ÖZET

Bu çalışmada bitki bazlı süt alternatiflerinin besin kalitesi, biyoerişilebilirliği ve sağlık üzerindeki etkileri incelenmiştir. Çalışmanın temel amacı, bitkisel süt alternatiflerinin hayvansal sütle kıyaslandığında sağladığı besin değerlerini ve potansiyel sağlık etkilerini değerlendirmektir. Yapılan incelemeler bitki bazlı sütlerin sürdürülebilirlik, etik hassasiyetler ve laktoz intoleransı gibi nedenlerle giderek daha fazla tercih edildiğini göstermektedir. Ancak protein, mineral ve bazı vitaminler açısından hayvansal sütle kıyaslandığında yetersizlikler bulunabilmektedir. Ayrıca bu ürünler bazı sağlık riskleri, düşük protein içeriği, yüksek şeker miktarı ve potansiyel alerjenler gibi faktörlerle ilişkilendirilmektedir. Buna karşın klinik ve in vitro çalışmalar, bitki bazlı süt alternatiflerinin kardiyometabolik sağlık, kemik sağlığı ve sindirim açısından olumlu etkiler gösterebileceğini ortaya koymaktadır. Bitki bazlı süt alternatiflerinin protein ve mikro besin eksikliklerinin giderilmesi, ürün formülasyonu ve teknolojik geliştirmeler yoluyla besin değerlerinin ve biyoerişilebilirliğinin artırılmasıyla mümkün olabilmektedir. Sonuç olarak, bitki bazlı süt alternatifleri hem sağlık hem de sürdürülebilirlik açısından önemli bir seçenek sunmakta olup besin kalitesinin optimize edilmesi ve farklı yaş grupları ile özel ihtiyaçlara uygun ürünlerin geliştirilmesi gelecekteki araştırmalar ve ürün tasarımı için kritik öneme sahiptir.

ABSTRACT

This study examined the nutritional quality, bioavailability, and health effects of plant-based milk alternatives. The primary aim of the study was to evaluate the nutritional value and potential health impacts of plant-based milk alternatives in comparison to animal milk. The review indicates that plant-based milks are increasingly preferred due to sustainability, ethical considerations, and lactose intolerance. However, they may be deficient in protein, minerals, and certain vitamins compared to animal milk. Additionally, these products may be associated with certain health risks, including low protein content, high sugar levels, and potential allergens.

On the other hand, clinical and in vitro studies have shown that plant-based milk alternatives may have positive effects on cardiometabolic health, bone health, and digestion. Addressing protein and micronutrient deficiencies in plant-based milks is possible through product formulation and technological improvements, which can enhance their nutritional value and bioavailability. In conclusion, plant-based milk alternatives provide an important option in terms of both health and

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sustainability. Optimizing their nutritional quality and developing products suitable for different age groups and specific needs is critical for future research and product design.

AVOKADO ÇEKİRDEĞİNİN GIDA ÜRÜNLERİNDE KULLANIMI
USE OF AVOCADO SEEDS IN FOOD PRODUCTS

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ÖZET

Avokado (*Persea americana*) zengin besin içeriğine sahip olması sebebiyle dikkat çeken bir meyvedir. Son zamanlarda oldukça popüler hale gelen avokado meyvesinin, taze meyve olarak tüketiminin yanı sıra gıda sektöründe birçok farklı kullanımı da mevcuttur. Avokadonun yaklaşık %13-18'ini avokado çekirdeği oluşturmaktadır. Avokado çekirdeği genelde kullanılmamakta ve atık olarak ortaya çıkmaktadır. Birçok ülkede yetiştirilen avokado meyvesinin dünyadaki üretimi düşünüldüğünde her yıl kayda değer miktarda çekirdek atığı ortaya çıkmaktadır. Avokado çekirdeği birçok vitamin (A, B₁, B₂, B₃, C, E), mineral (kalsiyum, fosfor, potasyum, sodyum, demir, bakır, çinko, kurşun, kobalt) ve yağ asitlerini yapısında bulundurmaktadır. Avokado çekirdeği fitokimyasallar bakımından da oldukça zengin olup sağlığa yararlı etkileri de bulunmaktadır. Ayrıca antibakteriyel ve antifungal özellikleri de mevcuttur. Atıkların değerlendirilmesi, içerdiği besinlerden faydalanmak ve daha birçok sebepten dolayı avokado çekirdeklerinin gıda ürünlerinde kullanımı araştırılmaya başlanmış olup bu konuda birçok çalışma mevcuttur. Avokado çekirdekleri; pandispanya, bisküvi, bitkisel çay, kek gibi birçok yiyecek ve içecek üretiminde hammadde olarak kullanılmıştır. Avokado çekirdeklerinin gıda ürünlerinde kullanımı sayesinde yeni fonksiyonel gıda ürünleri topluma kazandırılmış, ekonomiye katkı sağlanmıştır. Çekirdek atıkları değerlendirilerek israf azaltılmış ve daha az atık atılarak çevre kirliliği önlenip doğaya olumlu etki sağlanmıştır. Bu derlemede avokado çekirdeklerinin gıda ürünlerinde kullanımı hakkında araştırmalar incelenmiştir. Sonuç olarak bu araştırmaların gelişen gıda pazarı için faydalı olacağı ve ilerleyen zamanlarda gıda ürünlerindeki uygulamalarının artarak gelecek vadedeceği düşünülmektedir.

Anahtar Kelimeler: *Persea americana*, avokado çekirdeği, atık, fonksiyonel gıda

ABSTRACT

Avocado (*Persea americana*) is a fruit that stands out due to its rich nutritional content. Avocado, which has become quite popular recently, has many different uses in the food industry in addition to being consumed fresh. Avocado seeds make up approximately 13-18% of an avocado. Avocado seeds are generally unused and appear as waste. Considering the global production of avocado fruit, which is grown in many countries, a significant amount of seed waste is generated each year. Avocado seeds contain many vitamins (A, B₁, B₂, B₃, C, E), minerals (calcium, phosphorus, potassium, sodium, iron, copper, zinc, lead, cobalt), and fatty acids. Avocado seeds are also rich in phytochemicals and have beneficial health effects. They also have antibacterial and antifungal properties. The use of avocado

seeds in food products has begun to be researched for many reasons, including utilizing waste, benefiting from the nutrients they contain, and many other reasons, and many studies are available on this subject. Avocado seeds have been used as raw materials in the production of many foods and beverages, including sponge cakes, biscuits, herbal teas, and cakes. Thanks to the use of avocado seeds in food products, new functional food products have been introduced to society and contributed to the economy. By evaluating seed waste, waste has been reduced and environmental pollution has been prevented by throwing less waste, thus having a positive impact on nature. This review evaluates research on the use of avocado seeds in food products. Consequently, it is believed that this research will be beneficial to the growing food market and that their applications in food products will increase in the future and become promising.

Keywords: *Persea americana*, avocado seed, waste, functional food

ETE ALTERNATİF BİR YAKLAŞIM: YAPAY ET
AN ALTERNATIVE APPROACH TO MEAT: ARTIFICIAL MEAT

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ÖZET

Etin insan sağlığı ve beslenmesinde önemli bir yeri bulunmaktadır. Değerli protein kaynaklarından biri olan et, esansiyel aminoasitler, mineraller (çinko, demir, magnezyum vb.) ve aynı zamanda kayda değer miktarda B vitamini içermektedir. Ancak artan insan nüfusuyla birlikte et talebinin artış göstermesi, değişen sosyokültürel yapı, etik kaygılar, gıda kaynaklı hastalıklar, metan gazı yayılımı, çevre kirliliği, sınırlı su kaynakları, karbon ayak izinin azaltılmak istenmesi, fonksiyonel gıda arayışı gibi nedenlerden dolayı ete benzer yeni alternatif gıda aranmaya başlanmıştır ve bu kapsamda yapay et teknolojisi ortaya çıkmıştır. Yapay et, temelde ikiye ayrılmaktadır: bitkisel kaynaklardan ve mantarlardan üretilen et (vegan et) ve kültür eti. Kültür eti, laboratuvar koşullarında *in vitro* olarak elde edilmiş etleri ve genetiği değiştirilmiş organizmalar ve klonlanmış hayvanlardan elde edilen etleri kapsamaktadır. Yapay etin farklı üretim teknikleri bulunmaktadır. Hücre kültürü, biyofonotik, 3D tasarım, doku kültürü, nanoteknoloji yapay et üretim tekniklerinden bazılarıdır. Yapay etin sürdürülebilir yaşam, farklı opsiyonlar sunabilme ve daha birçok avantajı bulunmasıyla birlikte bazı kaygılar da söz konusu olmaktadır. Etin besin içeriğini birebir şekilde karşılayıp karşılayamayacağı, üretim maliyeti, dini konuda uygun olup olmayacağı belirsizliği, etin tadının, dokusunun ve hissinin tamamen aynı şekilde olup olamayacağı, yapay et tüketim risklerinin henüz tam anlamıyla belirlenmemiş olması bu kaygılardan birkaçıdır. Sonuç olarak, ilerleyen zamanlarda yapay et endüstrisinin daha da gelişeceği ve geleneksel yollarla üretilen ete güçlü bir alternatif olacağı düşünülmektedir.

Anahtar Kelimeler: yapay et, alternatif protein, *in vitro* et

ABSTRACT

Meat plays a substantial role in human health and nutrition. As a valuable source of protein, meat contains essential fatty acids, minerals (zinc, iron, magnesium, etc.), and significant amounts of B vitamins. However, due to the increasing demand for meat with the growing human population, changing sociocultural structures, ethical concerns, foodborne illnesses, methane emissions, environmental pollution, limited water resources, the desire to reduce carbon footprints, and the search for functional foods, new meat-like alternatives have been sought, leading to the emergence of artificial meat technology. Artificial meat is broadly divided into two categories: meat produced from plant sources and fungi (vegan meat) and cultured meat. Cultured meat includes meat grown *in vitro* under laboratory conditions, as well as meat obtained from genetically modified organisms and cloned animals. There are various production techniques for artificial meat. Cell culture, biophonics, 3D design,

tissue culture, and nanotechnology are some of the techniques used to produce artificial meat. While artificial meat offers sustainable living, diverse options, and many other advantages, it also raises some concerns. These include whether it can replicate the nutritional content of meat, its cost of production, uncertainty about religious compliance, the likelihood of achieving the exact same taste, texture, and feel, and the risks of consuming artificial meat that have yet to be fully determined. Consequently, it is anticipated that the artificial meat industry will further develop in the future and become a strong alternative to traditionally produced meat.

Keywords: artificial meat, alternative protein, *in vitro* meat

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ÖZET

Son yıllarda sağlıklı yaşam ve fonksiyonel beslenme kavramlarının öne çıkmasıyla birlikte bazı besinlerin doğal yollarla hastalıkları önleme ve tedavi etme konusunda bilimsel kanıtlarla desteklenen etkileri de araştırılmaya başlanmıştır. Bu sebeple, fonksiyonel gıdalar, nutrasötikler ve doğal sağlık ürünleri daha yaygın olarak tüketilmeye başlanmıştır. FDA (Gıda ve İlaç Teşkilatı) tarafından fonksiyonel gıdaların, vücuttaki fonksiyonları üzerine olumlu etkileri bilimsel olarak kanıtlanmış önemli besin öğelerini içermesi gerektiği belirtilmiştir. Gıda takviyelerinin kullanımının yaygınlaşmasıyla birlikte tüketicilerin uygun ürün arayışı artmıştır. Birçok farklı kombinasyonda takviyeler üretilmektedir. Tüketiciler gıda takviyelerinin içeriklerini inceleyerek ihtiyacına yönelik seçim yapma konusunda daha bilinçli hale gelmiştir. Bu derleme çalışmada, gıda takviyeleri içeriğinde yer alan kolajen ve formları, kondroitin sülfat ve glikozaminoglikan, hyalüronik asit, yumurta kabuğu zarı, elastin, propolis, arı poleni ve peynir altı suyu gibi hayvansal kaynaklı ürünlerin beslenmedeki işlevleri ve sağlık üzerine etkileri ele alınmıştır. Literatür taraması yöntemiyle elde edilen veriler ışığında, bu bileşenlerin özellikle eklem sağlığı, bağışıklık sistemi, kardiyovasküler fonksiyonlar ve kas gelişimi üzerinde olumlu etkileri vurgulanmaktadır. Bununla birlikte bazı takviyelerin üretim süreçleri ve etik boyutları da tartışılmaktadır. Halihazırda hayvansal besin ögesi üretiminde kullanılan kaynaklar dışında kesimhane artıklarının da kullanımının yaygınlaşması ekonomik ve ekolojik açıdan fayda sağlamakla birlikte sürdürülebilirlik açısından olumlu katkılar göstermektedir. Sonuç olarak, hayvansal kaynaklı gıda takviyeleri, beslenmenin desteklenmesinde önemli rol oynamakta; fakat güvenilirlik ve bireysel ihtiyaçlara uygunluk konularında dikkat edilmesi gerekmektedir.

Anahtar Kelimeler: gıda takviyesi, fonksiyonel gıda, kolajen, glikozaminoglikan, propolis, arı poleni, kondroitin sülfat

ABSTRACT

In recent years, with the rise of the concepts of healthy living and functional nutrition, the effects of certain foods in preventing and treating diseases through natural means which supported by scientific evidence, have also begun to be researched. For this reason, functional foods, nutraceuticals, and natural health products have become more widely consumed. The FDA (Food and Drug Administration) has stated that functional foods must contain important nutrients that have been scientifically proven to have positive effects on body functions. With the widespread use of dietary supplements, consumers have become more interested in finding the right products. Food supplements are produced in many different

combinations. Consumers have become more conscious about examining the contents of dietary supplements and making choices based on their needs. In the current review the functions and health effects of animal-derived products such as collagen and its forms, chondroitin sulfate and glycosaminoglycans, hyaluronic acid, eggshell membrane, elastin, propolis, bee pollen, and whey, which are found in dietary supplements were discussed. Based on data obtained through a literature review, the positive effects of these components on joint health, the immune system, cardiovascular functions, and muscle development are emphasized. However, the manufacturing processes and ethical dimensions of some supplements are also discussed. The widespread use of slaughterhouse waste, in addition to the resources currently used in the production of animal-based food ingredients, provides economic and ecological benefits and contributes positively to sustainability. In conclusion, animal-based food supplements play an important role in supporting nutrition; however, attention must be paid to issues of reliability and suitability for individual needs.

Keywords: dietary supplements, functional food, collagen, glycosaminoglycan, propolis, bee pollen, chondroitin sulfate

**COMMUNITAS'IN SOSYO-KÜLTÜREL İNŞASINDA HELAL OLANIN KONUMU:
“WORLD HALAL FOOD FESTIVAL” ÖRNEĞİ**

**THE POSITION OF THE HALAL IN THE SOCIO-CULTURAL CONSTRUCTION
OF COMMUNITAS: THE CASE OF “WORLD HALAL FOOD FESTIVAL”**

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ÖZET

Bu bildiri, Londra’da gerçekleştirilen World Halal Food Festival isimli helal yemek festivalindeki etnografik gözlemlere dayanmaktadır. Çalışmanın merkezinde Victor Turner’ın (1969) geliştirdiği communitas kavramı yer almaktadır. Festival, Müslüman katılımcılar için gündelik yaşamda sürekli karşılaşılan “helal endişesinin” (yemeğin içeriği, hazırlanma biçimi, pişirme koşulları, sertifikasyon vb.) geçici olarak askıya alındığı bir liminal güven alanı yaratmıştır. “Hiç endişe etmeden istediğin yemeği yiyecek” duygusu bireysel düzeyde rahatlama ve özgürlük sağlamakta, aynı zamanda kolektif olarak paylaşılan bir aidiyet ve eşitlik hissi üretmektedir. Festival alanında tamamıyla helal olan yiyeceklerin yanında mescitlerin bulunması, hoparlörden ezan okunması, İngiltere’nin kamusal yaşamında genellikle görünür olmayan dini pratiklerin sahneye taşınmasına imkan tanımış ve communitas deneyimini derinleştirmiştir. Konserlerde İngilizce ve Arapça ilahiler, şarkılar söylenmiş; sosyal medya üzerinden tanınan sanatçılarla kurulan yakınlık duygusu kolektif coşkuyu pekiştirmiştir. Şeflerin farklı etnik mutfaklardan sergiledikleri yemek performansları, yarışmalar, çekilişler, yemek şovları ve çocuklar için tasarlanmış eğlence alanları festivalin çok yönlü yapısını ortaya koymaktadır. Bu etkinlikler, çeşitlilik içinde birlik ve ortak eğlence duygusu etrafında yoğunlaşan bir communitas zemini üretmiştir. Festival, helalin yalnızca dini bir kategori değil, aynı zamanda sosyo-kültürel bir fenomen olarak işlev gördüğü, güçlü bir communitas deneyimi üretmektedir.

Anahtar Kelimeler: Helal festival, communitas, sosyo-kültürel etkileşim, Müslüman diaspora, etnografi.

ABSTRACT

This paper is based on ethnographic observations made at a halal food festival (World Halal Food Festival) held in London. At the heart of the study lies Victor Turner’s (1969) concept of communitas. The festival created a liminal safe space in which the 'halal anxiety' (concerns about food content, preparation methods, cooking conditions and certification etc.) that Muslim participants constantly experience in their daily lives was temporarily suspended. The ability to eat whatever one wants without worry provides individual relief and freedom, while also producing a collectively shared sense of belonging and equality. The communitas experience was deepened by the presence of mosques alongside completely halal food in the festival area, the call to prayer being broadcast over loudspeakers and religious practices being staged that are not usually visible in public life in the UK. Hymns and songs in English and Arabic were sung at concerts, and the sense of closeness established with artists known through social media reinforced collective enthusiasm. Culinary performances by chefs

showcasing different ethnic cuisines, competitions, raffles, cooking shows and entertainment areas designed for children reveal the festival's multifaceted nature. These events created a *communitas* space centred on unity and shared enjoyment amidst diversity. The festival demonstrates that halal functions not only as a religious category, but also as a socio-cultural phenomenon, producing a powerful *communitas* experience.

Keywords: Halal festival, *communitas*, socio-cultural interaction, Muslim diaspora, ethnography.

**ACİL SERVİSE BAŞVURAN GIDA ZEHİRLENMESİ OLGULARININ
DEĞERLENDİRİLMESİ**
**EVALUATION OF FOOD POISONING CASES PRESENTING TO THE EMERGENCY
DEPARTMENT**

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ÖZET

Giriş: Gıda kaynaklı hastalıklar küresel ve önemli bir sağlık sorunu teşkil etmektedir. Bu önlenabilir hastalıklar dünya çapında ciddi oranda sağlık sorunlarına yol açmaktadır. Bu çalışmanın amacı acil servise başvuran gıda zehirlenmesi olgularının klinik ve demografik özelliklerini değerlendirmektir.

Gereç ve Yöntem: 01.01.2024-31.12.2024 tarihleri arasında acil servise başvuran gıda zehirlenmesi olan hastaların, dosyaları ve otomasyon sisteminden hasta kayıtları retrospektif olarak incelendi. Hastaların yaşı, cinsiyeti, acil servise geliş nedenleri ve şikayetleri değerlendirildi. Bulgular, Ortalama $\pm$ Standart Sapma ve yüzde (%) olarak sunuldu.

Bulgular: 2024 yılında bir yıllık süreçte acil servise başvuran 66 besin zehirlenmesi olgusunun otomasyon sisteminden verileri incelendi. Gıda zehirlenmesi olgularının, yaş ortalaması 42 ± 6.68 olup, 63.6 (n=42)'sı erkek idi. Gıda zehirlenmesi nedenlerinin, %57.6 (n=38)'sında pirinç pilavı, çorba, et yemeği gibi yemeklerin en sık görülen neden olduğu tespit edilmiştir. Hastaların şikayetleri arasında en sık %90.1 (n=60) oran ile ishal görülmüştür. Görülen diğer başvuru şikayetleri ise karın ağrısı, halsizlik, ateş, bulantı ve kusmadır.

Sonuç: Gıda sektörü ülkemizde ve tüm dünyada giderek önemli gelişmeler göstermesine rağmen, hala gıda kaynaklı zehirlenmeler görülmektedir. Besin sektöründe hijyen kurallarına uyulması çok önemlidir. Bu süreçte hem üreticilerin, hem de denetleyicilerin çok dikkatli olması gerekmektedir. Acil servis hekimleri bu hastalar ile karşılaşması durumunda hızlı bir şekilde nedeni tespit edip, hastanın tedavi sürecini başlatması çok önemlidir.

Anahtar Kelimeler: Acil servis, gıda zehirlenmesi, ishal

ABSTRACT

Introduction: Foodborne illnesses represent a significant global health issue. These preventable diseases cause serious health problems worldwide. The aim of this study is to evaluate the clinical and demographic characteristics of food poisoning cases presenting to the emergency department.

Materials and Methods: The files and patient records from the automation system of patients with food poisoning who visited the emergency department between January 1, 2024, and December 31, 2024, were retrospectively reviewed. The patients' age, gender, reasons for visiting the emergency department, and complaints were evaluated. Findings are presented as mean $\pm$ standard deviation and percentage (%).

Results: Data from the automation system were analyzed for 66 cases of food poisoning that presented to the emergency department over a one-year period in 2024. The average age of food poisoning cases was 42 ± 6.68 , and 63.6 (n=42) were male. It was determined that the most common causes of food poisoning, in 57.6% (n=38) of cases, were foods such as rice pilaf, soup, and meat dishes. The most common complaint among patients was diarrhea, seen in 90.1% (n=60) of cases. Other complaints included abdominal pain, fatigue, fever, nausea, and vomiting.

Conclusion: Despite significant developments in the food sector in our country and around the world, food poisoning cases still occur. Compliance with hygiene rules in the food industry is crucial. Both producers and regulators must be very careful in this process. When emergency room physicians encounter such patients, it is very important to quickly identify the cause and initiate treatment.

Keywords: Emergency department, food poisoning, diarrhea

**BRADİKARDİ VE SENKOP ATAĞIYLA SEYREDEN DELİ BAL ZEHİRLENMESİ: BİR
OLGU SUNUMU**

**MAD HONEY POISONING PRESENTING WITH BRADYCARDIA AND SYNCOPE
ATTACK: A CASE REPORT**

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ÖZET

Deli bal hastalığı, bazı *Rhododendron* bitki türlerinde bulunan grayanotoksan-nörotoksinler içeren balın tüketilmesiyle oluşur. Deli bal zehirlenmesi olan hastalarda baş dönmesi, mide bulantısı, senkop, bulanık görme, bradikardi ve hipotansiyon; EKG bulgularında ise sinüs bradikardisi, AV tam blok veya ST elevasyonu görülebilmektedir. Doğal ve geleneksel ilaçlara olan ilgi arttıkça, potansiyel riskleri konusunda farkındalığın artırılması giderek daha da önemli hale gelmektedir. Bu hastaların yatış verilerek takip ve tedavisi yapılmalıdır. Hastalara intravenöz sıvı, atropin enjeksiyonu ve gerektiğinde yardımcı vazopressör ve oksijen tedavisi uygulanmaktadır. Çalışmamızda, fazla miktarda bal tükettikten sonra senkop atağı ile acil servise getirilen bir olguyu ve tedavi yaklaşımını sunmayı amaçladık.

Anahtar Kelimeler: Acil Tıp, Deli Bal, Toksikoloji, Bradikardi, Senkop, Tedavi

ABSTRACT

Mad honey disease is caused by consuming honey containing grayanotoxins, neurotoxins found in certain *Rhododendron* plant species. Patients with mad honey poisoning may experience dizziness, nausea, syncope, blurred vision, bradycardia, and hypotension; ECG findings may include sinus bradycardia, complete AV block, or ST elevation. As interest in natural and traditional medicines increases, raising awareness about their potential risks is becoming increasingly important. These patients should be hospitalized for monitoring and treatment. Patients are administered intravenous fluids, atropine injections, and, when necessary, vasopressors and oxygen therapy. In our study, we aimed to present a case of a patient who was brought to the emergency department with a syncopal attack after consuming excessive amounts of honey and the treatment approach used.

Keywords: Emergency Medicine, Mad Honey, Toxicology, Bradycardia, Syncope, Treatment

**KARAYOLU ÇEVRESİNDE YETİŞTİRİLEN BUĞDAYLARDA AĞIR METAL
BİRİKİMİNİN ARAŞTIRILMASI**

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ÖZET

Çevre kirliliği ve insan sağlığı açısından en önemli tehditlerden biri, toksik özelliklere sahip ağır metallerdir. Bu çalışmada, Erzincan-Erzurum karayolu üzerinde, organize sanayi bölgesi yakınında yetiştirilen buğdaylarda ağır metal birikiminin incelenmesi amaçlanmıştır. Hasat öncesi dönemde, karayoluna farklı mesafelerden (10 m aralıklarla toplam 10 noktadan) buğday örnekleri toplanmış ve mesafeye bağlı olarak ağır metal kirliliğinin düzeyleri araştırılmıştır. Örneklerdeki arsenik (As), kobalt (Co), krom (Cr), manganez (Mn), nikel (Ni), bakır (Cu), alüminyum (Al) konsantrasyonları, indüktif eşleşmiş plazma kütle spektrometresi (ICP-MS) kullanılarak belirlenmiştir. As (28.25–11.38 $\mu\text{g kg}^{-1}$), Co (116.60–44.72 $\mu\text{g kg}^{-1}$), Cr (243.60–75.69 $\mu\text{g kg}^{-1}$), Mn (51892.76–17720.97 $\mu\text{g kg}^{-1}$), Ni (3020.97–1361.07 $\mu\text{g kg}^{-1}$), Cu (6141.64–2660.67 $\mu\text{g kg}^{-1}$) ve Al (19699.98–3573.63 $\mu\text{g kg}^{-1}$) seviyelerinin karayoluna daha yakın bölgelerde belirgin şekilde yüksek olduğu saptanmıştır. Analiz sonuçları, buğday bitkilerinde karayoluna olan mesafe ile ağır metal birikimi arasında anlamlı bir ilişki olduğunu ortaya koymuştur. Bu durum, yalnızca bitki sağlığı açısından değil, aynı zamanda besin zinciri yoluyla insan ve diğer canlıların sağlığı açısından da ciddi riskler oluşturmaktadır.

Anahtar Kelimeler: Ağır Metaller, buğday, kirlilik

ABSTRACT

Heavy metals with toxic properties represent a major threat to environmental quality and human health. This study investigates heavy metal accumulation in wheat grown near the organized industrial zone along the Erzincan-Erzurum highway. Prior to harvest, wheat samples were collected from ten sites at 10-meter intervals from the highway, and the concentrations of arsenic (As), cobalt (Co), chromium (Cr), manganese (Mn), nickel (Ni), copper (Cu) and aluminum (Al), were determined using inductively coupled plasma mass spectrometry (ICP-MS). The results showed that heavy metal levels were considerably higher in samples collected closer to the highway, with concentrations ranging between 28.25–11.38 $\mu\text{g kg}^{-1}$ for As, 116.60–44.72 $\mu\text{g kg}^{-1}$ for Co, 243.60–75.69 $\mu\text{g kg}^{-1}$ for Cr, 51892.76–17720.97 $\mu\text{g kg}^{-1}$ for Mn, 3020.97–1361.07 $\mu\text{g kg}^{-1}$ for Ni, 6141.64–2660.67 $\mu\text{g kg}^{-1}$ for Cu, and 19699.98–3573.63 $\mu\text{g kg}^{-1}$ for Al. A significant relationship was observed between distance from the highway and metal accumulation in wheat. These findings indicate that wheat cultivated in close

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proximity to highways and industrial activities is subject to heavy metal contamination, posing potential risks to food safety, human health, and ecological sustainability.

Keywords: Heavy metals, wheat, pollution

SPORCU BESLENMESİNDE PROTEİN BARLARIN ROLÜ
THE ROLE OF PROTEIN BARS IN SPORTS NUTRITION

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ÖZET

Düzenli fiziksel aktivitenin küresel ölçekte artması, sporcu beslenmesinin önemini giderek ön plana çıkarmaktadır. Beslenme, yalnızca performans artışıyla sınırlı kalmayıp metabolik süreçlerin desteklenmesi, egzersiz sonrası toparlanmanın hızlanması ve uzun vadeli sağlık çıktılarının korunmasında kritik bir rol üstlenmektedir. Bu kapsamda protein alımı, özellikle direnç egzersizi yapan sporcularda kas onarımı, hipertrofi, vücut kompozisyonunun düzenlenmesi ve performansın sürdürülmesi açısından temel bir gereklilik olarak değerlendirilmektedir. Egzersiz yoğunluğuna bağlı olarak protein ihtiyacının 0,8–2 g/kg arasında değişebildiği bildirilmektedir. Son yıllarda protein barlar, sporcu beslenmesi kapsamında öne çıkan fonksiyonel ürünlerden biri haline gelmiştir. Yüksek protein içerikleri, taşınabilirlikleri ve lif ile mikrobesein katkıları, bu ürünleri hem sporcular hem de yoğun yaşam temposuna sahip bireyler için cazip kılmaktadır. Bununla birlikte, içerik profillerindeki farklılıklar nedeniyle sağlık etkileri değişkenlik göstermektedir. Yüksek şeker, doymuş yağ ve yapay katkı maddeleri içeren barların uzun vadeli sağlık riskleri barındırabileceği belirtilmektedir. Bu nedenle, protein bar seçiminde protein miktarı, karbonhidrat ve yağ kompozisyonu, lif oranı ve katkı maddeleri dikkatle değerlendirilmeli etiket bilgileri iyi okunmalıdır. Sonuç olarak, protein barlar sporcular için egzersiz öncesi veya sonrası protein gereksinimini hızlı ve pratik bir biçimde karşılayan destekleyici ürünlerdir. Ancak, dengeli ve doğal bir beslenmenin yerine geçemeyecekleri unutulmamalı; kullanımda bireysel ihtiyaçlar ve beslenme hedefleri gözetilmelidir. Tamamen öğün olarak düşünülüp, dengeli beslenme ihmal edilmemelidir.

Anahtar Kelimeler: Sporcu beslenmesi, protein bar, sporcu sağlığı, protein takviyesi, performans, toparlanma.

ABSTRACT

The global rise in regular physical activity has underscored the increasing significance of sports nutrition in optimizing performance and health outcomes. Adequate nutrition contributes not only to athletic performance but also to the regulation of metabolic processes, enhancement of post-exercise recovery, and maintenance of long-term physiological well-being. Within this context, protein intake is recognized as a fundamental requirement, particularly among athletes engaged in resistance training, due to its critical role in muscle repair, hypertrophy, body composition regulation, and sustained performance capacity. Current evidence indicates that protein requirements may vary between 0.8-2 g/kg/day depending on exercise intensity. In recent years, protein bars have emerged as functional food products frequently incorporated into athletes' diets. Their high protein density, portability, and fortification with dietary fiber and micronutrients enhance their practicality and appeal for both athletes and individuals with demanding lifestyles. However, variations in macronutrient distribution and ingredient composition can result in divergent health impacts. Specifically, formulations high in added sugars, saturated fats, and artificial additives may impose long-term metabolic and physiological risks. Therefore, during the selection of protein bars, it is essential to conduct a careful examination of the product label information, with particular attention to protein content, carbohydrate and fat composition, fiber ratio, and the presence of additives. In summary, protein bars can serve as convenient dietary adjuncts to meet pre- and post-exercise protein demands. Nevertheless, they should not be considered substitutes for a balanced and naturally varied diet. Their utilization should be aligned with individualized nutritional requirements and athletic performance goals. It should not be regarded as a complete meal, and the principles of balanced nutrition should not be neglected.

Keywords: Sports nutrition, protein bars, athlete health, protein supplementation, performance, recovery.

POSTBİYOTİKLER VE SAĞLIK
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ÖZET

Postbiyotikler, canlı mikroorganizmaların (probiyotik olsun ya da olmasın) yaşam döngüsü sırasında veya hücresel parçalanma sonrası salınan ve konak sağlığı üzerinde olumlu etkiler gösteren biyoaktif bileşikleridir. Bu maddeler mikrobiyal metabolitler, enzimler, hücre duvarı bileşenleri veya süpernatantlar gibi farklı formlarda olabilir ve "metabiyotik", "biyojenik" gibi alternatif terimlerle de tanımlanabilmektedir. Postbiyotikler, çok yönlü biyolojik aktiviteleri sayesinde sağlık üzerinde olumlu etkiler yaratır. Antiinflamatuvar, antioksidan, antikanser, immün sistemi düzenleyici, antimikrobiyal ve kolesterol düşürücü özellikler gösterebilirler. Ayrıca, bağırsak mukozasının bütünlüğünü destekleyerek bağırsak bariyer fonksiyonlarını koruma potansiyeline sahiptirler. Postbiyotikler, kaynaklandıkları mikroorganizmalara ve etkili oldukları biyokimyasal bileşenlere göre farklı gruplara ayrılır. Hücre dışı bileşenler arasında ekzopolisakkaritler ve peptidoglikanlar yer alırken, hücre içi bileşikler arasında organik asitler (laktik asit, asetat, bütirat), teikoik asitler ve biyoaktif peptitler (asidofilin, bifidin vb.) bulunur. Postbiyotikler, gıda, ilaç, tarım ve su ürünleri yetiştiriciliği gibi birçok alanda kullanılabilir. Bu bileşikler, hem fonksiyonel gıdalarda katkı maddesi olarak hem de enfeksiyon kontrol ajanı olarak kullanılabilir. Postbiyotiklerin etkisi, bağışıklık sisteminin modülasyonu, bağırsak bariyerinin güçlendirilmesi, inflamasyonun baskılanması ve patojenlerin inhibisyonu gibi çoklu yollarla gerçekleşir. Postbiyotikler, probiyotiklere göre daha kararlı yapıda olmaları, sağlık açısından potansiyel faydaları ve canlı hücre içermemeleri nedeniyle giderek daha fazla dikkat çekmektedir. Ancak sağlık üzerindeki net etkileri henüz belirlenmemiştir. Sonuç olarak postbiyotiklerin verimliliklerini, güvenlik profillerini, önerilen dozajlarını, potansiyel etki mekanizmalarını, sağlık üzerindeki etkilerini belirlemek için öncelikle randomize kontrollü çalışmalar olmak üzere daha ileri çalışmalara ihtiyaç duyulmaktadır.

Anahtar kelimeler: Postbiyotik, bağırsak mikrobiyotası, sağlık.

ABSTRACT

Postbiotics are bioactive compounds released during the life cycle or after the cellular breakdown of live microorganisms (whether probiotic or not), and they exert beneficial effects on host health. These substances can be present in diverse forms, including microbial metabolites, enzymes, cell wall components or supernatants and are also referred to by alternative terminologies such as “metabiotics” or “biogenics.”. Postbiotics exert positive effects on health due to their diverse and multifaceted biological activities. They may exhibit anti-inflammatory, antioxidant, anticancer, immunomodulatory, antimicrobial, and cholesterol-lowering properties. Additionally, they are capable of supporting the integrity of the intestinal mucosa and protecting gut barrier functions. Postbiotics are categorized into different groups depending on the microorganisms from which they originate and the bioactive biochemical components they contain. Among the extracellular components are exopolysaccharides and peptidoglycans, while intracellular components include organic acids (such as lactic acid, acetate, and butyrate), teichoic acids, and bioactive peptides (e.g., acidophilin, bifidin). Postbiotics have potential applications across multiple domains, including food, pharmaceuticals, agriculture and aquaculture. These compounds may function not only as additives in functional foods but also as agents in infection control. The effects of postbiotics occur through multiple mechanisms, including modulation of the immune system, enhancement of gut barrier function, suppression of inflammation, and inhibition of pathogens. Compared to probiotics, postbiotics have attracted growing interest due to their greater structural stability, potential health benefits, and the absence of live microorganisms. However, their exact effects on human health have not yet been fully established. In conclusion, further research—particularly randomized controlled trials—is required to determine the efficacy, safety profiles, recommended dosages, potential mechanisms of action, and health impacts of postbiotics.

Keywords: Postbiotic, intestinal microbiota, health.

SU ÜRÜNLERİ ATIK ve YAN ÜRÜNLERİNİN GASTRONOMİDE KULLANIMI
USE OF AQUATIC PRODUCTS WASTE AND BY-PRODUCTS IN GASTRONOMY

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ÖZET

Günümüzde gıda atık ve yan ürünlerinin değerlendirilmesi çevresel, ekonomik ve sürdürülebilirlik açısından büyük önem taşımaktadır. Su ürünleri içerdiği yüksek besin değeriyle beslenme ve sağlık açısından önemli bir gıda kaynağını oluşturmaktadır. Bu ürünlerden avlama ve balık işleme endüstrisi sonucu ortaya çıkan baş, deri, kılçık, iç organlar (özellikle karaciğer ve yumurtalık), kırıntı et ve kabuklar vb. gibi yan ürünlerinin amino asitler, jelatin, kolajen, yağ asitleri ve kitosan gibi değerli bileşenlere sahip olması, başta gıda olmak üzere birçok endüstriyel alanda da değerlendirilmesine olanak sağlamaktadır. Bu değerli atık ve yan ürünlerinin uygun şekillerde işlenerek gastronomide kullanılması balık suyu (fish stock), balık çorbası, balık sosu, havyar, balık derisi çıtır gibi tat ve lezzet verici yüksek besin içeriğine sahip ürünlere ve balık ezmesi (fish pate), balık jelatini gibi fonksiyonel gıda ürünlerine dönüştürülmesine olanak sağlamaktadır. Bu nedenle bu derleme, su ürünleri atık ve yan ürünlerinin önemi, içerdikleri bileşenleri, gastronomi ve fonksiyonel gıda ürünleri olarak nerede kullanıldıkları hakkında bilgi sağlayacaktır.

Anahtar Kelimeler: Sürdürülebilirlik, su ürünleri yan ürünleri, gastronomi, besin içeriği, sıfır atık.

ABSTRACT

Nowadays, the utilization of food waste and by-products is of great importance in terms of environmental, economic, and sustainability aspects. Seafood constitutes an important food source in terms of nutrition and health due to its high nutritional value. By-products such as heads, skin, bones, internal organs (especially liver and ovaries), trimmings, and shells, possess valuable components such as amino acids, gelatin, collagen, fatty acids, and chitosan, enabling their utilization in many industrial fields, primarily food. Processing these valuable waste and by-products in appropriate ways for use in gastronomy enables them to be converted into flavorful, high-nutrient products such as fish stock, fish soup, fish sauce, caviar, and crispy fish skin, as well as functional food products like fish pâté and fish gelatin. Therefore, this review will provide information about the importance of seafood waste and by-products, their components, and where they are used in gastronomy and functional food products.

Keywords: Sustainability, seafood by-products, gastronomy, nutritional content, zero waste.

AFYON BÜKMESİNİN GLUTENSİZ ÜRETİMİ
THE GLUTEN-FREE PRODUCTION OF AFYON BÜKMESİ

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ÖZET

Gıda teknolojisindeki gelişmeler, farklı beslenme ihtiyaçlarına uygun ürünlerin üretilmesine olanak sağlamaktadır. Buğday, yulaf, çavdar ve arpa türevlerinde doğal olarak bulunan gluten proteini fırıncılık ürünlerinde oldukça önemlidir. Dünya genelinde gluten intoleransına sahip olan bireylerin sayısı her geçen gün artmakta ve bu durum glutensiz diyeteye uygun gıdalara olan ihtiyacı da artırmaktadır. Günlük beslenmenin vazgeçilmezlerinden olan hamur işlerinin geliştirilerek beslenme engeli ile karşı karşıya kalan bireylere alternatif bir yol sunulabileceği düşünülmektedir. Bu nedenle, glutensiz geleneksel ürün bileşenlerini işlemek için yeni yöntemler aranmaktadır. Beslenme kültürüne yerleşmiş ve yerel halkın benimsediği yiyecekler olarak ifade edilen geleneksel reçetelerin glutensiz formülasyonlar ile üretim imkânı çalışma metodolojisini oluşturmuştur. Böylece Afyon yöresine ait bükme reçetesi glutensiz kara buğday ve glutensiz standart buğday unu ile yeniden formalize edilerek tüketime uygunluğunu belirlenmek amaç edinilmiştir. Bu doğrultu da üretilen bükmelerin; tekstür, fiziksel analizleri ile duyuşal özellikleri uzman kişilerce (n: 10) değerlendirilmiştir. Bükmelerin duyuşal analizlerinde sertlik parametresi tüm reçetelerde en az beğenilen kriter olduğu görülmüştür. Ayrıca GKBÜ ile hazırlanan bükmelerin (sertlik harici) hem kontrol hem de GBU'ya göre en az beğenilen reçete olduğu anlaşılmıştır. Duyuşal analizler açısından genel beğeni ortalamaları karşılaştırıldığında GBU GKBÜ'dan (3.15>2.77) daha çok tercih edilmiştir. İlerleyen çalışmalarda yöresel lezzetlerin glutensiz reçeteler geliştirilerek beslenme engeli bulunan bireylere yeni bir alternatif sunacağı düşünülmektedir.

ANAHTAR KELİMELEER: Glutensiz Beslenme, Afyon Yöresi, Besinsel Sürdürülebilirlik, Bükme

ABSTRACT

Advancements in food technology enable the development of products tailored to diverse dietary needs. Gluten, a protein naturally present in wheat, oats, rye, and barley derivatives, plays a critical role in bakery products. However, the global prevalence of individuals with gluten intolerance is steadily increasing, thereby enhancing the demand for gluten-free dietary options. Bakery products, being indispensable components of daily nutrition, can be reformulated to offer alternatives for individuals facing dietary restrictions. Consequently, novel approaches are being sought to process gluten-free traditional product ingredients. Traditional recipes, which are embedded in food culture and widely accepted by local communities, constitute the methodological framework for producing gluten-free formulations. In this context, the traditional *bükme* recipe from the Afyon region was reformulated using gluten-free buckwheat flour and gluten-free standard wheat flour in order to assess its suitability for consumption. Accordingly, the produced *bükme* samples were evaluated in terms of texture, physical analyses, and sensory attributes by a panel of experts (n:10). Sensory analysis results revealed that hardness was the least favored criterion across all formulations. Moreover, except for hardness, the samples prepared with gluten-free buckwheat flour (GKBÜ) were found to be the least preferred in comparison to both the control and those prepared with gluten-free standard wheat flour (GBÜ). Based on overall sensory evaluation scores, GBÜ was more preferred than GKBÜ ($3.15 > 2.77$). It is anticipated that future studies will contribute to providing new alternatives for individuals with dietary restrictions by developing gluten-free versions of traditional flavors.

KEY WORDS: Gluten-free diet, Afyon region, Nutritional sustainability, Bending

**EFFECT OF MEDIA SELECTION ON ESCHERICHIA COLI GROWTH: A COMPARISON
WITH MOLECULAR DOCKING**

**ESCHERICHIA COLI GELİŞMESİNDE BESİYERİ SEÇİMİNİN ETKİSİ: MOLEKÜLER
MODELLEME KARŞILAŞTIRMASI**

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ABSTRACT

Escherichia coli (E. coli) is a Gram-negative bacterial species naturally found in the intestines of humans and animals. Most subspecies are non-pathogenic and even contribute to the healthy functioning of the digestive system. However, some E. coli strains can cause serious infections, particularly by contaminating food or water sources. Therefore, the location and environmental conditions under which the bacteria are transmitted/exist are crucial for its activity. The growing, living, storage, and re-activation of E. coli are greatly influenced by the nutrient composition of the culture medium. Three commonly used culture media, Luria-Bertani (LB) medium, M9 minimal medium, and Terrific Medium (TB), were comparatively evaluated. Tryptophan from LB, glucose from M9, and glycerol from TB were selected as critical components. These ligands interacted with target proteins in E. coli: tryptophanase (TnaA), the glucose transporter PtsG, and glycerol kinase (GlpK). In this study, an in silico analysis was performed to investigate the molecular interactions between critical medium-specific components and E. coli proteins that play key roles in nutrient uptake and metabolism. Each protein and ligand was prepared in Chimera, and molecular docking simulations were performed in AutoDock4. The docking binding energies and interaction profiles for each interaction were analyzed. All results showed that each ligand exhibited a stable binding conformation with its target protein, supporting its essential role in bacterial growth and adaptation. Tryptophan-TnaA interactions were linked to metabolic pathways affecting cell survival and stress response in nutrient-rich LB. Glucose-PtsG interactions reflected the central role of glucose uptake as the sole carbon source in M9. Glycerol-GlpK interactions emphasized the enhanced energy needs of TB, contributing to improved biomass yield and viability. When the docking results were compared in terms of binding energies, the following were found: TnaA–Trp (–4.76 kcal/mol), PtsG–Bgc (–1.58 kcal/mol), and GlpK–Gol (–1.74 kcal/mol). These values can be interpreted as structural representations of the capacity of E. coli to recognize and metabolize nutrient molecules in different media. A comparative analysis of the results revealed that LB broth, thanks to its tryptophan and complex compounds, was superior to the other media in terms of both rapid adaptation and post-thaw reactivation of E. coli. TB and M9 were found to provide useful but more limited metabolic support. This molecular modelling study provides a comparative molecular perspective on medium selection for E. coli and highlights how modeling-based approaches can guide practical decisions in microbiological applications.

Key words: Escherichia coli, Molecular Docking, Broth Chosing, In Silico Analysis, Food Pathogen

ÖZET

Escherichia coli (E. Coli), insan ve hayvan bağırsaklarında bulunan gram negatif bir bakteri türüdür. Çoğu alt türü patojenik değildir hatta sindirim sisteminin sağlıklı çalışmasına yardımcı olmaktadır. Ancak bazı E. coli türleri, özellikle gıda veya su kaynaklarını kontamine ederek ciddi enfeksiyonlara sebebiyet verebilmektedir. Dolayısı ile bakterinin nerede hangi ortam şartlarında bulaştığı/var olduğu bakterinin aktivitesi açısından önemlidir. E coli'nin büyümesi, hayatta kalması, depolanması ve yeniden aktivasyonu, bakterinin kültürlendiği ortamın besin bileşiminden büyük ölçüde etkilenmektedir. Yaygın olarak kullanılan üç kültür ortamı Luria-Bertani (LB) besiyeri, M9 minimal besiyeri ve Terrific Besiyeri (TB) karşılaştırılmalı olarak değerlendirilmiştir. LB'den triptofan, M9'dan glikoz ve TB'den gliserol, kritik bileşenler olarak seçilmiştir. Bu ligandlar, E. Coli'deki hedef proteinler ile etkileştirilmiştir. Bu proteinler triptofanaz (TnaA), glikoz taşıyıcısı PtsG ve gliserol kinaz (GlpK)'dır. Bu çalışmada, kritik ortama özgü bileşenler ile besin alımı ve metabolizmasında kilit rol oynayan E. coli proteinleri arasındaki moleküler etkileşimleri araştırmak için bir in silico analiz gerçekleştirilmiştir. Her bir protein ve ligand Chimera programında hazırlanarak moleküler yerleştirme simülasyonları AutoDock4 programında gerçekleştirilmiştir. Etkileşim sonucunda her bir etkileşim için ortaya çıkan bağlanma enerjileri ve etkileşim profilleri analiz edilmiştir. Sonuçlar, her ligandın hedef proteiniyle kararlı bir bağlanma konformasyonu sergilediğini ve bu durumun bakteriyel büyüme ve adaptasyondaki temel rolünü desteklediğini göstermiştir. Triptofan-TnaA etkileşimleri, besin açısından zengin LB'de hücre sağkalımını ve stres tepkisini etkileyen metabolik yollarla ilişkilendirilmiştir. Glikoz-PtsG etkileşimleri, M9'da glikoz alımının tek karbon kaynağı olarak görev yaptığı merkezi rolünü yansıtmıştır. Gliserol-GlpK etkileşimleri, TB'nin gelişmiş enerji ihtiyacını vurgulamış ve bu da gelişmiş biyokütle verimine ve canlılığa katkıda bulunmuştur. Bağlanma enerjileri açısından modelleme sonuçları karşılaştırıldığında, TnaA-Trp (-4,76 kcal/mol), PtsG-Bgc (-1,58 kcal/mol) ve GlpK-Gol (-1,74 kcal/mol) değerleri bulunmuştur. Bu değerler, E. coli'nin farklı ortamlardaki besin moleküllerini tanıma ve metabolize etme kapasitesinin yapısal göstergeleri olarak yorumlanabilir. Sonuçlar karşılaştırmalı analiz edildiğinde LB broth, içerdiği triptofan ve kompleks bileşenler sayesinde E. Coli'nin hem hızlı adaptasyonu hem de döndürme çözme sonrası yeniden aktivasyonu açısından diğer besiyerlerine kıyasla daha üstün olduğu görülmüştür. TB ve M9'un ise yararlı ancak daha sınırlı metabolik destek sağladığı görülmüştür. Bu moleküler modelleme çalışması, E. coli için besiyeri seçimine karşılaştırmalı bir moleküler bakış açısı sunmakta ve modelleme tabanlı yaklaşımların mikrobiyolojik uygulamalarda pratik kararlara nasıl rehberlik edebileceğini vurgulamaktadır.

Anahtar kelimeler: *Escherichia coli*, Moleküler Yerleştirme, Besiyeri Seçimi, In Silico Analiz, Gıda Patojeni

**KASTAMONU'DA BERBERİS VULGARİS BİTKİSİNİN GELENEKSEL KULLANIMI:
KIZAMIK EKŞİSİ VE KARA ÇORBA**
**TRADITIONAL USE OF BERBERIS VULGARIS PLANT IN KASTAMONU: KIZAMIK
SOUR AND BLACK SOUP**

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ÖZET

Berberidaceae familyasına ait olan **Berberis vulgaris L.** (yerel adıyla kızamık), anavatanı Avrupa, Kuzey Amerika ve Asya olan bir bitki olup Türkiye’de özellikle Karadeniz Bölgesi’nde; İstanbul, Kastamonu, Artvin, Samsun, Tokat illerinde ve Çoruh ile Kelkit vadilerinde yayılış göstermektedir. Çalılık alanlar, taşlı yamaçlar ve orman içi boşluklarda 500–1500 m rakımlar arasında yetişen tür; sarı çiçekleri, kırmızı üzüksü meyveleri ve dikenli yapısıyla tanınmaktadır. Çeşitli ikincil metabolitleri, özellikle izokinolin alkaloidleri (berberin, berbamin, palmatin vb.) ve fenolik bileşikleri içermesi nedeniyle hem farmakolojik hem de gıda bilimi açısından dikkat çekici bir bitkidir. Literatürde antioksidan, antibakteriyel, antitümör, antienflamatuar ve antihistaminik özellikleri rapor edilmiştir. Ayrıca geleneksel tıpta ateş düşürücü, müshil ve analjezik olarak kullanımı yaygındır. Bunun yanı sıra, *Berberis vulgaris L.* taze veya işlenmiş meyveleriyle de beslenmede değerlendirilmektedir. Reçel, marmelat, çay ve içecek üretiminde kullanıldığı gibi, bazı yörelerde yaprakları yemeklerde de tüketilmektedir. Kastamonu ilinde bu bitkinin en bilinen geleneksel kullanım alanları arasında, meyvesinden elde edilen “kızamık ekşisi” ile coğrafi işaretli yöresel bir ürün olan “kara çorba” yer almaktadır. Kastamonu yöresinde kızamık ekşisi olarak bilinen ürüne hammadde sağlaması ve coğrafi işaretli kara çorbanın hazırlanışında kullanılması, *Berberis vulgaris L.*’nin yerel kültürel ve gastronomik önemini ortaya koymaktadır. Bu bildiri çalışması, *Berberis vulgaris L.*’nin etken maddeleri, tıbbi ve beslenme amaçlı kullanımı ile Kastamonu yöresindeki geleneksel ürünlerdeki rolünü derlemeyi amaçlamaktadır.

Anahtar Kelimeler: *Berberis vulgaris*, kızamık, berberin, kızamık ekşisi, kara çorba.

ABSTRACT

Berberis vulgaris L. (locally known as *kızamık*), belonging to the Berberidaceae family, is a plant native to Europe, North America, and Asia, and it is distributed in Turkey particularly in the Black Sea Region; in the provinces of Istanbul, Kastamonu, Artvin, Samsun, Tokat, as well as in the Çoruh and Kelkit valleys. The species, which grows in shrublands, rocky slopes, and forest clearings at altitudes between 500–1500 m, is recognized by its yellow flowers, red berry-like fruits, and thorny structure. Due to its various secondary metabolites, especially isoquinoline alkaloids (berberine, berbamine, palmatine, etc.) and phenolic compounds, it is a plant of interest in both pharmacology and food science. Antioxidant, antibacterial, antitumor, anti-inflammatory, and antihistaminic properties have been reported in the literature. In addition, it is widely used in traditional medicine as an antipyretic, laxative, and analgesic. Moreover, *Berberis vulgaris L.* is also consumed in nutrition through its fresh or processed fruits. It is

used in the production of jam, marmalade, tea, and beverages, while in some regions its leaves are also consumed in meals. Among the most well-known traditional uses of this plant in Kastamonu province are “kızamık ekşisi” (a sour condiment obtained from its fruit) and “kara çorba,” a geographically indicated traditional product. The fact that it provides raw material for the product known as kızamık ekşisi in Kastamonu region and is used in the preparation of the geographically indicated kara çorba reveals the local cultural and gastronomic importance of *Berberis vulgaris* L. This study aims to review the active compounds, medicinal and nutritional uses of *Berberis vulgaris* L., as well as its role in traditional products of the Kastamonu region.

Keywords: *Berberis vulgaris*, kızamık, berberine, kızamık sour, black soup.

SAMBUCUS EBULUS BİTKİSİNİN GELENEKSEL KULLANIMI VE SAĞLIK ETKİLERİ
TRADITIONAL USE AND HEALTH EFFECTS OF SAMBUCUS EBULUS PLANT

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ÖZET

Sambucus ebulus (bodur mürver) Adoxaceae familyasına dâhil olup çok yıllık otsu veya çalı formunda gelişen bir bitkidir. Doğal yayılım alanı; Güney ve Orta Avrupa, Kuzeybatı Afrika ile Güneybatı Asya'dır. *S. Ebulus*'un çiçek ve meyveleri; antosiyaninler, flavonoidler ve fenolik asitler açısından zengin bir içerik taşımakta, bu bileşiklerin sağlık üzerine olumlu etkileri güçlü bilimsel verilerle desteklenmektedir. Literatürde, *S. ebulus*'un çiçeklerinde klorojenik asit, kafeik asit ve türevleri ile p-kumarik asit bulunduğu bildirilmektedir. Ekstraktlarda en baskın fenolik bileşik olan klorojenik asit; antiinflamatuvar, antibakteriyel, hepatoprotektif, antiobezite, kardiyoprotektif, antipiretik, nöroprotektif, antimikrobiyal ve antioksidan özellikler gibi pek çok terapötik aktivite göstermektedir. Geleneksel ve halk tıbbında ise bu bitki, dahili ve harici olarak romatizma tedavisinde kullanılmaktadır. Meyvelerinde pektinler, antosiyaninler (mavi renk sağlayan), malik asit, tanenler, valerian asidi ve tartarik asit yer almaktadır. *Sambucus* türlerinin meyveleri hem beslenmede hem de bitkisel tedavi uygulamalarında yaygın biçimde kullanılmaktadır. Olgunlaşmış meyveler; reçel, şurup (bal veya şekerle hazırlanan), şarap, çay, alkollü ya da alkolsüz içecekler, yoğurt ve dondurma üretiminde değerlendirilir. Bitkinin tamamı idrar söktürücü, müshil ve terletici etkilere sahiptir. Meyvelerde bulunan polifenoller, antosiyaninler ve flavonoidler; immün sistemi uyarıcı, antioksidan, antikanser ve antiinflamatuvar etkilerden sorumludur. Ayrıca meyveler yüksek besin değeri ile dikkat çekmektedir. Bu nedenle bu bildiride, *S. ebulus*'un biyoaktif bileşenleri, geleneksel mutfak ve tıbbi kullanımları ile sağlık üzerine etkileri ele alınacaktır.

Anahtar Kelimeler: *Sambucus ebulus*, Polifenoller, Antioksidan, Geleneksel tıp

ABSTRACT

Sambucus ebulus (dwarf elder) belongs to the Adoxaceae family and is a perennial plant that grows either in a herbaceous or shrub form. Its natural distribution areas include Southern and Central Europe, Northwestern Africa, and Southwestern Asia. The flowers and fruits of *S. ebulus* are rich in anthocyanins, flavonoids, and phenolic acids, and the beneficial effects of these compounds on health are supported by strong scientific evidence. According to the literature, the flowers of *S. ebulus* contain chlorogenic acid, caffeic acid and its derivatives, as well as p-coumaric acid. Chlorogenic acid, which is the predominant phenolic compound in the extracts, exhibits a wide range of therapeutic activities, including anti-inflammatory, antibacterial, hepatoprotective, anti-obesity, cardioprotective, antipyretic, neuroprotective, antimicrobial, and antioxidant properties. In traditional and folk medicine, this plant has been used both internally and externally in the treatment of rheumatism. Its fruits contain pectins, anthocyanins (responsible for the blue coloration), malic acid, tannins, valerianic acid, and tartaric acid. The fruits of *Sambucus* species are widely used in both nutrition and herbal medicine applications. Fully

ripened fruits are utilized in the preparation of jams, syrups (prepared with honey or sugar), wines, teas, alcoholic or non-alcoholic beverages, yogurts, and ice creams. The whole plant exhibits diuretic, laxative, and diaphoretic effects. Polyphenols, anthocyanins, and flavonoids present in the fruits are responsible for immunostimulatory, antioxidant, anticancer, and anti-inflammatory effects. In addition, the fruits are considered a valuable nutritional source. Therefore, this paper will address the bioactive components of *S. ebulus*, its traditional culinary and medicinal uses, and its effects on health.

Keywords: Sambucus ebulus, Polyphenols, Antioxidant, Traditional medicine.

YENİ NESİL FONKSİYONEL BİLEŞENLER: POSTBİYOTİKLERİN TANIMI VE ELDE EDİLMESİ

NEW GENERATION FUNCTIONAL INGREDIENTS: DEFINITION AND OBTAINING OF POSTBIOTICS

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ÖZET

Fonksiyonel gıda alanında probiyotikler uzun süredir en çok araştırılan bileşenler arasında yer almakta olup, canlı mikroorganizma içermeleri nedeniyle özellikle bağışıklık sistemi baskılanmış bireylerde güvenlik açısından bazı potansiyel riskler taşımaktadır. Bu doğrultuda, probiyotik kökenli metabolitler veya inaktive edilmiş mikroorganizmalardan elde edilen postbiyotikler; canlı mikroorganizma içermemeleri, ısı ve enzimatik kararlılık göstermeleri, enfeksiyon riski barındırmamaları ve gıda endüstrisinde kolay uygulanabilir yöntemlerle üretilebilmeleri, postbiyotiklerin fonksiyonel bileşen olarak değerini artırmaktadır. Bu çalışmanın amacı, postbiyotiklerin bilimsel tanımını ortaya koymak ve üretim teknolojilerine ilişkin güncel literatürü kapsamlı biçimde incelemektir. Postbiyotikler; bağırsak mikrobiyotasının modülasyonu, epitel bariyer fonksiyonlarının güçlendirilmesi, immün yanıtın düzenlenmesi ile antiinflamatuvar ve antioksidan aktiviteler gibi çok yönlü fizyolojik etkiler sergilemektedir. Uluslararası Probiyotikler ve Prebiyotikler Bilimsel Derneği (ISAPP) tarafından postbiyotikler, “konakçıya sağlık yararı sağlayan cansız mikroorganizmalar ve/veya bileşenlerinin bir preparatı” olarak tanımlanmaktadır. Üretimleri; ısı işlem, yüksek hidrostatik basınç, ışınlama, sonikasyon ve mekanik parçalama gibi çeşitli fiziksel ve kimyasal yöntemlerle gerçekleştirilmektedir. Canlı mikroorganizma içermemeleri, probiyotiklere özgü enfeksiyon riski ve diğer potansiyel olumsuzlukları ortadan kaldırmaktadır. Bununla birlikte, postbiyotiklerin bileşen profillerinin karakterizasyonu, gıda matrisi ile etkileşimlerinin değerlendirilmesi, doz-cevap ilişkilerinin belirlenmesi ve klinik etkinliklerinin doğrulanmasına yönelik ileri düzey araştırmalara ihtiyaç duyulmaktadır. Bu doğrultuda postbiyotikler, hem güvenli hem de etkili biyofonksiyonel bileşenler olarak, probiyotiklere alternatif ya da tamamlayıcı bir yaklaşım sunma potansiyeline sahiptir.

Anahtar Kelimeler: Postbiyotik Tanımı, Postbiyotik Üretimi, Fonksiyonel Gıdalar

ABSTRACT

Probiotics have long been among the most researched ingredients in the functional food sector. However, due to their content of live microorganisms, they carry certain potential risks in terms of safety, particularly for individuals with compromised immune systems. In this context, postbiotics

derived from probiotic metabolites or inactivated microorganisms increase the value of postbiotics as functional components because they do not contain live microorganisms, exhibit thermal and enzymatic stability, do not pose an infection risk, and can be produced using methods that are easily applicable in the food industry. The aim of this study is to establish the scientific definition of postbiotics and to comprehensively review the current literature on production technologies. Postbiotics exhibit multifaceted physiological effects, such as modulation of the gut microbiota, enhancement of epithelial barrier functions, regulation of the immune response, and anti-inflammatory and antioxidant activities. The International Scientific Association for Probiotics and Prebiotics (ISAPP) defines postbiotics as “a preparation of non-living microorganisms and/or their components that provide a health benefit to the host.” Their production is achieved through various physical and chemical methods, such as thermal processing, high hydrostatic pressure, irradiation, sonication, and mechanical fragmentation. Their lack of live microorganisms eliminates the infection risk and other potential drawbacks specific to probiotics. However, advanced research is needed to characterize the component profiles of postbiotics, evaluate their interactions with food matrices, determine dose-response relationships, and validate their clinical efficacy. In this regard, postbiotics have the potential to offer an alternative or complementary approach to probiotics as both safe and effective biofunctional components.

Keywords: Definition of Postbiotics, Postbiotic Production, Functional Foods

**POSTBİYOTİKLERİN SAĞLIK ÜZERİNDEKİ ETKİLERİ: BİLİMSEL KANITLAR
IŞIĞINDA DEĞERLENDİRME**

**THE EFFECTS OF POSTBIOTICS ON HEALTH: AN EVALUATION IN LIGHT OF
SCIENTIFIC EVIDENCE**

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ÖZET

Postbiyotikler, cansız mikroorganizmalardan veya bunların metabolitlerinden elde edilen biyolojik ürünler olup, antimikrobiyal aktivite, bağırsak mikrobiyotasının modülasyonu, immün yanıtın düzenlenmesi ve epitel bariyer fonksiyonunun iyileştirilmesi gibi çeşitli mekanizmalar aracılığıyla konakçı sağlığı üzerinde olumlu etkiler göstermektedir. Probiyotiklerle benzer yararlar sunmalarına karşın postbiyotikler canlı mikroorganizma içermemeleri, özellikle bağışıklık sistemi baskılanmış bireylerde güvenlik açısından önemli bir avantaj oluşturmaktadır. Klinik açıdan bakıldığında klinik öncesi ve klinik araştırmaların sonuçları, farmasötik veya diyet takviyelerinde uygulanan bazı probiyotiklerin özellikle pediatrik popülasyonlarda ve altta yatan hastalığı olanlarda probiyotik kullanımına bağlı bazı yan etkilerin görüldüğü birçok çalışmaya rastlanmaktadır. Son yıllarda yapılan araştırmalar, postbiyotiklerin fonksiyonel gıdalar ve terapötik ajanlar olarak değerlendirilmesine yönelik ilgiyi artırmıştır. Literatürde, postbiyotiklerin gastrointestinal bozukluklar (örneğin; irritabl bağırsak sendromu, Helicobacter pylori enfeksiyonu ve ishal), bağışıklık sistemi ve inflamasyon yönetimi, endokrin fonksiyonların düzenlenmesi ve kas sağlığının korunması üzerine olumlu etkilerini gösteren çok sayıda randomize kontrollü klinik çalışma bulunmaktadır. Bu doğrultuda, postbiyotiklerin probiyotiklere alternatif ya da tamamlayıcı, güvenli ve etkin bir seçenek olabileceğini ortaya koymaktadır. Bu derlemenin amacı, postbiyotiklerin başta bağırsak sağlığı ve bağışıklık sistemi olmak üzere insan sağlığı üzerindeki potansiyel terapötik etkilerini ve klinik çalışmalarla desteklenen sağlık üzerine etkilerini incelemektir. Postbiyotik bileşenlerin karakterizasyonu, kantitatif analizleri, inaktivasyon yöntemlerinin standardizasyonu, gıda matrisi ile olası etkileşimleri ve konakçı ile doz-etki ilişkilerinin netleştirilmesine yönelik ileri araştırmalara ihtiyaç vardır. Ayrıca, önerilen sağlık yararlarının geçerliliği iyi tasarlanmış, randomize, çift kör, plasebo kontrollü klinik denemelerle desteklenmelidir.

Anahtar Kelimeler: Postbiyotikler, Probiyotikler, Bağırsak Mikrobiyotası, Klinik Araştırmalar

ABSTRACT

Postbiotics are biological products derived from dead microorganisms or their metabolites, and they exert positive effects on host health through various mechanisms, including antimicrobial activity, modulation of the gut microbiota, regulation of the immune response, and improvement of epithelial barrier function. Although they offer similar benefits to probiotics, postbiotics do not contain live microorganisms, which is an important safety advantage, especially in individuals with compromised immune systems. From a clinical perspective, the results of preclinical and clinical studies indicate that many studies have reported certain side effects associated with the use of probiotics, particularly in pediatric populations and those with underlying diseases, when applied in pharmaceutical or dietary supplements. Research conducted in recent years has increased interest in evaluating postbiotics as functional foods and therapeutic agents. The literature contains numerous randomized controlled clinical trials demonstrating the positive effects of postbiotics on gastrointestinal disorders (e.g., irritable bowel syndrome, *Helicobacter pylori* infection, and diarrhea), immune system and inflammation management, regulation of endocrine functions, and maintenance of muscle health. In this regard, it has been demonstrated that postbiotics may be a safe and effective alternative or complementary option to probiotics. The aim of this review is to examine the potential therapeutic effects of postbiotics on human health, particularly on gut health and the immune system, and their health effects supported by clinical studies. Further research is needed on the characterization of postbiotic components, quantitative analyses, standardization of inactivation methods, possible interactions with food matrices, and clarification of host-dose-response relationships. In addition, the validity of the suggested health benefits should be supported by well-designed, randomized, double-blind, placebo-controlled clinical trials.

Keywords: Postbiotics, Probiotics, Gut Microbiota, Clinical Studies

**TOPLU BESLENME SİSTEMLERİNDE GIDA HİJYENİ VE SÜRDÜRÜLEBİLİR
BESLENME: BİLGİ DÜZEYLERİNİN BELİRLENMESİ**
**FOOD HYGIENE AND SUSTAINABLE NUTRITION IN MASS CATERING SYSTEMS:
DETERMINATION OF KNOWLEDGE LEVELS**

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ÖZET

Toplu beslenme yapılan kurumlarda besinlerin hazırlanması ve servisinde görevli olan personelin kişisel ve mutfak hijyeni konusunda eğitilmiş ve bilgili olması hem beslenme hizmetinin kalitesi hem de tüketicinin sağlığının korunması açısından önemlidir. Toplu beslenme alanlarında beslenme oranının git gide artması ile çevreye olan zarar artarak sürdürülebilirliği olumsuz etkilemektedir. Yapılan araştırmalar sonucu harcanılan enerjinin en çok yiyecek ve içecek üreten işletmelerde olduğu saptanmıştır. Yürütülen bu çalışmada toplu beslenme hizmetlerinde çalışan bireylerin gıda hijyenine yönelik bilgi, tutum, davranış ve sürdürülebilir gıda okuryazarlığı düzeyinin belirlenmesi amaçlanmıştır. Çalışmaya Sivas'ta yemek üretim hizmeti yapan catering şirketlerinde, otel ve restoran mutfaklarında yiyecek/içecek üretim veya servisinde çalışan (aşçı, aşçı yardımcısı, kasap, bulaşıkçı, meydancı ve servis elemanı vb.) bireyler dahil edilmiştir. Bireylerin sosyo-demografik özelliklerini belirlemek amacıyla bir anket formu uygulanmıştır. Gıda Hijyeni Bilgi, Tutum ve Davranış Düzeyi Ölçeğiyle bireylerin hijyen bilgi, tutum ve davranışlar düzeyi, Sürdürülebilir Gıda Okuryazarlığı Ölçeğiyle sürdürülebilir bilgi düzeyi incelenmiştir. Çalışmaya Sivas'ta toplu beslenme sistemlerinde çalışan %55,8'i kadın olmak üzere toplam 113 birey dahil edilmiştir. Çalışmaya dahil edilen bireylerin %38,9'u aşçı, %31'i garson, %11,5'i aşçı yardımcısı, %6,2'si temizlik personeli, %3,5'i pastacılık ve %8,8'i ise diğer alanlarda çalışmaktadır. Bireylerin meslekte çalışma süresi ortalama 8,40 yıl olarak bulunmuştur. Bireylerin %68,1'i catering, %10,6'sı otel ve %8'i restoranda çalışmaktadır. Bireylerin %80,5'i işe başlamadan önce hijyen eğitimi aldığını belirtmiştir. Bireylerin Sürdürülebilir Gıda Okuryazarlığı Ölçeği toplam puanı 154,08±21,5 olarak bulunmuştur. Bireylerin gıda hijyeni bilgi puanı 1,52±0,2; gıda hijyeni davranış puanı 1,87±0,1 ve gıda hijyeni tutum puanı 4,48±0,6 olarak bulunmuştur. Gıda Hijyeni Bilgi, Tutum ve Davranış Düzeyi Ölçeği toplam puanı ise 7,89±0,6 olarak saptanmıştır. Bireylerin meslekteki çalışma süresi ile gıda hijyeni davranış, tutum ve ölçek toplam puanı arasında pozitif korelasyon ilişkisi saptanmıştır (p<0,05). Bireyleri yaşlarıyla gıda hijyeni tutum ve ölçek toplam puanı arasında pozitif korelasyon ilişkisi saptanmıştır (p<0,05). Hijyen eğitimi alan ve almayan bireyler arasında ise gıda hijyeni tutum puanı bakımından anlamlı fark saptanmıştır (p<0,05). Çalışma sonucunda bireylerin sürdürülebilir gıda okuryazarlığı ve gıda hijyeni tutumlarının yüksek olduğu görülmüştür. Toplu beslenme sistemlerinde çalışan bireylerin meslek tecrübesi ve yaş faktörü gıda hijyeni tutumlarını olumlu etkilemiştir. Ancak bireylerin gıda hijyeni bilgi ve davranış skorlarının düşük

olduğu belirlenmiştir. Bu nedenle toplu beslenme sistemlerinde çalışan bireylerin meslekte çalışma süresine bakılmaksızın gıda hijyenine yönelik eğitim programları düzenlenmeli ve bu eğitimler belirli aralıklarla tekrarlanmalıdır.

Anahtar Kelimeler: Beslenme, Gıda, Hijyen, Sürdürülebilirlik, Toplu Beslenme

ABSTRACT

In institutions where mass catering is carried out, it is crucial that personnel responsible for the preparation and service of foods are educated and knowledgeable about personal and kitchen hygiene — both for the quality of nutrition services and the protection of consumer health. As the rate of catering in mass feeding settings increases, the environmental damage increases as well, negatively affecting sustainability. Research shows that the highest energy consumption is observed in businesses that produce food and beverages. In this study, the aim was to determine the levels of food hygiene knowledge, attitudes, behaviors, and sustainable food literacy of individuals working in mass catering services. The study included individuals working in food/beverage production or service (e.g. cook, assistant cook, butcher, dishwasher, hall staff, service personnel, etc.) in catering companies, hotel and restaurant kitchens in Sivas. A questionnaire was used to determine the socio-demographic characteristics of the participants. The Food Hygiene Knowledge, Attitude and Behavior Scale was used to examine the participants' levels of hygiene knowledge, attitudes and behaviors; the Sustainable Food Literacy Scale was used to examine their level of sustainable knowledge. A total of 113 individuals, 55.8% of whom were women, working in mass catering systems in Sivas were included in the study. Among the participants, 38.9% were cooks, 31.0% waiters, 11.5% assistant cooks, 6.2% cleaning staff, 3.5% pastry staff, and 8.8% worked in other roles. The average duration of their professional experience was 8.40 years. Of them, 68.1% worked in catering, 10.6% in hotels, and 8.0% in restaurants. 80.5% reported having received hygiene training before starting work. The total score on the Sustainable Food Literacy Scale was found to be 154.08 ± 21.5 . The mean scores for food hygiene knowledge, behavior, and attitude were 1.52 ± 0.20 , 1.87 ± 0.10 , and 4.48 ± 0.60 , respectively. The total score on the Food Hygiene Knowledge, Attitude and Behavior Scale was 7.89 ± 0.60 . Positive correlations were found between the duration of service and food hygiene behavior, attitude, and the total scale score ($p < 0.05$). A positive correlation was also found between ages and food hygiene attitude as well as total scale score ($p < 0.05$). A significant difference in food hygiene attitude scores was found between those who had received hygiene training and those who had not ($p < 0.05$). The results show that while the sustainable food literacy and food hygiene attitudes of individuals working in mass catering systems are high, their scores for food hygiene knowledge and behavior are low. The professional experience and age factors of individuals working in mass catering systems positively influenced their food hygiene attitudes. Therefore, hygiene training programs should be implemented for personnel in mass catering systems regardless of their length of professional experience, and these trainings should be repeated at regular intervals.

Keywords: Nutrition, Food, Hygiene, Sustainability, Mass Catering

**KETENCİK TOHUMU MÜSİLAJININ YAĞ İKME MADDESİ OLARAK GLÜTENSİZ
KURABIYE YAPIMINDA KULLANIMI**
**USE OF CAMELINA SEED MUCILAGEN AS A FAT REPLACER IN MAKING GLUTEN-
FREE COOKIES**

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ÖZET

Son yıllarda tüketicilerin beslenme konusunda bilinç seviyesi artmış ve daha sağlıklı ürünlerin tercih edildiği görülmüştür. Özellikle yağ oranı ve enerji değeri düşük ancak diyet lif içeriği yüksek ürünlere talep artmıştır. Tüketicilerin bu talebine cevap vermek adına sağlıklı ve düşük kalorili yağ ikameleri araştırılmaktadır. Öte yandan dünya genelinde gluten intoleransı çok yaygınlaşmış olup bu durumda glütensiz gıda ürünlere de olan ihtiyaç artmıştır. Bu çalışmada ilk kez ketencik tohumu müsilağı (KM), glütensiz (GF) kurabiye formülünde yağ ikamesi olarak kullanılmış ve müsilağ katkılı kurabiyelerin fizikokimyasal ve tekstürel özellikleri araştırılmıştır. Çalışmada GF-Kontrol-Kurabiye, GF-%20 KM-kurabiye ve GF-%40 KM-kurabiye olmak üzere üç farklı kurabiye örneği hazırlanmış olup, şortening sırasıyla %0, %20 ve %40 oranlarında KM ile değiştirilmiştir. GF-%20 KM-Kurabiye ve GF-%40 KM-Kurabiye örneklerinin yağ içeriği kontrol örneğine kıyasla sırasıyla %14.13 ve %35.88 oranında azalmıştır. En yüksek sertlik ve esneklik değerleri GF-Kontrol-Kurabiye örneğine ait iken en düşük değerler GF-%40 KM-Kurabiye örneğine aittir ($p < 0.05$). Müsilağ kullanımı ile kurabiyelerin L^* ve a^* değerleri azalmış olup b^* değeri artmıştır. Bu sonuçlar, KM'nin önemli bir kalite kaybı olmaksızın glütensiz kurabiye üretiminde yağ ikamesi olarak kullanım potansiyelinin olduğunu göstermektedir.

Anahtar kelimeler: Ketencik tohumu müsilağı, şortening, düşük kalori, glütensiz kurabiye.

ABSTRACT

In recent years, consumers have become more aware of nutrition and have been choosing healthier products. There has been an increase in demand for products that are low in fat and energy but high in dietary fiber. In order to meet this demand, healthy and low-calorie fat substitutes are being researched. On the other hand, gluten intolerance has become very common throughout the world, and the need for gluten-free food products has also increased. In this study, for the first time, camelina seed mucilage (CM) was used as a fat substitute in a gluten-free (GF) cookie formula, and the physicochemical and textural properties of mucilage-incorporated cookies were investigated. In the study, three distinct cookie samples were examined: the GF-Control-Cookie, GF-20% CM-Cookie, and GF-40% CM-Cookie, were prepared by replacing shortening with CM at 0%, 20%, and 40% levels, respectively. The

fat content of the GF-20% CM-cookie and GF-40% CM-cookie samples decreased by 14.13% and 35.88%, respectively, compared to the GF-Control-cookie. The highest hardness and flexibility values (9.56 ± 0.84 N and 10.31 ± 0.83 mm) belonged to the GF-Control-cookie, while the lowest (7.34 ± 0.58 N and 7.87 ± 0.58 mm) belonged to the GF-40% CM-cookie ($p < 0.05$). Incorporation of CM in the GF cookie formula resulted in a decrease in L^* and a^* values and an increase in b^* value. These results show that CM has potential utility as a fat substitute in GF cookie production without significant quality loss.

Keywords: Camelina seed, mucilage, shortening, low calorie, gluten-free cookie.

DEPREM DÖNEMİNDE GIDA GÜVENLİĞİ: 6 ŞUBAT DEPREMİ SİVAS İLİ
FOOD SAFETY DURING EARTHQUAKE PERIOD: FEBRUARY 6 EARTHQUAKE SIVAS
PROVINCE

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ÖZET

Doğal afetler, ölüm, yaralanma, yaşam alanı kaybı, gıda, enerji ve su kıtlığı gibi ciddi etkileri nedeniyle insan yaşamını etkileyen küresel problemlerden biridir. Depremi etkilerin ortadan kaldırılabilmesi ve insan yaşamının sürdürülebilmesi için barınma, kıyafet, güvenlik, tıbbi bakım gibi ihtiyaçlar elzem olmakla birlikte bu ihtiyaçlardan birisi de beslenme ihtiyacıdır. Afet gibi olağanüstü durumlarda beslenme ihtiyacının aksamadan sağlanabilmesi afet kaynaklı oluşabilecek can kayıplarının daha da artmasının önüne geçilebilmesine ve insanların ruhsal açıdan kendilerini daha iyi hissetmelerine yardımcı olmaktadır. Doğal afetlerden jeofiziksel olgular sonucu gerçekleşen depremler sonrasında yapılan gözlem ve incelemeler, gıda tedarik zincirindeki aksamalardan kaynaklanan beslenme sorunlarının ortaya çıktığını göstermektedir. Bu aşamada yeterli miktarda, güvenilir ve besleyici gıdaya erişim yaşamın sürdürülebilirliği ve mevcut sağlığın korunması açısından çok önemlidir. Bu çalışmada ülkemizde 6 Şubat 2023 tarihinde meydana gelen depremde kısa dönem gıda tedariki sağlamak amacıyla Sivas Cumhuriyet Üniversitesi tarafından organize edilen, gönüllüler tarafından deprem bölgesine gönderilmek için üretilen ekmek, sandviç ve poğaçaların mikrobiyolojik açıdan gıda mevzuatına uygunluğu araştırılmıştır. Sivas Cumhuriyet Üniversitesi Turizm fakültesi bünyesindeki mutfaklarda yapılan ekmek, sandviç ve poğaçalardan 4 günlük depolama süresince örnekler alınmıştır. Tüm örneklerde maya-küf, *Staphylococcus aureus*, *Bacillus spp.*, *Salmonella spp.*, *Escherichia coli* sayımı

yapılmıştır. Yapılan mikrobiyolojik analizler sonucunda 4 günlük depolama süresi boyunca tüm örneklerde sadece *Bacillus* cinsi tespit edilmiş olup, MALDI-TOF MS (Matris Destekli Lazer Desorpsiyon/İyonizasyon Uçuş Süresi Kütle Spektrometresi) cihazı ile *B. cereus*, *B. subtilis*, *B. pumilus*, *B. magaterium* türleri tanımlanmıştır. Örnekler içeriğinde en çok *Bacillus* cinsi sayısı depolamanın 4. gününden alınan poğaça örneklerinde 56×10^3 kob/ml olarak belirlenmiştir. Örneklerin depolama süresi boyunca *Bacillus* türlerine ait sayıları mikrobiyolojik kriterler açısından gıda mevzuatında belirtilen değerlerin altında olduğu belirlenmiştir. Bu durumda ürünlerinin üretiminde hijyen ve sanitasyon kurallarına uyulduğunu, güvenli hammadde kullanıldığını göstermiştir.

Anahtar Kelimeler: Doğal Afet, Deprem, Gıda Güvenliği.

ABSTRACT

Natural disasters are among the global problems that affect human life due to their serious impacts, including death, injury, loss of habitat, and food, energy, and water scarcity. While shelter, clothing, security, and medical care are essential for mitigating the effects of earthquakes and sustaining human life, one of these needs is the need for nutrition. In extraordinary situations like disasters, meeting nutritional needs without disruption helps prevent further disaster-related deaths and improves people's mental well-being. Observations and studies conducted after earthquakes caused by geophysical phenomena from natural disasters indicate that nutritional problems arise from disruptions in the food supply chain. At this stage, access to sufficient, safe, and nutritious food is crucial for the sustainability of life and the protection of existing health. This study investigated the microbiological compliance of bread, sandwiches, and pastries produced by volunteers to the earthquake zone, organized by Sivas Cumhuriyet University to provide short-term food supplies for the earthquake that struck Turkey on February 6, 2023, with food legislation. Samples were taken from bread, sandwiches, and pastries made in the kitchens of the Tourism Faculty of Sivas Cumhuriyet University during a 4-day storage period. *Yeast and mold*, *Staphylococcus aureus*, *Bacillus spp.*, *Salmonella spp.*, and *Escherichia coli* were counted in all samples. As a result of microbiological analyses, only the *Bacillus* genus was detected in all samples during the 4-day storage period. MALDI-TOF MS (Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry) identified *B. cereus*, *B. subtilis*, *B. pumilus*, and *B. magaterium*. The highest number of *Bacillus* species was found in the pastry samples taken on the 4th day of storage, at 56×10^3 cfu/ml. Throughout the storage period, the number of *Bacillus* species was found to be below the limits specified in food legislation in terms of microbiological criteria. This demonstrated that hygiene and sanitation rules were followed in the production of food products and that safe raw materials were used.

Keywords: Natural Disaster, Earthquake, Food Security.

FERMENTE GIDALARIN ANTİBİYOTİK DİRENÇ GENLERİNİ TAŞIMA POTANSİYELİ
THE POTENTIAL OF FERMENTED FOODS TO TRANSFER ANTIBIOTIC RESISTANCE
GENES

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ÖZET

Fermente gıdalar, gıda bileşenlerinin kontrollü mikrobiyal büyüme ve enzimatik modifikasyon süreçleriyle elde edilen ürünler olarak tanımlanmaktadır. Bu ürünler, probiyotiklerin taşıyıcısı olarak işlev görerek onların konağa etkin biçimde ulaşmasını sağlamakta ve böylece hem modifiye edilmiş gıda matriksinin hem de içerdiği probiyotik mikroorganizmaların sağlık yararlarını bir arada sunabilmektedirler. Yoğurt, peynir, sirke, kefir ve turşu gibi fermente ürünlerde doğal olarak bulunan laktik asit bakterileri, bağırsak mikrobiyotasını düzenleme, bağışıklık sistemi destekleme ve sindirimi kolaylaştırma gibi olumlu etkileri nedeniyle yoğun ilgi görmektedir. Ancak, bu probiyotik suşların bazıları, doğal mekanizmalar veya yatay gen transferi yoluyla kazanılmış antibiyotik direnç genlerini barındırabilmektedir. Bu direnç genleri, özellikle hayvancılıkta kontrolsüz antibiyotik kullanımı, çevresel kontaminasyon ve endüstriyel atıklar gibi çeşitli yollarla mikrobiyal topluluklarda hızla yaygınlaşabilmektedir. Bu durum, Dünya Sağlık Örgütü (WHO) tarafından küresel bir tehdit olarak kabul edilen antimikrobiyal direnç bağlamında gıda güvenliği ve halk sağlığı açısından kritik bir risk faktörü olarak değerlendirilmektedir. Mikroorganizmalar, yatay gen transferi mekanizmalarından olan konjugasyon, transformasyon ve transdüksiyon ile direnç genlerini diğer bakterilere aktarabilmektedirler. Fermente gıdalar, bu genlerin insan bağırsak mikrobiyotasına transferinde potansiyel bir taşıyıcı rol üstlenebilmektedir. Direnç genlerinin patojen mikroorganizmalara aktarılması, tedavi sürecini olumsuz etkilemektedir. Bu nedenle, fermente gıdalarda antibiyotik direnç genlerinin tespiti ve izlenmesi büyük önem taşımaktadır. Günümüzde, polimeraz zincir reaksiyonu (PCR) ve kantitatif PCR (qPCR) gibi yöntemler, direnç genlerinin hızlı ve spesifik tespitinde kullanılırken; metagenomik dizileme ve yüksek verimli dizileme (next-generation sequencing) teknolojileri, kompleks mikrobiyal topluluklardaki direnç genlerinin kapsamlı analizine olanak sağlamaktadır. Fermente ürünlerde antibiyotik direnç riskini minimize etmek için, bu genleri taşımayan güvenli mikroorganizmaların kullanılması, patojenleri inhibe edecek optimizasyonun (pH, sıcaklık, süre) sağlanması ve istenmeyen mikrobiyal kontaminasyonunun önlenmesi gerekmektedir. Bunlara ek olarak uluslararası düzenlemelerle gıda kaynaklı direnç geni yayılımının kontrol altına alınması hayati önem taşımaktadır.

Anahtar Kelimeler: antibiyotik direnci, direnç genleri, fermente gıdalar, gıda güvenliği.

ABSTRACT

Fermented foods are defined as products derived from the controlled microbial growth and enzymatic modification of food components. These products function as carriers for probiotics, ensuring their effective delivery to the host. Thus, they are able to offer both the health benefits of the modified food matrix and the probiotic microorganisms it contains. Lactic acid bacteria naturally present in fermented products such as yogurt, cheese, vinegar, kefir, and pickles have attracted considerable attention due to their beneficial effects, including modulation of the gut microbiota, support of the immune system, and facilitation of digestion. However, some of these probiotic strains may harbour antibiotic resistance genes acquired through natural mechanisms or horizontal gene transfer. These resistance genes can rapidly disseminate within microbial communities, particularly through various pathways such as uncontrolled antibiotic use in livestock, environmental contamination, and industrial waste. This situation is considered a critical risk factor for food safety and public health in the context of antimicrobial resistance, which is recognised as a global threat by the World Health Organisation (WHO). Microorganisms can transfer resistance genes to other bacteria through conjugation, transformation and transduction, which are mechanisms of horizontal gene transfer. Fermented foods may play a potential role as carriers in the transfer of these genes to the human gut microbiota. The transfer of resistance genes to pathogenic microorganisms adversely affects the treatment process. Therefore, the detection and monitoring of antibiotic resistance genes in fermented foods is of great importance. Nowadays, techniques such as polymerase chain reaction (PCR) and quantitative PCR (qPCR) are used for the rapid and specific detection of resistance genes, while metagenomic sequencing and high-throughput sequencing (next-generation sequencing) technologies enable comprehensive analysis of resistance genes in complex microbial communities. To minimize the risk of antibiotic resistance in fermented products, it is necessary to use safe microorganisms that do not carry these genes, ensure optimization (pH, temperature, duration) to inhibit pathogens, and prevent unwanted microbial contamination. In addition, controlling the dissemination of foodborne resistance genes through international regulations is of crucial importance.

Keywords: antibiotic resistance, resistance genes, fermented foods, food safety.

**MİKRODALGA YÖNTEMİYLE KURUTULAN KIRMIZI VE YEŞİL BİBERLERDEN ELDE
EDİLEN TOZLARLA ZENGİNLEŞTİRİLEN KRAKERLERİN FİZİKSEL VE DUYUSAL
ÖZELLİKLERİ**

**PHYSICAL AND SENSORY PROPERTIES OF CRACKERS ENRICHED WITH POWDERS
OBTAINED FROM RED AND GREEN PEPPERS DRIED BY MICROWAVE METHOD**

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ÖZET

Kırmızı ve yeşil biberler, fenolikçe zengin ve doğal renk veren mevsimsel sebzeler olup, doğru kurutma yöntemleriyle kalitelerinin korunması önemlidir. Günümüzde tüketicilerin daha sağlıklı ve doğal içeriklere yönelmesiyle, kraker gibi atıştırmalıkların besin ve duyu kalitesini artırmak için doğal bileşen kullanımı önem kazanmaktadır. Bu çalışmanın amacı, mikrodalga yöntemiyle kurutulan kırmızı ve yeşil biber tozlarının, farklı oranlarda (%5, %10, %15) krakerlere eklenmesiyle biber türünün ve doz seviyelerinin ürünün renk, tekstür ve duyu özellikleri üzerindeki etkilerinin belirlenmesidir. Kontrol kraker en yüksek L* değeriyle (73,51 ± 0,45) en açık renge sahipken, biber eklenen krakerler daha koyu renkte olmuştur. %5 kırmızı ve yeşil biber eklenen krakerler renk açısından kontrole daha yakinken, en düşük L* değerleri %10 ve %15 kırmızı biberli krakerlerde gözlenmiştir. Tekstür değerlerine bakıldığında, sertlik açısından %15 yeşil biber kullanımı en yüksek değeri verirken, kırmızı biberde %5 ve %10 dozları daha orta sertlik ve kırılabilirlik değerleriyle kontrole yakın sonuçlar vermiştir. Kırılabilirlik değerleri açısından, %15 kırmızı biber en düşük değeri göstererek daha esnek bir yapıya işaret etmiştir. Kontrol krakerler en yüksek duyu puanları alırken, kırmızı biber özellikle %15 dozda yeşil biberden daha iyi genel beğeni ve görünüş sağlamış, yeşil biberde doz arttıkça duyu puanları azalmıştır. Sonuç olarak, yeşil biberde %5 dozu, kırmızı biberde ise %5 ve %10 dozları kontrole en yakın fiziksel ve duyu özellikleri sunması sebebiyle tercih edilebilir.

Anahtar Kelimeler: kırmızı ve yeşil biber, mikrodalga kurutma, kraker, zenginleştirme, renk ve tekstürel özellikler

ABSTRACT

Red and green peppers are seasonal vegetables rich in phenolics and natural colorants, making it important to preserve their quality through proper drying methods. With consumers increasingly turning to healthier and more natural ingredients today, the use of natural components to enhance the nutritional and sensory quality of snacks such as crackers has gained importance. The aim of this study is to determine the effects of red and green pepper powders, dried by microwave method and added at

different levels (5%, 10%, 15%) to crackers, on the product's color, texture, and sensory properties according to pepper type and dosage. The control crackers had the highest L* value (73.51 ± 0.45), indicating the lightest color, while crackers with added pepper powders exhibited darker colors. Crackers enriched with 5% red and green pepper were closer to the control in terms of color, whereas the lowest L* values were observed in crackers with 10% and 15% red pepper. Regarding texture, the highest hardness value was found in crackers with 15% green pepper, while red pepper at 5% and 10% doses showed moderate hardness and brittleness values closer to the control. The lowest brittleness was observed in crackers with 15% red pepper, indicating a more flexible structure. Control crackers received the highest sensory scores, but red pepper, especially at the 15% dose, achieved better overall acceptance and appearance compared to green pepper, which showed a decrease in sensory scores with increasing dosage. In conclusion, the 5% dose of green pepper and the 5% and 10% doses of red pepper provided physical and sensory properties closest to the control and are thus preferable.

Keywords: red and green pepper, microwave drying, cracker, enrichment, color and textural properties

**NAR POSASI TOZU İLE ZENGİNLEŞTİRİLMİŞ GLUTENSİZ BİSKÜVİLERİN
TEKNOLOJİK VE DUYUSAL ÖZELLİKLERİ**
**TECHNOLOGICAL AND SENSORY PROPERTIES OF GLUTEN-FREE BISCUITS
ENRICHED WITH POMEGRANATE PULP POWDER**

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ÖZET

Meyve ve sebze işleme süreçlerinde ortaya çıkan atık ve yan ürünler, zengin besinsel içerikleri ve teknolojik özellikleri nedeniyle araştırmacıların ilgisini çekmektedir. Gıda endüstrisinde nar suyu ve türevlerinin üretimi sırasında nar kabuğu ve çekirdekten oluşan posa açığa çıkmaktadır. Nar posası fenolik bileşikler, flavonoidler ve diyet lifi açısından zengin olup, değerlendirilmeleri hem besinsel fayda hem de çevresel sürdürülebilirlik açısından önemlidir. Bu çalışmada nar posasından elde edilen tozun (NPT) farklı oranları (%0, 3, 6, 9, 12) glutensiz bisküvi formülasyonuna ikame edilerek ürünün renk, tekstür ve duyuşal özellikleri üzerindeki etkileri araştırılmıştır. Bisküvilerin renk özellikleri incelendiğinde, artan oranda NPT ikamesiyle örneklerin L* değerlerinde azalma, a* ve b*değerinde artış meydana gelmiş ve en düşük L* değeri %12 NPT ikameli bisküvi örneklerinde ölçülmüştür. Nar posası kullanımı örneklerin tekstürel özelliklerini etkilemiş ve ikame oranlarının artması ile bisküvide daha sert bir yapı gözlemlenmiş, kontrol grubuna (4426,11 ± 752,70) göre en yüksek sertlik değeri (9709,21± 1652,127) %9 NPT ikameli bisküvi örneklerinde ölçülmüştür. Bisküvi formülasyonundaki NPT oranı arttıkça duyuşal panelden alınan puanlarda düşüş görülmüştür. Yapılan duyuşal değerlendirmelerde; %9 NPT ikameli bisküvilerin renk ve görünüş özellikleri panelistler tarafından en yüksek skorlar ile değerlendirilmiştir. Tat, koku ve gevreklik değerleri %3 NPT ikameli örneklerde yüksek beğeni skorları almıştır. Bu çalışma sonucu elde edilen veriler, besinsel açıdan zenginleştirilmiş bisküvi üretiminde NPT'nin %9 oranına kadar, son ürünün teknolojik ve organoleptik özelliklerini olumsuz yönde etkilemeden kullanılabileceğini ortaya koymaktadır.

Anahtar Kelimeler: glutensiz bisküvi, Punica granatum, atık, yan ürün, teknolojik özellikler

ABSTRACT

Waste and by-products generated during fruit and vegetable processing attract the attention of researchers due to their rich nutritional content and technological properties. During the production of pomegranate juice and its derivatives in the food industry, pomegranate peel and seed pulp are produced. Pomegranate pulp is rich in phenolic compounds, flavonoids, and dietary fiber, and its utilization is important for both nutritional benefits and environmental sustainability. In this study, different

proportions of pomegranate pulp (PPP) were substituted into a gluten-free biscuit formulation (0, 3, 6, 9, and 12%) to investigate the effects on color, texture, and sensory properties of the product. When the color properties of the biscuits were examined, the L^* values of the samples decreased with increasing PPP substitution, while a^* and b^* values increased. The lowest L^* value was measured in the biscuit samples with 12% PPP substitution. The use of pomegranate pulp affected the textural properties of the samples, and with increasing substitution rates, a harder structure was observed in the biscuits. The highest hardness value (9709.21 ± 1652.127) was measured in the biscuit samples with 9% PPP substitution compared to the control group (4426.11 ± 752.70). As the PPP ratio in the biscuit formulation increased, a decrease in the scores obtained from the sensory panel was observed. In the sensory evaluations, the color and appearance of the biscuits with 9% PPP substitution were evaluated with the highest scores by the panelists. Taste, odor, and crispness values received high approval scores in the samples with 3% PPP substitution. The data obtained from this study reveal that up to 9% PPP can be used in the production of nutritionally enriched biscuits without adversely affecting the technological and organoleptic properties of the final product.

Keywords: gluten-free biscuit, *Punica granatum*, waste, by-product, technological properties.

GIDA ENDÜSTRİSİNDE OLEOJEL UYGULAMALARI VE GELECEĞİ
OLEOGEL APPLICATIONS AND FUTURE IN THE FOOD INDUSTRY

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ÖZET

Bu çalışmada oleojellerin gıda endüstrisindeki işlevsel uygulama alanlarının ve gelecek kullanım imkânlarının, sağlık/regülasyon bağlamı ve sürdürülebilirlik boyutuyla birlikte bütüncül biçimde değerlendirilmesi amaçlanmıştır. Oleojeller; balmumu, monogliserit, fitosterol ve etilselüloz gibi jelatörlerin kullanılmasıyla sıvı yağların üç boyutlu ağ yapıları içinde immobilize edilmesi sonucu katı yağ benzeri işlevler kazandırmaktadır. Bu sistemlerde reolojik parametreler (ör. $G' > G''$ koşulunun sağlanması, lineer viskoelastik bölgenin genişliği, akma gerilmesi), kristal morfolojisi ve hibrit ağ mimarisi; ürünün tekstürel özelliklerini, fonksiyonel yayılabilirliğini ve oksidatif ile fiziksel stabilitesini belirleyen kritik yapısal göstergeler olarak değerlendirilmektedir. Bu parametrelerin optimizasyonu, oleojel bazlı sistemlerin endüstriyel ölçekte istenen kalite ve dayanıklılığı sağlayabilmesi açısından temel bir rol oynamaktadır. Fırıncılık, margarin/sürülebilir ürünler, süt ve et ürünleri ile çikolata uygulamalarında katı yağ ikamesi başarıyla sağlanırken, doymuş/trans yağ yükü azaltılmaktadır. Oleojeller ayrıca lipofilik biyoaktiflerin korunumu/ kontrollü salımı ve emülsiyon/kaplama sistemlerinde raf ömrü iyileştirmeleri sunmaktadır. Duyusal optimizasyon (özellikle bazı mum bazlı sistemlerde “balmumsu” his), endüstriyel ölçeklenebilirlik, raf ömrü modellemesi ve maliyet analizleri öncelikli Ar-Ge alanları olduğu saptanmıştır. Klinik düzeyde uzun dönem insan çalışmalarına, yeşil üretim teknolojilerinin entegrasyonuna ve uluslararası standardizasyon/etiketleme netliğine ihtiyaç bulunduğu belirlenmiştir. Oleojellerin, trans ve doymuş yağların azaltılması, fonksiyonel bileşenlerin taşınması ve ürün kalitesinin korunması açısından sunduğu güçlü yapı sayesinde gıda endüstrisinde benimsenmesinin artacağı öngörülmektedir. Bu yaygınlaşma, formülasyon–proses etkileşimlerinin optimize edilmesi ve düzenleyici çerçevenin netleşmesiyle birlikte hız kazanacaktır.

Anahtar kelimeler: Oleojel, Katı yağ ikamesi, Duyusal kalite, Gıda endüstriyel uygulamalar, Sürdürülebilirlik.

ABSTRACT

In this study, the functional application areas and future utilization potential of oleogels in the food industry were comprehensively evaluated, together with their health/regulatory context and sustainability dimension. Oleogels provide solid-fat-like functionality by immobilizing liquid oils within three-dimensional networks using gelators such as waxes, monoglycerides, phytosterols, and ethyl cellulose. In these systems, rheological parameters (e.g., ensuring $G' > G''$, width of the linear viscoelastic zone, yield stress), crystal morphology, and hybrid network architecture are considered critical structural indicators that determine the textural properties, functional spreadability, and oxidative

and physical stability of the product. In bakery, margarines/spreads, dairy and meat products, and chocolate, solid-fat replacement has been successfully achieved while reducing saturated/trans fat loads. Oleogels also offer protection/controlled release of lipophilic bioactives and shelf-life improvements in emulsion/coating systems. Sensory optimization (particularly mitigating the “waxy” sensation in some wax-based systems), industrial scalability, shelf-life modeling, and cost analyses were identified as priority R&D areas. The need for long-term human clinical trials, integration of green processing technologies, and clearer international standardization/labeling was also highlighted. Oleogels are anticipated to increase their adoption in the food industry due to their robust structure in reducing trans and saturated fats, transporting functional ingredients, and preserving product quality. This adoption will accelerate with the optimization of formulation-process interactions and the clarification of the regulatory framework.

Keywords: Oleogel, Solid-fat replacement, sensory quality, Food industrial applications, Sustainability.

GIDA SANAYİNDE ENKAPSÜLASYON UYGULAMALARI
ENCAPSULATION APPLICATIONS IN THE FOOD INDUSTRY

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ÖZET

Enkapsülasyon, gıda endüstrisinde biyoaktif bileşiklerin (vitaminler, antioksidanlar, probiyotikler, aroma bileşikleri vb.) korunması, kontrollü salınımı ve biyoyararlanımının artırılması amacıyla kullanılan yenilikçi bir teknolojidir. Katı, sıvı veya gaz haldeki aktif maddelerin protein, polisakkarit veya lipid esaslı kaplama materyalleriyle hapsedilmesi prensibine dayanır. Bu yöntem sayesinde, gıdalarda fonksiyonel bileşiklerin çevresel koşullara karşı korunması, raf ömrünün uzatılması ve duyu özelliklerinin iyileştirilmesi mümkün olmaktadır. Gıda endüstrisinde yaygın kullanılan kapsülleme teknikleri arasında sprey kurutma, dondurarak kurutma, koaservasyon, emülsifikasyon ve ekstrüzyon yer almaktadır. Ayrıca, nanotaşıyıcı sistemler (lipozomlar, hidrojel, hibrit taşıyıcılar) aktif bileşiklerin daha etkin taşınmasını ve hedefli salınımını sağlamaktadır. Kapsül duvarı materyali olarak polisakkaritler, proteinler, lipidler, selüloz türevleri ve biyobozunur polimerler kullanılmaktadır. Bu materyallerin seçimi, kapsülleme verimliliği, bileşik stabilitesi ve istenen fonksiyonel özellikler üzerinde belirleyici rol oynamaktadır. Literatürde yapılan çalışmalar, enkapsülasyonun probiyotiklerin canlılığını korumada, esansiyel yağların oksidatif bozulmasını önlemede, antosiyaninler gibi doğal pigmentlerin stabilitesini artırmada ve fonksiyonel süt ürünleri ile içeceklerde besin değerini desteklemede etkili olduğunu göstermektedir. Bu yönüyle enkapsülasyon, gıda endüstrisinde ürün geliştirme, fonksiyonel gıdaların yaygınlaştırılması ve sürdürülebilir üretim stratejilerinde öne çıkan bir teknolojidir. Ancak, yüksek üretim maliyetleri, regülasyon eksiklikleri ve depolama koşullarına bağlı stabilite sorunları teknolojinin yaygın kullanımını sınırlandırmaktadır. Gelecekte, biyobozunur ve ekonomik taşıyıcı materyallerin geliştirilmesiyle enkapsülasyonun daha geniş bir uygulama alanı bulması beklenmektedir. Bu bildirinin amacı, gıda sanayinde enkapsülasyon teknolojisinin mevcut durumu ile uygulama alanlarını ortaya koymak; kullanılan yöntem ve materyalleri tanıtmak; avantajlar ile sınırlılıkları tartışmak; ayrıca gelecekteki potansiyel gelişmelere ışık tutmaktır.

Anahtar Kelimeler: Enkapsülasyon, fonksiyonel gıdalar, nanoteknoloji, kapsülleme teknikleri.

ABSTRACT

Encapsulation is an innovative technology used in the food industry for the protection, controlled release, and enhanced bioavailability of bioactive compounds such as vitamins, antioxidants, probiotics, and flavor compounds. It is based on the principle of entrapping active substances in solid, liquid, or gaseous forms within coating materials composed of proteins, polysaccharides, or lipids. This method enables the protection of functional compounds in foods against environmental conditions, extends shelf life, and improves sensory properties. Common encapsulation techniques used in the food industry include spray drying, freeze-drying, coacervation, emulsification, and extrusion. Additionally, nanocarrier systems (liposomes, hydrogels, hybrid carriers) facilitate more effective transport and targeted release of active compounds. Polysaccharides, proteins, lipids, cellulose derivatives, and biodegradable polymers are employed as capsule wall materials. The choice of these materials plays a critical role in encapsulation efficiency, compound stability, and desired functional properties. Studies in the literature have shown that encapsulation is effective in maintaining the viability of probiotics, preventing oxidative degradation of essential oils, enhancing the stability of natural pigments such as anthocyanins, and supporting nutritional value in functional dairy products and beverages. In this regard, encapsulation stands out as a key technology in product development, the promotion of functional foods, and sustainable production strategies in the food industry. However, high production costs, regulatory gaps, and stability issues related to storage conditions limit the widespread use of this technology. In the future, the development of biodegradable and cost-effective carrier materials is expected to expand the application scope of encapsulation. The aim of this paper is to present the current status and application areas of encapsulation technology in the food industry; to introduce the methods and materials used; to discuss its advantages and limitations; and to shed light on potential future developments.

Keywords: Encapsulation, functional foods, nanotechnology, encapsulation techniques.

**GLİSEMİK İNDEKS, HASTALIKLARLA İLİŞKİSİ VE GLİSEMİK İNDEKSİ DÜŞÜRMEYE
YÖNELİK YAKLAŞIMLAR**

**GLYCEMIC INDEX, ITS RELATIONSHIP WITH DISEASES AND APPROACHES FOR ITS
REDUCTION**

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ÖZET

Günümüzde sağlıklı beslenmeye olan ihtiyacın artmasıyla diyetlerdeki karbonhidratların kalitesinin değerlendirilmesi her zamankinden daha önemli hale gelmiştir. Son yıllarda ülkemizde ve dünyada yanlış ve yetersiz beslenme ile hareketsizlikten kaynaklanan kronik hastalıklar, kalp-damar hastalıkları, obezite ve diyabet giderek artmaktadır. Sağlıklı beslenmede önemli noktalardan biri karbonhidrat metabolizması ve doğru seçilen karbonhidrat kaynaklarıdır. Glisemik indeks, karbonhidrat içeren bir gıdanın kan şekerini ne kadar hızlı yükselteceğini gösteren bir ölçüttür. Besinlerin glisemik indeks değerlerini etkileyen ve değiştiren birçok etmen vardır. Yüksek glisemik indeksli gıdalar hızlı bir şekilde kan şekerini yükseltirken, düşük glisemik indeksli gıdalar kan şekerini daha yavaş yükseltir. Tüketildikten sonra kan şekerini hızlı yükselten besinler, pankreastan aşırı insülin salınımına sebep olur. Artan insülin, kan şekerinin vücutta yağ olarak depolanmasına ve kanda şeker oranının hızla düşmesine neden olur. Bu durum kişide artmış yağlanmaya ve yemekten sonra kısa sürede tekrar açlık hissine sebep olur. Yıllar içerisinde genetik yatkınlığı olan kişilerde obezite, insülin direnci, beta-hücrelerinde işlev bozuklukları, oksidatif stres, damar çeperlerinde ve kan yağlarında bozulmalar gibi sorunlara yol açarak sonunda Tip 2 diyabet, hipertansiyon ve kardiyovasküler hastalıklara yol açabilir. Öte yandan, düşük glisemik indeksli diyetler, glisemik kontrolü ve insülin duyarlılığını iyileştirici, kolesterolü düşürücü, kalp-damar hastalığı ve tip 2 diyabet riskini azaltıcı etki gösterir. Günlük aldığımız toplam enerjinin yaklaşık yarısının karbonhidratlardan karşılanması ve karbonhidratların glisemik indeksi belirleyici önemli besinler olması nedeniyle, diyetle aldığımız karbonhidratların kalitesi ve glisemik indeks değerleri sağlık açısından oldukça etkilidir. Bu sebeple düşük glisemik indeksli ürünlerin geliştirilmesi ve yaygınlaştırılması halk sağlığı açısından önemlidir.

Anahtar kelimeler: Glisemik indeks, karbonhidrat, kan şekeri, insülin, obezite, kardiyovasküler hastalık, tip 2 diyabet

ABSTRACT

With the increasing need for healthy nutrition in today's conditions, evaluating the quality of carbohydrates in diets has become more important than ever. In recent years, chronic diseases, cardiovascular diseases, obesity and diabetes caused by improper and inadequate nutrition and inactivity have been increasing in our country and the world. One of the important points in healthy nutrition is carbohydrate metabolism and correctly selected carbohydrate sources. The glycemic index is a measure that shows how quickly a food containing carbohydrates will increase blood sugar. There are many factors that affect and change the glycemic index values of foods. While high glycemic index foods increase blood sugar quickly, low glycemic index foods increase blood sugar more slowly. Foods that increase blood sugar rapidly after consumption cause excessive insulin secretion from the pancreas. Increased insulin causes blood sugar to be stored as fat in the body and the blood sugar rate to decrease rapidly. This situation causes increased fatness in the person and a feeling of hunger again shortly after eating. Over the years, obesity in people with a genetic predisposition can lead to problems such as insulin resistance, beta cell dysfunction, oxidative stress, deterioration of vascular walls and blood lipids, and eventually lead to Type 2 diabetes, hypertension and cardiovascular diseases. On the other hand, low glycemic index diets improve glycemic control and insulin sensitivity, lower cholesterol, and reduce the risk of cardiovascular disease and type 2 diabetes. Since approximately half of our total daily energy comes from carbohydrates and carbohydrates are important nutrients that determine the glycemic index, the quality of the carbohydrates we take in through our diet and their glycemic index values are quite effective in terms of health. For this reason, the development and dissemination of low glycemic index products is important for public health.

Keywords: Glycemic index, carbohydrate, blood sugar, insulin, obesity, cardiovascular disease, type 2 diabetes

DENİZ ÜRÜNLERİNİN FONKSİYONEL GIDA OLARAK ÖNEMİ
THE IMPORTANCE OF SEAFOOD AS FUNCTIONAL FOOD

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ÖZET

Fonksiyonel gıda besleyici özelliklerine ek olarak insan sağlığını iyi yönde etkileyen, hastalıkların oluşmasını önleyen, vücut fonksiyonları üzerine düzenleyici etkisi olan gıdalardır. Günümüzde insanların beslenme konusunda daha bilinçli hareket etmesi fonksiyonel besinlere olan ilgiyi artırmıştır. Bunun sonucunda bu tür gıdaların üretim ve tüketim miktarları dünya çapında artış göstermiştir.

Sağlıklı beslenmek isteyen bireyler, besin öğelerini yeterli ve dengeli oranda içeren besinleri tercih etmektedirler. Balık eti bunların başında gelmektedir. Balık ve diğer deniz ürünleri kalsiyum, peptit ve hidrolizatları, antioksidanlar, selenyum, kitin, omega-3 çoklu doymamış yağ asitleri (PUFA), taurin ve diğer biyoaktif bileşenler bakımından zengindir. Bu bileşenler çeşitli deniz ürünlerinden elde edilebilir. Yengeç ve karides kabuk zenginliği sayesinde kitin ve kitosan, somon ve morina balığı omega-3, deniz balıklarından vitamin ve mineraller, köpek balıklarından kartilaj, balık kılçıklarından kalsiyum, balık proteinlerinden biyoaktif peptit ve balık proteinin hidrolizatları, morina uskumru somon gibi balıklardan taurin elde edilir.

Balık eti; omega-3 serisi çoklu doymamış yağ asitleri, eikosapentaenoik (EPA) ve dokosaheksaenoik (DHA) asitleri açısından zengindir. Balık tüketilerek alınan omega-3 yağ asitleri insan vücudunda önemli fizyolojik ve biyokimyasal etkilere yol açar. EPA kardiyovasküler sorunların önüne geçilmesine, DHA ise göz sağlığı, büyüme ve beyin fonksiyonlarının gelişmesine önemli fayda sağlamaktadır.

Deniz canlılarından elde edilen kitin, kitosan ve benzeri ürünler kullanıldığı gıda maddelerinde antioksidan etki gösterir. Omega-3 yağ asitleri prostat, göğüs, akciğer ve bağırsak kanserinin engellenmesi, kardiyovasküler hastalıklar, nörolojik hastalıkların önlenmesinde önemli etkileri vardır. Ayrıca göz sinirlerinin gelişmesi üzerine de olumlu etkileri bulunmaktadır. Protein hidrolizatları yüksek kaliteli protein olmasının yanında antioksidan özelliği de taşır. Köpek balığı kartilajı antikanserojen ajan olarak, balık kılçığı ise diş ve kemiklerin güçlendirilmesi için kullanılır. Taurin ise Alzheimer riskini azaltır ve sistik fibroza karşı koruyucudur.

Anahtar Kelimeler: Fonksiyonel gıda, omega-3, EPA, DHA, balık

ABSTRACT

Functional foods are foods that, in addition to their nutritional properties, positively affect human health, prevent the onset of diseases, and have a regulatory effect on bodily functions. Today, people's increased awareness of nutrition has led to a rise in interest in functional foods. As a result, the production and consumption of these foods have increased worldwide.

Individuals who want to eat healthily prefer foods that contain sufficient and balanced amounts of nutrients. Fish meat is at the top of this list. Fish and other seafood are rich in calcium, peptides and hydrolysates, antioxidants, selenium, chitin, omega-3 polyunsaturated fatty acids (PUFA), taurine, and other bioactive components. These components can be obtained from various seafood. Crab and shrimp shells are rich in chitin and chitosan, salmon and cod are rich in omega-3, sea fish provide vitamins and minerals, sharks provide cartilage, fish bones provide calcium, fish proteins provide bioactive peptides and fish protein hydrolysates, and fish such as cod, mackerel, and salmon provide taurine.

Fish meat is rich in omega-3 series polyunsaturated fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Omega-3 fatty acids obtained by consuming fish have important physiological and biochemical effects on the human body. EPA helps prevent cardiovascular problems, while DHA provides significant benefits for eye health, growth, and brain function development.

Chitin, chitosan, and similar products obtained from marine organisms exhibit antioxidant effects in food products where they are used. Omega-3 fatty acids have important effects in preventing prostate, breast, lung, and colon cancer, cardiovascular diseases, and neurological diseases. They also have positive effects on the development of the optic nerves. Protein hydrolysates are high-quality proteins and also have antioxidant properties. Shark cartilage is used as an anticarcinogenic agent, while fish bones are used to strengthen teeth and bones. Taurine reduces the risk of Alzheimer's disease and protects against cystic fibrosis.

Key Words: Functional food, omega-3, EPA, DHA, fish

PIŞİRME EKİPMANLARINDA GÖRÜNMEYEN TEHLİKE: GIDALARA AĞIR METAL GEÇİŞİ

THE INVISIBLE HAZARD IN COOKING EQUIPMENT: THE TRANSITION OF HEAVY METALS INTO FOODS

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ÖZET

Bu çalışma, gıdalara pişirme ekipmanları aracılığıyla bulaşan ağır metallerin varlığı ve bunların insan sağlığı üzerindeki etkilerini araştırmayı amaçlamaktadır. Günümüzde gıda güvenliği, küresel ölçekte insan sağlığının korunması ve sağlıklı toplumların oluşumu açısından önemli bir sorun haline gelmiştir. Özellikle ağır metallerin gıdalara geçişi ciddi bir risk oluşturmaktadır. Gıdaların üretiminden saklama, pişirme ve tüketime kadar geçen süreçte ambalajlardan, mutfak eşyalarından ve pişirme ekipmanlarından meydana gelen ağır metal bulaşmaları dikkat çekmektedir. Bu çalışmada öncelikle ağır metal kavramı sonrasında bakır, alüminyum, çelik, demir, teflon, emaye, cam, porselen, seramik gibi yaygın kullanılan mutfak ekipmanlarındaki gıdalara bulaşabilen başlıca metaller (Pb, Cd, Hg, As, Al, Cr, Ni, Fe, Cu, Sn, Zn) ve bulaşma kaynakları incelenmiştir. Ayrıca suda pişirme, buharda pişirme, kuru ısıda pişirme ve yağda pişirme gibi yöntemlerin gıdalardaki ağır metal düzeylerine olan etkisi ele alınmıştır. Özellikle asidik gıdaların pişirilmesi esnasında migrasyonun artması gıda güvenliği bakımından tehlike arz etmektedir. Ağır metal maruziyetiyle birlikte ağır metallerin insan vücudunda birikmesi; nörolojik, solunum, sindirim, kardiyovasküler, üreme sistemleri başta olmak üzere böbrek ve karaciğer hasarları ve hatta kansere kadar uzanan ciddi sağlık problemlerine neden olabilmektedir. Bu sebeple pişirme ekipmanlarının malzemesi seçilirken dikkatli olunmalı, uygun kullanım koşulları sağlanmalı ve tüketicilerin bilinçlendirilmesi gerekmektedir. Sonuç olarak, bu çalışma pişirme ekipmanlarından meydana gelen ağır metal bulaşmalarının insan sağlığına olan önemini ele almakta ve gıda güvenliğinin sağlanmasında alınması gereken önlemleri vurgulamaktadır. Alanyazı ve analiz sonuçları incelendiğinde, pişirme esnasında çelik veya ısıya dayanıklı cam ekipmanların kullanılması; ayrıca alternatif güvenilir materyallerin geliştirilmesine yönelik araştırma ve geliştirme çalışmalarının desteklenmesi önerilmektedir.

Anahtar Kelimeler: Gıda güvenliği, ağır metaller, pişirme yöntemleri, pişirme ekipmanları, insan sağlığı

ABSTRACT

This study investigates the presence of heavy metals transferred to food through cooking equipment and their potential impacts on human health. Food safety has emerged as a critical global issue, playing a

pivotal role in the protection of human health and the establishment of sustainable, healthy societies. Among the various hazards, the migration of heavy metals into food constitutes a significant risk factor. Throughout the stages of food production, storage, preparation, and consumption, contamination arising from packaging materials, kitchen utensils, and cooking equipment has been widely reported. This study first outlines the concept of heavy metals, followed by an examination of the primary contaminants (Pb, Cd, Hg, As, Al, Cr, Ni, Fe, Cu, Sn, Zn) that may leach into food from commonly used kitchen materials such as copper, aluminum, stainless steel, iron, teflon, enamel, glass, porcelain, and ceramics. In addition, the influence of different cooking methods—including boiling, steaming, dry-heat cooking, and frying—on heavy metal migration is analyzed. Emphasis is placed on the increased leaching observed during the preparation of acidic foods, which presents heightened concerns for food safety. Chronic exposure to heavy metals and their bioaccumulation in the human body may result in severe health consequences, including neurological, respiratory, digestive, cardiovascular, and reproductive system disorders, as well as kidney and liver damage, and carcinogenesis. Therefore, careful selection of cooking equipment materials, adherence to appropriate usage conditions, and the enhancement of consumer awareness are essential. In conclusion, this study underscores the significance of heavy metal contamination originating from cooking equipment in relation to human health and highlights the necessary preventive measures to ensure food safety. Based on literature and analytical evaluations, the use of stainless steel or heat-resistant glass during cooking is strongly recommended, alongside the promotion of research and development initiatives aimed at designing alternative safe materials.

Keywords: Food safety, heavy metals, cooking methods, cooking equipment, human health

ÇİKOLATA TÜKETİMİNİN SAĞLIĞA FAYDALARI
HEALTH BENEFITS OF CHOCOLATE CONSUMPTION

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ÖZET

Çikolata, yüzyıllardan beridir farklı formlarda ve içerikte tüketilmeye devam etmektedir. Ancak, çikolata için kakao ve kakao yağı değişmeyen iki unsur olarak süregelmektedir. Kakao biyoaktif bileşikler için önemli bir kaynaktır. Başlıca biyoaktif bileşenleri ise flavanoidler ve flavonoid olmayan maddelerden oluşan polifenollerdir. Bu maddeler doğaları gereği yoğun antioksidan içeriğine ve anti-enflamatuvar aktiviteye sahiptirler. Bu nitekler ise tüketici sağlığı için önemli faydalar sunmaktadır. Örneğin, flavanoidlerce zengin çikolata tüketiminin periferik damar fonksiyonlarını iyileştirdiği tespit edilmiştir. Yapılan bir araştırma sonuçlarına göre ise, yüksek kakao tüketiminin daha düşük düşük sistolik ve diyastolik kan basıncıyla ilişkili olduğu tespit edilmiştir. Kakao'nun içeriğindeki biyoaktif bileşiklerin kanser üzerinde potansiyel sağlık etkileri olduğunu gösteren araştırmalar mevcuttur. Öte yandan, kakao tozu tüketiminin açlık kan şekeri seviyesinde önemli bir düşüşe sebep olarak, diyabet hastalığı yönetiminde etkili bir gıda olabileceği bildirilmiştir. Çikolata tüketiminin cilt sağlığı için faydalı olabileceğine dair çeşitli araştırma sonuçları da mevcuttur. Belirtilenlere ek olarak ise, kakaonun yapısında doğal olarak bulunan flavanollerinin kan akışını artırdığına ve beyin perfüzyonunu desteklediğine dair araştırma sonuçları mevcuttur. Bu durumun ise, tüketicileri sinirsel bozulma ve nöronal hasardan koruduğu düşünülmektedir. Dolayısıyla, çikolata tüketimi sadece fizyolojik sağlıkla değil, psikolojik sağlıkla ilgili de potansiyel faydalara sahiptir. Örneğin, düzenli (2 hafta boyunca, günde 40 gram) çikolata tüketiminin, algılanan stresin azaltılmasında faydalı olduğu rapor edilmiştir. Sonuç olarak, kakao oranı yüksek ve şeker oranı düşük çikolatanın ölçülü düzeyde tüketildiğinde insan sağlığı için pek çok farklı faydasının olma potansiyeli mevcuttur.

Anahtar Kelimeler: Antioksidan, biyoaktif bileşikler, çikolata, *Theobroma cacao*, sağlık faydası

ABSTRACT

Chocolate has been consumed in various forms and contents for centuries. However, cocoa and cocoa butter remain the two constant elements in chocolate. Cocoa is an important source of bioactive compounds. The main bioactive components of chocolate are polyphenols, which consist of flavonoids and non-flavonoid substances. These substances are inherently rich in antioxidants and have anti-inflammatory properties. These characteristics offer significant health benefits to consumers. For example, it has been found that consuming chocolate rich in flavonoids improves peripheral vascular function. According to the results of a study, high cocoa consumption is associated with lower systolic and diastolic blood pressure. There are studies showing that the bioactive compounds in cocoa have potential health effects on cancer. On the other hand, it has been reported that cocoa powder consumption can cause a significant drop in fasting blood sugar levels, making it an effective food for diabetes management. There are also various research results suggesting that chocolate consumption

may be beneficial for skin health. In addition to the above, research findings indicate that flavanols, which are naturally present in cocoa, increase blood flow and support brain perfusion. This is thought to protect consumers from neurological deterioration and neuronal damage. Therefore, chocolate consumption has potential benefits not only for physical health but also for psychological health. For example, regular chocolate consumption (40 grams per day for 2 weeks) has been reported to be beneficial in reducing perceived stress. In conclusion, when consumed in moderation, chocolate with a high cocoa content and low sugar content has the potential to offer many different benefits for human health.

Keywords: Antioxidants, bioactive compounds, chocolate, *Theobroma cacao*, health benefits

**KURUTULMUŞ SACCHAROMYCES CEREVISIAE HÜCRELERİNİN *L.ACIDOPHILUS*
PROBİYOTİK BAKTERİSİNİN ENKAPSÜLASYONUNUNDA KULLANIMI**
**USE OF DRIED SACCHAROMYCES CEREVISIAE CELLS IN THE ENCAPSULATION OF
L. ACIDOPHILUS PROBIOTIC BACTERIA**

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ÖZET

Bu çalışmada, püskürtmeli kurutma tekniği ile elde edilmiş kurutulmuş otolize *Saccharomyces cerevisiae* hücre esaslı materyalinin probiyotik bakterilerin enkapsülasyon prosesinde kaplama ajanı olarak kullanımı ve bu işlemin püskürtmeli kurutucu kaplama yöntemi ile gerçekleşmesine yönelik proses parametrelerinin optimizasyonu içeren bir deneme planı (n=16) oluşturulmuştur. Çalışma kapsamında püskürtmeli kurutucu sistemi işlem koşullarından hava giriş sıcaklığı (120-150 °C), besleme hızı (6-14 mL/dak) ve kaplayıcı materyal konsantrasyonu (%10-30) bağımsız değişken seçilmiş olup, işlem koşullarının *L.Acidophilus* bakterisinin enkapsülasyon verimliliği, mide ve bağırsak sindirimleri sonucunda canlılık durumları ve depolama sürecinde canlılıkları üzerindeki etkileri incelenmiştir. Besleme ortamına 9 log kob/mL olarak ilave edilen *L.Acidophilus* kültürünün kurutma sonrası canlılık değerleri 5.53-7.64 log kob/mL arasında değişim göstermiştir. Kurutma sonrası canlılık değeri üzerinde hava giriş sıcaklığı ve duvar materyali konsantrasyonu önemli bulunmuştur (p<0,05). Hava giriş sıcaklığı ve konsantrasyonda meydana gelen artış kurutma sonrası canlılığı olumsuz etkilemiştir. In vitro sindirim koşullarının incelendiği aşamada ise mide sindirimi sonrasında canlılık değerleri 4.48-6.15 log kob/mL arasında değişim göstermiştir. İşlem koşullarından kaplayıcı konsantrasyonu canlılık üzerinde etkili bulunmuşken düşük konsantrasyonlarda daha iyi kapsüllemenin gerçekleştirdiği ve canlılığın korunabildiği sonucuna varılmıştır. Mide sindirimi sonrasında bağırsak koşullarındaki canlılık değerlerinde ise 3.26-5.38 log kob/mL arasında tespit edilmiştir. Kurutma sonrası 3 ay süre ile buzdolabı koşullarında depolanan tozların canlılık değerleri 4.14-6.15 aralıklarında tespit edilmiştir (p<0,05). Depolama sonrası canlılık üzerine işlem koşullarından hava giriş sıcaklığı ve kaplayıcı konsantrasyonu önemli bulunmuştur (p<0,05). Bu iki parametrenin artışı canlılık üzerine olumsuz etki göstermiştir. İstenirlik fonksiyonu kullanarak maksimum kurumadde, maksimum kurutma sonrası, in vitro sindirim sonrası ve depolama sonrasında canlılık miktarının yanı sıra minimum su aktivitesi değerleri hedef olarak seçilmesiyle optimum proses koşullarının 145 °C hava giriş sıcaklığı, %10 kaplayıcı konsantrasyonu ve 9 mL/dak besleme hızı olduğu tespit edilmiştir (İstenirlik=0.783). Çalışma sonucunda otolize *Saccharomyces cerevisiae* hücre esaslı materyalinin enkapsülasyon prosesinde etkili bir kaplama materyali olarak kullanılabileceği ortaya konulmuştur.

Anahtar Kelimeler: Enkapsülasyon, otolize maya hücre duvarı, probiyotik enkapsülasyonu

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ABSTRACT

In this study, an experimental design (n=16) was developed to investigate the use of spray-dried autolyzed *Saccharomyces cerevisiae* cell-based material as a coating agent in the encapsulation process of probiotic bacteria and to optimize the process parameters for this operation using the spray-drying coating method. Within the scope of the study, the independent variables selected were air inlet temperature (120-150 °C), feed rate (6-14 mL/min), and coating material concentration (10-30%). The effects of the process conditions on the encapsulation efficiency of *L. acidophilus* bacteria, their viability after gastric and intestinal digestion, and their viability during storage were investigated. The viability values of the *L. Acidophilus* culture added to the feeding medium at 9 log cfu/mL ranged from 5.53 to 7.64 log cfu/mL after drying. Air inlet temperature and wall material concentration were found to be significant factors affecting post-drying viability (p<0.05). Increases in air inlet temperature and

concentration negatively affected post-drying viability. During the stage where in vitro digestion conditions were examined, viability values after gastric digestion ranged from 4.48 to 6.15 log cfu/mL. Among the process conditions, the coating concentration was found to affect viability, and it was concluded that better encapsulation and viability preservation were achieved at lower concentrations. After gastric digestion, viability values in intestinal conditions were found to range from 3.26 to 5.38 log cfu/mL. The viability values of powders stored under refrigeration conditions for 3 months after drying were found to be between 4.14 and 6.15 log cfu/mL. ($p < 0.05$). Air inlet temperature and coating concentration were found to be significant factors affecting viability after storage ($p < 0.05$). An increase in these two parameters had a negative effect on viability. Using the desirability function, the optimum process conditions were determined to be an inlet air temperature of 145°C, a wall material concentration of 10%, and a feed rate of 9 mL/min, with the targets being maximum dry matter, maximum viability after drying, viability after in vitro digestion, and viability after storage, as well as minimum water activity values (Desirability = 0.783). The study demonstrated that autolyzed *Saccharomyces cerevisiae* cell-based material can be effectively used as a coating material in the encapsulation process.

Keywords: Encapsulation, autolyzed yeast cell wall, probiotic encapsulation

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**İKİNCİL METABOLİTLERİN KARAKTERİZASYONU İÇİN ANALİTİK YÖNTEMLER:
EKSTRAKSİYONDAN TANIMLAMAYA**

**ANALYTICAL METHODS FOR THE CHARACTERIZATION OF SECONDARY
METABOLITES: FROM EXTRACTION TO IDENTIFICATION**

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ÖZET

Büyüme, gelişme veya üremede doğrudan rol oynamayan, ancak savunma, iletişim ve ekolojik etkileşimlerde hayati rolleri olan; ikincil metabolitler, esas olarak bitkiler (yaklaşık %80), ayrıca mantarlar, mikroorganizmalar, süngerler, salyangozlar ve mercanlar gibi bazı deniz canlılarının metabolizmalarında üretilen organik bileşiklerdir. Bu bileşikler genel olarak: terpenoidler, fenolikler, kükürt ve azot içeren bileşikler şeklinde üç kategoriye ayrılırlar. İkincil metabolitlerin etkin kullanımı, doğru örnek hazırlığı ve uygun ekstraksiyon yöntemlerine dayanır. Bu çalışmada en yaygın ekstraksiyon yöntemleri olan sıvı-sıvı ekstraksiyon, katı-sıvı ekstraksiyon ve süperkritik sıvı ekstraksiyon yöntemleri açıklanmaya çalışılmıştır. Ayrıca, mikrodalga yardımcı ve ultrasonik ekstraksiyon gibi alternatif yöntemlere de değinilmiştir. Ekstraksiyon sonrası, bu bileşiklerin yapısal analizinde spektrofotometri, gaz kromatografisi (GC), yüksek performanslı sıvı kromatografisi (HPLC) ve nükleer manyetik rezonans (NMR) gibi modern analiz teknikleri kullanılmaktadır. Bu yöntemler, ikincil metabolitlerin karakterizasyonunu sağlamak ve potansiyel sağlık faydalarını ortaya koymak için kritik öneme sahiptir. Gelecekte, biyoinformatik ve yeşil ekstraksiyon teknolojilerinin entegrasyonunun, bu alandaki verimliliği artıracağı düşünülmektedir.

Anahtar Kelimeler: İkincil metabolitler, Ekstraksiyon, Sınıflandırma, Analitik Yöntem.

ABSTRACT

Secondary metabolites are organic compounds primarily produced in the metabolism of plants (approximately 80%), as well as in some marine organisms such as fungi, microorganisms, sponges, snails, and corals. While they do not play a direct role in growth, development, or reproduction, these compounds have vital roles in defense, communication, and ecological interactions. Generally,

secondary metabolites are divided into three categories: terpenoids, phenolics, and sulfur- and nitrogen-containing compounds. The effective use of secondary metabolites depends on proper sample preparation and suitable extraction methods. This study aims to explain the most common extraction techniques: liquid-liquid extraction, solid-liquid extraction, and supercritical fluid extraction. Alternative methods, such as microwave-assisted and ultrasonic extraction, are also discussed. Following extraction, modern analytical techniques including spectrophotometry, gas chromatography (GC), high-performance liquid chromatography (HPLC), and nuclear magnetic resonance (NMR) are employed for structural analysis. These methods are critical for characterizing secondary metabolites and uncovering their potential health benefits. In the future, the integration of bioinformatics with green extraction technologies is expected to enhance efficiency in this field.

Keywords: Secondary metabolites, Extraction, Classification, Analytical Method.

**FONKSİYONEL BİR BESLENME ÖĞESİ OLARAK DİYET LİFLERİ VE SAĞLIK
ÜZERİNDEKİ ETKİLERİ**

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ÖZET

Bu çalışmada, diyet liflerinin tanımı, sınıflandırılması, fizyolojik işlevleri ve sağlık üzerindeki etkilerini kapsamlı bir şekilde ele almaktadır. Diyet lifleri, sindirilemeyen karbonhidratlar ve bitki kaynaklı bileşenler olarak tanımlanmakta ve insan sağlığı üzerinde çok yönlü etkiler göstermektedir. Çözünür lifler su tutma kapasitesi ve bağırsak mikrobiyotası tarafından fermente edilebilme özellikleri sayesinde kısa zincirli yağ asitleri (asetat, propiyonat, bütirat) üretmekte, bu yolla enerji metabolizması, glisemik kontrol, iştah düzeni ve bağırsak sağlığına katkıda bulunmaktadır. Çözünmez lifler ise dışkı hacmini artırarak bağırsak hareketliliğini düzenlemekte, konstipasyonu önlemekte ve bağırsak sağlığının korunmasında önemli rol oynamaktadır. Selüloz, hemiselüloz, lignin, rezistan nişasta, inülin ve fruktooligosakkaritler farklı biyolojik mekanizmalar üzerinden prebiyotik etki göstermekte, mikrobiyota çeşitliliğini desteklemektedir. Güncel araştırmalar, diyet liflerinin obezite, tip 2 diyabet, kardiyovasküler hastalıklar, hipertansiyon, inflamatuvar bağırsak hastalıkları ve kolorektal kanser riskini azaltıcı yönde etkiler sağladığını ortaya koymaktadır. Ayrıca lif tüketiminin, tokluk hissi, lipid metabolizması ve immün fonksiyonlar üzerinde de önemli düzenleyici rolü bulunmaktadır. Bu nedenle diyet lifleri, sağlıklı beslenme ve hastalıkların önlenmesinde kritik bir bileşen olarak değerlendirilmekte, toplum sağlığını geliştirmek amacıyla günlük beslenme önerilerinde mutlaka yer alması gereken bir besin ögesi olarak görülmektedir.

Anahtar Kelimeler: Diyet lifi, çözünür lif, çözünmez lif, prebiyotik, sağlık

ABSTRACT

This study provides a comprehensive overview of the definition, classification, physiological functions, and health effects of dietary fibers. Dietary fibers are defined as indigestible carbohydrates and plant-derived components, and they exert multifaceted effects on human health. Soluble fibers, through their water-holding capacity and fermentability by gut microbiota, lead to the production of short-chain fatty acids (acetate, propionate, butyrate), thereby contributing to energy metabolism, glycemic control, appetite regulation, and intestinal health. Insoluble fibers, on the other hand, increase stool bulk, regulate bowel motility, prevent constipation, and play a key role in maintaining gut health. Compounds such as cellulose, hemicellulose, lignin, resistant starch, inulin, and fructooligosaccharides exhibit prebiotic effects through distinct biological mechanisms and support microbial diversity. Recent research has

demonstrated that dietary fibers may reduce the risk of obesity, type 2 diabetes, cardiovascular diseases, hypertension, inflammatory bowel diseases, and colorectal cancer. Additionally, fiber intake plays a significant regulatory role in satiety, lipid metabolism, and immune functions. Therefore, dietary fibers are considered critical components in healthy nutrition and disease prevention. They are recognized as essential nutrients that should be included in daily dietary recommendations to promote public health.

**INFLUENCE OF THE IONIC STRENGTH WITH HIGH PRESSURE HOMOGENIZATION
ON STRUCTURAL AND TECHNO-FUNCTIONAL PROPERTIES OF SESAME PROTEIN
ISOLATE**

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ABSTRACT

While proteins are essential for healthy nutrition and food functionality, there has recently been a growing demand for plant-based proteins that are low-cost, sustainable, and have less negative environmental impact. In this context, sesame protein is a promising candidate due to its widespread cultivation, high protein content, and essential amino acids such as methionine and tryptophan. While sesame protein can potentially improve the properties of various foods due to its various functional properties, its low solubility limits its use. Therefore, the current study aimed to investigate the effects of different ionic strengths (0-200 mM) combined with high-pressure homogenization (HPH) at various pressures (0-100 MPa) on structural and techno-functional properties of sesame protein isolate from cold-pressed sesame cake. Both protein solution turbidity and particle size gradually decreased with increasing pressure. However, particle size tended to decrease with increasing ionic charge in the control sample, while it increased in those subjected to 100 MPa pressure. The highest free –SH group (8.01 µmol/g) was observed at an ionic strength of 100 mM and pressure of 100 MPa. The techno-functional properties, including protein solubility, water and oil holding capacities, foam properties, and emulsion properties, were significantly affected by both ionic strength and pressure ($P<0.05$). The results revealed that sesame protein subjected to HPH had increased techno-functional properties, but excessively high ionic strength adversely affected these properties. Sesame protein isolate exhibited the best techno-functional properties (95.56% for solubility, 2.35% for water holding capacity, 1.97 % for oil holding capacity, 141.66% for foam capacity, and 53.55 m²/g for emulsion activity index) at moderate ionic strength values (50-100 mM) at 100 MPa pressure. Overall, this study revealed that HPH at moderate ionic strength values would be the most effective process for enhancing the techno-functional properties of sesame protein isolate that could be used as a food system auxiliary ingredient.

Keywords: Sesame protein, High pressure homogenization, ionic strength, techno-functional properties, protein modification

“NUTRI-SCORE” PAKET ÖN YÜZÜ BESİN ETİKETİ NEDİR? TÜRKİYE’DEKİ DURUMU
WHAT IS THE "NUTRI-SCORE" FRONT-PACKAGE NUTRITION LABEL? ITS STATUS
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ÖZET

Sağlıksız beslenme ve obezite, özellikle günümüzde, hem sağlık hem de refah açısından önde gelen bir risk faktörü olarak tanımlanmaktadır. Bulaşıcı Olmayan Hastalıklar olarak adlandırılan kronik hastalıklar (kardiyovasküler hastalıklar, kanser, kronik akciğer hastalıkları ve diyabet) için sağlıksız beslenme ciddi bir risk faktörüdür. Bu kapsamda besin etiketi okuma ve etiket bilgileri beslenmemiz ve hastalıkları önlemek adına oldukça önemli bir yere sahiptir. Besin etiket bilgileri tüketicilerin sağlıklarına daha uygun gıdalara yönelmelerine yardımcı olmayı amaçlamaktadır. Avrupada uzun süredir kullanılan paket ön yüzündeki Nutri-Score besin etiketi, Fransa'da geliştirilmiş ve birçok Avrupa ülkesinde uygulanmakta olan bir etiket bilgi sistemidir. Nutri-Score, besin derecelendirme sistemini basitleştirmeyi ve gıda ürünlerinin genel besin değerini göstermeyi amaçlayan 5 renkli bir paket ön etiketidir. Nutri-Score, gıda maddelerini parlak yeşil A'dan koyu kırmızı E'ye kadar uzanan beş farklı sağlıklılık seviyesinden birine sınıflandırmaktadır. Nutri-Score, temel olarak gıda maddelerinin şeker, tuz ve kalori içeriğine dayanmaktadır. Gıdaların içeriğiyle ilgili karmaşık bilgileri azaltmasının yanı sıra Nutri-Score sağlıklı beslenme konusunda kolay anlaşılır bilgiler sağlayabilir ve tüketicileri eğitmede ve gıda tercihlerini etkilemede değerli bir araç haline gelebilir. Bu çalışma Nutri-Score'un sağlıklı ve sağlıksız gıda maddelerini doğru bir şekilde belirleyip belirlemediğini ve Nutri-Score'un tüketicilerin tercihleri üzerinde ne kadar büyük bir etkiye sahip olabileceğini araştırmanın yanı sıra Türkiye'deki durum ve geleceği hakkında bilgi vermeyi amaçlamaktadır.

Anahtar Kelimeler: Nutri-Score, kronik hastalıklar beslenme, sağlık.

ABSTRACT

Unhealthy diet and obesity, especially today, are identified as a leading risk factor for both health and well-being. Unhealthy diet is a serious risk factor for chronic diseases (cardiovascular disease, cancer, chronic lung disease, and diabetes), also known as Non-Communicable Diseases. Therefore, reading food labels and label information plays a crucial role in our nutrition and disease prevention. Nutritional label information aims to help consumers choose foods that are more suitable for their health. The Nutri-Score front-of-pack nutrition label, long used in Europe, is a label information system developed in France and implemented in many European countries. Nutri-Score is a five-color front-of-pack label

that aims to simplify the nutritional rating system and display the overall nutritional value of food products. Nutri-Score classifies foods into one of five healthiness levels, ranging from bright green A to dark red E. Nutri-Score is primarily based on the sugar, salt, and calorie content of foods. In addition to reducing the complexity of food ingredients, Nutri-Score can provide easily understandable information about healthy eating and become a valuable tool in educating consumers and influencing food choices. This study aims to investigate whether Nutri-Score accurately identifies healthy and unhealthy food items and how significantly it impacts consumer preferences. It also aims to provide insights into the current situation and future trends in Türkiye.

Keywords: Nutri-Score, chronic diseases, nutrition, health.

SÜPER BESİNLERİN BESLENMEDEKİ YERİ VE SAĞLIK ÜZERİNE ETKİLERİ
THE PLACE OF SUPERFOODS IN NUTRITION AND THEIR EFFECTS ON HEALTH

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ÖZET

Günümüz toplumlarında diyetlerin artarak güncellenmesi ve yeniden yapılandırma arayışı, daha sağlıklı yaşam şekilleri oluşturma kapsamında aralarında süper gıdaların da bulunduğu, çok yönlü faydaları olan gıdalara olan talebin artmasına yol açmıştır. Bunun en önemli sebebi sağlık sorunlarının artış göstermesidir. Bu nedenle bireyler artık diyetlerinde sadece enerji ihtiyacını karşılayacak besinlere değil; makro ve mikro besinler açısından zengin, dengeli, sağlığa faydalı, minimum düzeyde işlenmiş olan besinlere yer vermeye özen göstermektedir. “Süper besinler” bu ihtiyacı karşılamak için en güzel alternatif olarak görülüyor. Bu besinler yalnızca bir veya daha fazla değil, bir düzine veya daha fazla benzersiz özelliğe sahip yiyecekleri içermektedir. Süper besinler, vitamin, mineral, lif, biyoaktif bileşik gibi bileşenler açısından birçok besine göre daha zengin bir içeriğe sahiptir. Yapısında bulunan biyoaktif bileşikler sayesinde antioksidan aktiviteleri başta olmak üzere, çeşitli sağlığa yararlı aktiviteler göstererek kronik hastalıklar, cilt hastalıkları, kanser gibi çeşitli hastalıklar üzerinde olumlu etkiler geliştirirler. Bağışıklık sistemini güçlendirerek vücut için koruma sağlarlar. Bu biyolojik özellikleri sayesinde süper besinler, dengeli, besleyici, sağlıklı bir diyet planlamasına süper katkılarda bulunabilirler. Bu çalışma, Tüketicilerin daha sağlıklı yaşam tarzları ve refah konusundaki farkındalığının artmasıyla birlikte beslenmemize yeni katılan bu besinlerin profilini ve küresel gıda sistemindeki yerini açıklamaya çalışacaktır.

Anahtar Kelimeler: Biyoaktif bileşikler, diyet, makro besinler, mikro besinler, sağlık, süper besinler

ABSTRACT

The increasing quest for updating and restructuring diets in today's societies, as part of a healthier lifestyle, has led to a growing demand for foods with multifaceted benefits, including superfoods. The primary reason for this is the rise in health problems. Therefore, individuals are now focusing on including not only foods that meet their energy needs but also foods rich in macro- and micronutrients, balanced, health-promoting, and minimally processed. "Superfoods" are seen as the best alternative to meet this need. These foods include not just one but a dozen or more foods with unique properties. Superfoods are richer in vitamins, minerals, fiber, and bioactive compounds than many other foods. Thanks to their bioactive compounds, they exhibit various health-promoting activities, especially antioxidant activity, and have positive effects on various diseases such as chronic diseases, skin conditions, and cancer. They also provide protection for the body by strengthening the immune system.

Thanks to these biological properties, superfoods can make excellent contributions to a balanced, nutritious, and healthy diet. This study will attempt to explain the profile of these new foods that have become part of our diets as consumers become more aware of healthier lifestyles and well-being, and their place in the global food system.

Keywords: Bioactive compounds, diet, macronutrients, micronutrients, health, superfoods

**GIDALARDA KULLANILAN KORUYUCU MADDELERİNİN ÜZERİNE TÜKETİCİ
GÜVENİ VE ALGISI**
CONSUMER CONFIDENCE AND PERCEPTION REGARDING FOOD PRESERVATIVES

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ÖZET

Gıda endüstrisinde koruyucu maddeler, ürünlerin raf ömrünü uzatmak, mikrobiyal bozulmayı engellemek ve gıda güvenliğini sağlamak amacıyla yaygın şekilde kullanılmaktadır. Ancak tüketici algısı, gıda tercihlerini ve satın alma davranışlarını doğrudan etkilemektedir. Yapılan araştırmalar, tüketicilerin bu konudaki bilgi düzeyinin sınırlı, ancak endişelerinin yüksek olduğunu göstermektedir. Almanya genelinde 1.000'in üzerinde katılımcıyla yapılan Alman Federal Risk Değerlendirme Enstitüsü (BfR) anketine göre, tüketicilerin %55'i alışveriş sırasında belirli katkı maddelerinden kaçındığını belirtmiştir. Katılımcıların %27'si katkıların gıda intoleranslarına yol açabileceğini, %26'sı ise kanser riskini artırabileceğini düşündüğünü ifade etmiştir. Ayrıca %58'i katkıların sağlık riskleri hakkında kendini bilgili hissetmezken, %60'ı üretim süreçleri konusunda bilgi sahibi olmadığını belirtmiştir. Bu bilgi eksikliği, tüketici güvenliğini zedeleyen unsurlardan biridir. Giderek artan sayıda tüketici, ürün etiketlerini dikkatle incelemekte ve “koruyucu madde içermez” ibaresini olumlu değerlendirmektedir. “Clean label” trendi kapsamında, kısa ve tanınır içerik listesine sahip, yapay katkısız ürünlere olan talep hızla artmaktadır. Bu nedenle birçok üretici, koruyucu kullanımını azaltmakta veya natamisin, laktat gibi doğal alternatiflere yönelmektedir. Tüketici güvenliğini güçlendirmek için şeffaf iletişim ve koruyucuların güvenlik değerlendirmeleri hakkında bilgilendirme yapılması kritik önem taşımaktadır.

Anahtar Kelimeler: Koruyucu, tüketici algısı, gıda güvenliği

**DÜNYADA VE TÜRKİYE'DE FERMENTE İÇECEKLER VE TURŞU SUYUNA GENEL BİR
BAKIŞ**

**AN OVERVIEW OF FERMENTED BEVERAGES AND PICKLE JUICE IN WORLDWIDE
AND TÜRKİYE**

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ÖZET

Fermente gıdalar, tarih boyunca yalnızca bir beslenme unsuru değil, aynı zamanda kültürel kimliğin ve toplumsal hafızanın da önemli bir parçası olmuştur. Dünya genelinde kımız, kefir, kombucha, kimchi, sauerkraut ve miso öne çıkarken; Anadolu'da boza, şalgam suyu, hardaliye, tarhana, ayran, turşu ve turşu suyu güçlü bir geleneğe sahiptir.

Bilimsel açıdan fermente içecekler; probiyotik mikroorganizmalar, organik asitler ve biyoaktif bileşikler içermeleri sayesinde sindirim sağlığı, bağışıklık sisteminin güçlenmesi, kan şekeri ve lipid metabolizmasının düzenlenmesi gibi çok yönlü faydalar sunmaktadır. Özellikle turşu suyu, içerdiği laktik asit bakterileri ve elektrolitler sayesinde probiyotik özellik göstermekte, sporcularda sıvı-elektrolit dengesi ve kas kramplarının önlenmesi açısından ilgi görmektedir.

Türkiye'de artan sağlık bilinci, geleneksel fermente içeceklerin yeniden değer kazanmasına yol açmıştır. Tüketiciler probiyotik yoğurt ve kefirin yanı sıra şalgam ve turşu suyunu fonksiyonel özellikleri nedeniyle tercih etmektedir. Küresel ölçekte kombucha ve kefir hızla büyüyen bir pazara sahiptir. Ayrıca, meyve-sebze atıklarının sirke ve turşu üretiminde değerlendirilmesi, sürdürülebilirlik ve ekonomik değer açısından önemli fırsatlar sunmaktadır.

Anahtar Kelimeler: Fermente içecekler, turşu suyu, fonksiyonel gıdalar, sürdürülebilirlik

FARKLI MARKA TURŞU SULARINDA KALİTE PARAMETRELERİNİN İNCELENMESİ
ANALYSIS OF QUALITY PARAMETERS IN PICKLE BRINES FROM DIFFERENT BRANDS

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ÖZET

Bu çalışmada, çeşitli markalara ait 6 farklı turşu suyu örnekleri üzerinde pH, tuz içeriği, toplam asitlik, renk (L*, a*, b*), bulanıklık ve mikrobiyolojik özellikler incelenmiştir. Ölçümler sonucunda pH değerleri markalar arasında farklılık göstermiş, en düşük pH değeri C örneği (2,40), en yüksek pH değeri D örneğinde (3,44) bulunmuştur. Toplam asitlik analizinde C örneği en yüksek (%0,76), D örneği en düşük (%0,47) asitlik göstermiştir. Renk analizlerinde E örneği en koyu ve en kırmızı örnek olarak öne çıkarken, B örneği en parlak ve açık renkli bulunmuştur. Bulanıklık ölçümleri, F örneği ve E örneği yüksekken, A ve C örneklerde düşük değerler göstermiştir. Tuz içerikleri markalar arasında farklılık göstermekte olup, daha asidik örneklerin tuz içeriği nispeten yüksek bulunmuştur. Mikrobiyolojik analizlerde fekal koliform tespit edilmemiştir. A, D ve F örnekleri laktik asit bakterileri ve toplam canlı sayısı yüksek bulunurken, C, B ve E örnekleri güvenli seviyelerde kalmıştır. Çalışma, farklı markaların turşu sularının kalite ve güvenlik parametrelerinde belirgin farklılıklar gösterdiğini ve markalara özgü özelliklerin tüketici sağlığı açısından önem taşıdığını ortaya koymaktadır.

Anahtar Kelimeler: Turşu suyu, fizikokimyasal özellikler, mikrobiyolojik değerlendirme, kalite parametresi

**LAKTOFERRİN İLE ZENGİNLEŞTİRİLMİŞ YOĞURDUN UÇUCU BİLEŞENLERİNİN
KARAKTERİZASYONU**
**CHARACTERIZATION OF VOLATILE COMPOUNDS IN LAKTOFERRIN-ENRICHED
YOGURT**

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ÖZET

Laktoferrin; demir, kalsiyum, bakır, alüminyum veya manganez iyonlarını bağlama özelliğine sahip, antimikrobiyal, antioksidan, antikanser, immünomodülatör aktiviteler gösteren, hücre büyümesini düzenleyebilen fonksiyonel bir süt proteindir. Bu çalışmada fonksiyonel özelliği arttırmak amacıyla yoğurt sütüne ilave edilen laktoferrinin (doğal formda) yoğurdun uçucu bileşikleri üzerine etkisi ortaya konmuştur. Çalışmada 75 mg/100 g laktoferrin içerecek şekilde set tipi yoğurt üretilmiş ve üretilen yoğurtlar 4-6 °C'de 21 gün depolanmıştır. Uçucu bileşenler depolamanın 1 ve 21. günlerinde katı faz mikroekstraksiyon (SPME) tekniği ile ekstrakte edilmiştir. Uçucu bileşenler, iç standart (2-metil valerik asit ve 2-metil-3-heptanon) kullanılarak Gaz Kromatografisi-Kütle Spektrometresi (GC-MS) kullanılarak belirlenmiş ve veritabanları kullanılarak tanımlanmıştır. Yoğurt örneklerinde asit, aldehit, keton, alkol ve diğer gruplarına ait toplam 26 uçucu bileşen belirlenmiştir. Depolamanın ilk gününde asetik asit, bütirik asit, 3-metil bütirik asit, pentanoik asit, hekzanoik asit, 2-etil hekzanoik asit, heptanoik asit ve oktanoik asit miktarlarının laktoferrin ilaveli yoğurtlarda kontrole göre daha yüksek olduğu bulunmuştur. Ancak depolamanın 21. gününde pentanoik asit dışında diğer tüm asitler laktoferrinli örneklerde kontrole kıyasla düşük belirlenmiştir. Yoğurtlarda istenilen aromadan sorumlu olan diasetil ve asetoin miktarları ise tüm örneklerde benzer miktarlarda belirlenmiştir. Uçucu bileşen profilleri bakımından, kontrol ve laktoferrin ile zenginleştirilmiş yoğurt örnekleri genel olarak benzer bulunmuştur. Laktoferrin ile zenginleştirilmiş yoğurtlarda, 2-bütanon depolama sonunda %21,3 oranında azalma göstermiş, benzaldehit ise yalnızca 1. günde tespit edilmiştir.

Anahtar Kelimeler: Doğal laktoferrin, yoğurt, fermantasyon, SPME/GC-MS, uçucu bileşenler

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ABSTRACT

Lactoferrin is a functional milk protein with the ability to bind iron, calcium, copper, aluminum, or manganese ions, exhibiting antimicrobial, antioxidant, anticancer, and immunomodulatory activities, and capable of regulating cell growth. In this study, the effect of lactoferrin (in its natural form), added to yogurt milk to enhance its functional properties, on the volatile compounds of yogurt was investigated. Set-type yogurts containing 75 mg/100 g lactoferrin were produced and stored at 4-6 °C for 21 days. On the 1st and 21st days of storage, volatile compounds were extracted using solid-phase microextraction (SPME) technique. Volatiles were determined by Gas Chromatography–Mass Spectrometry (GC-MS) using internal standards (2-methyl valeric acid and 2-methyl-3-heptanone) and identified through databases. A total of 26 volatile compounds belonging to acid, aldehyde, ketone, alcohol, and other groups were identified in yogurt samples. On the first day of storage, the concentrations of acetic acid, butyric acid, 3-methylbutyric acid, pentanoic acid, hexanoic acid, 2-ethylhexanoic acid, heptanoic acid, and octanoic acid were higher in the lactoferrin-fortified yogurts compared to the control. However, on the 21st day of storage, except for pentanoic acid, all other acids were found to be lower in the lactoferrin-fortified samples relative to the control. The amounts of diacetyl and acetoin, which are responsible for the desirable aroma in yogurts, were found to be similar across all samples. Volatile compound profiles were generally similar between the control and lactoferrin-enriched yogurt samples. In lactoferrin-fortified yogurts, 2-butanone showed a 21.3% decrease at the end of storage, while benzaldehyde was detected only on day 1.

Keywords: Native lactoferrin, yogurt, fermentation, SPME/GC-MS, volatile compounds

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**ŞALGAM ÜRETİMİNDE YAN ÜRÜN OLARAK ORTAYA ÇIKAN SİYAH HAVUÇ
POSASININ FONKSİYONEL GIDA BİLEŞENİ OLARAK DEĞERLENDİRİLME
POTANSİYELİ**

**THE POTENTIAL FOR UTILIZING BLACK CARROT PULP, A BY-PRODUCT OF
TURNIP PRODUCTION, AS A FUNCTIONAL FOOD INGREDIENT**

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ÖZET

Gıda endüstrisinde üretim süreçleri sırasında açığa çıkan yan ürünler hem ekonomik kayıplara hem de çevresel sorunlara yol açmaktadır. Bu bağlamda, endüstriyel atıkların yeniden değerlendirilmesi, sürdürülebilir üretim anlayışının önemli bir parçası haline gelmiştir. Şalgam üretiminde yüksek miktarda ortaya çıkan siyah havuç (*Daucus carota* ssp. *sativus* var. *atrorubens*) posası, içerdiği zengin biyoaktif bileşenler nedeniyle fonksiyonel gıda formülasyonlarında değerlendirilebilecek değerli bir yan üründür. Siyah havuç, özellikle antosiyaninler açısından öne çıkmakta olup, güçlü antioksidan aktivitesiyle insan sağlığı üzerinde olumlu etkiler göstermektedir. Bunun yanında, posada bulunan çözünür diyet lifleri de prebiyotik etki sağlayarak bağırsak sağlığını desteklemektedir.

Literatürde yapılan çalışmalar, siyah havuç posasının kontrollü fermentasyon, enzimatik ekstraksiyon ve membran filtrasyonu gibi yenilikçi yöntemlerle işlenebileceğini ve bu sayede yüksek katma değerli biyoaktif bileşenlerin elde edilebileceğini ve bunların biyoyararlılığını ve stabilitesini artırmayı ortaya koymaktadır. Gıda sanayinde sentetik renklendiricilere ve katkı maddelerine alternatif olan antosiyaninlerin doğal renklendirici ve antioksidan özellikleri, çözünür prebiyotik liflerin ise fonksiyonel katkı potansiyeli sayesinde, bu yan ürün hem içecek hem de çeşitli gıda ürünlerinde kullanılabilir. Böylelikle endüstriyel atık miktarının azaltılması, ekonomik faydanın artırılması ve sıfır atık yaklaşımına katkı sağlanması mümkün hale gelmektedir.

Sonuç olarak, şalgam üretiminde ortaya çıkan siyah havuç posasının değerlendirilmesi, döngüsel ekonomi ve sürdürülebilir gıda üretimi perspektifinden ele alındığında hem endüstriye hem de çevreye önemli katkılar sunabilecek yenilikçi bir yaklaşım olarak öne çıkmaktadır.

Anahtar Kelimeler: Siyah havuç posası, şalgam üretimi, antosiyanin, çözünür lif, fonksiyonel bileşen, sürdürülebilirlik.

ABSTRACT

By-products generated during production processes in the food industry lead to both economic losses and environmental problems. In this context, the revaluation of industrial waste has become an important part of sustainable production practices. Black carrot (*Daucus carota* ssp. *sativus* var. *atrorubens*) pulp, which is produced in high quantities during turnip production, is a valuable by-product that can be evaluated in functional food formulations due to its rich bioactive components. Black carrots are particularly notable for their anthocyanins, which have strong antioxidant activity and positive effects on human health. In addition, the soluble dietary fibers found in the pulp also have a prebiotic effect, supporting intestinal health.

Studies in the literature indicate that black carrot pulp can be processed using innovative methods such as controlled fermentation, enzymatic extraction, and membrane filtration, thereby enabling the production of high-value bioactive compounds and enhancing their bioavailability and stability. With the natural coloring and antioxidant properties of anthocyanins, which are alternatives to synthetic colorants and additives in the food industry, and the functional additive potential of soluble prebiotic fibers, this by-product can be used in both beverages and various food products. This makes it possible to reduce the amount of industrial waste, increase economic benefits, and contribute to the zero-waste approach.

In conclusion, the utilization of black carrot pulp generated during beetroot production stands out as an innovative approach that can make significant contributions to both industry and the environment when considered from the perspective of the circular economy and sustainable food production.

Keywords: Black carrot pulp, turnip production, anthocyanin, soluble fiber, functional component, sustainability.

**DIYET LİFİ İLAVESİ İLE ZENGİNLEŞTİRİLMİŞ İÇECEKLERİN
DEĞERLENDİRİLMESİ**
THE EVALUATION OF DIETARY FIBER-ENRICHED BEVERAGES

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ÖZET

Diyet lifleri, yararlı bağırsak mikrobiyotasının gelişimini destekleyerek ve diyabet gibi kronik hastalıkların riskini azaltarak insan sağlığının korunmasında önemli bir rol oynamaktadır. Günümüz diyetlerinin çoğu yeterli miktarda lif içermediğinden, içeceklerin diyet lifi ile zenginleştirilmesi, bu açığı kapatmaya ve toplum sağlığını geliştirmeye yönelik etkili bir yaklaşım olarak değerlendirilmektedir. Diyet lifinin sağlık açısından taşıdığı önem, lifle zenginleştirilmiş gıda pazarının büyümesine ve lif katkılı içeceklerin geliştirilmesine katkı sağlamaktadır. Vitaminler, mineraller ve antioksidanlar bakımından zengin doğal kaynaklar olan meyve ve sebzeler, fonksiyonel içeceklere lif ilavesi için uygun bir matris oluşturmaktadır. İnülin, oligofruktoz, pektin ve çeşitli gamlar gibi çözünür lifler, içecek formülasyonlarında yaygın olarak tercih edilmektedir. Bu bileşenler süspansiyon stabilitesini artırmakta, ağız hissini iyileştirmekte ve çözünmeyen liflerin duysal özellikler üzerindeki olumsuz etkilerini azaltmaktadır. Ayrıca bazı çözünür lifler kolesterol adsorpsiyonu ve sindirim enzimlerinin inhibisyonu gibi biyolojik işlevler göstererek ürünün besleyici ve nutrasötik değerini artırmaktadır. Bununla birlikte, lif ilavesi çökme, bulanıklık kaybı, viskozite değişiklikleri, mineral biyoyararlanımının azalması ve istenmeyen duysal farklılıklar gibi teknolojik zorluklara da yol açabilmektedir. Bu sorunların giderilmesinde modifiye polisakkaritler ve hidrokolloitler kullanılmaktadır. Sonuç olarak, içeceklere diyet lifi ilavesi, mevcut ve önerilen lif alımı arasındaki farkı azaltmaya yönelik umut verici bir strateji olmasının yanı sıra, sağlık odaklı, doğal ve fonksiyonel ürünlere yönelik tüketici talebine de yanıt vermektedir. Bu bağlamda, teknolojik-fonksiyonel özellikler ve tüketici kabulü üzerine gerçekleştirilecek ileri araştırmalar, formülasyonların optimize edilmesi ve lifle zenginleştirilmiş içecek pazarının genişlemesi açısından kritik öneme sahiptir.

Anahtar Kelimeler: Zenginleştirilmiş içecekler, çözünür diyet lifi, inülin, β -glukan, pektin, meyve suyu

ABSTRACT

Dietary fibers are recognized as key contributors to human health, promoting the development of beneficial gut microbiota and mitigating the risk of chronic conditions such as diabetes. Since most recent diets do not contain enough fiber, enriching beverages with dietary fiber is considered an effective approach to fill this gap and promote public health. The recognized health benefits of dietary fiber have further fueled the growth of the fiber-enriched food sector and stimulated the development of fiber-fortified beverages. Fruits and vegetables, as natural sources abundant in vitamins, minerals, and antioxidants, offer an ideal matrix for fiber incorporation into functional beverages. Soluble fibers, including inulin, oligofructose, pectin, and various gums, are widely utilized in beverage formulations due to their ability to improve suspension stability, enhance mouthfeel, and counteract the negative

sensory effects associated with insoluble fibers. Additionally, certain soluble fibers exhibit bioactive properties, such as cholesterol adsorption and inhibition of digestive enzymes, thereby increasing the nutritional and nutraceutical value of the products. Despite these advantages, the incorporation of dietary fiber presents technological challenges, including sedimentation, loss of clarity, viscosity alterations, decreased mineral bioavailability, and potential adverse sensory impacts. The application of modified polysaccharides and hydrocolloids has been shown to mitigate these issues effectively. In summary, the enrichment of beverages with dietary fiber represents a promising approach not only to bridge the gap between actual and recommended fiber intake but also to meet the growing consumer demand for health-oriented, natural, and functional products. In this context, further research focusing on optimizing technological and functional properties, alongside consumer acceptance, is crucial for advancing formulation strategies and expanding the market for fiber-enriched beverages.

Keywords: Fortified beverages, soluble dietary fiber, inulin, β -glucan, pectin, fruit juice

**MEYVE/SEBZE BAZLI FONKSİYONEL İÇECEKLERİN ÜRETİMİ VE KALİTE
DEĞERLENDİRMESİ**
**PRODUCTION AND QUALITY EVALUATION OF FUNCTIONAL FRUIT/VEGETABLE-
BASED DRINKS**

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ÖZET

Bu çalışmada, Çukurova Bölgesi'nden temin edilen hammaddeler kullanılarak Yeşil (G), Sarı (Y) ve Kırmızı (R) olmak üzere üç farklı renkte içecek üretilmiştir. Farklı meyve/sebze gruplarını temsil edecek şekilde formülasyonlar oluşturularak G içeceği ağırlıklı olarak ıspanak, salatalık, elma ve yapraklı otlardan; Y içeceği portakal, limon ve zerdeçaldan; R içeceği ise pancar, reyhan ve limondan hazırlanmıştır. Üretimden hemen sonra ve bir aylık depolama süresinin ardından bazı kalite özelliklerindeki değişimleri incelemek amacıyla örnekler analiz edilmiştir. Üretilen içeceklerin pH (G: 4,10; Y: 3,67; R: 3,54), titrasyon asitliği (G: 0,423 g/100 mL; Y: 0,423 g/100 mL; R: 0,298 g/100 mL) ve suda çözünür kuru madde değerleri (G: %2,05; Y: %3,67; R: %2,05), toplam fenolik madde miktarı (G: 205,86 mg/L; Y: 239,03 mg/L; R: 191,50 mg/L), antioksidan aktivite (G: %58,09; Y: %50,31; R: %51,11), protein (G: %0,424; Y: %0,333; R: %0,224) ve mineral madde içeriği (Zn, Fe, Cu, Na, K, Ca ve Mg) belirlenmiştir. Ayrıca, Y içeceğinde toplam karotenoid miktarı (0.0595 mg/100 mL) ve G içeceğinde klorofil içeriği tespit edilmiştir. Analiz sonuçları, G içeceğinin fenolik madde, antioksidan aktivite ve protein içeriği açısından, R içeceğinin ise antosiyanin içeriği bakımından zengin olduğunu göstermiştir. Y içeceği, en yüksek HMF içeriğine sahiptir. Duyusal değerlendirmede renk ve tat açısından R ve Y içecekleri, koku açısından ise Y içeceği diğerlerine kıyasla daha fazla beğenilmiştir. G içeceği duyusal olarak düşük puan almasına rağmen, besin ve fonksiyonel içerik açısından avantaj sağlama potansiyeline sahiptir. Bu bulgular, meyve/sebze bazlı fonksiyonel içeceklerin sağlık odaklı ürün geliştirme konusundaki potansiyelini ortaya koymakta olup, ileri çalışmalarda formülasyon etkilerinin daha ayrıntılı incelenmesi önerilmektedir.

Anahtar Kelimeler: Meyve/Sebze bazlı içecek, kalite özellikleri, toplam fenolik madde, antioksidan aktivite, toplam karotenoid madde, klorofil, depolama.

ABSTRACT

In this study, three drinks with different colors, Green (G), Yellow (Y), and Red (R), were produced using raw materials sourced from the Çukurova Region. Formulations representing different fruit and vegetable groups were developed: the G drink was mainly prepared with spinach, cucumber, apple, and leafy herbs, the Y drink with orange, lemon, and turmeric, and the R drink with beetroot, basil, and lemon. Samples were analyzed immediately after production and following one month of storage to examine changes in some quality attributes. The pH (G: 4.10; Y: 3.67; R: 3.54), titratable acidity (G: 0.423 g/100 mL; Y: 0.423 g/100 mL; R: 0.298 g/100 mL), and water-soluble solids content (G: 2.05%; Y: 3.67%; R: 2.05%) of the drinks were determined, along with total phenolic content (G: 205.86 mg/L; Y: 239.03 mg/L; R: 191.50 mg/L), antioxidant activity (G: 58.09%; Y: 50.31%; R: 51.11%), protein content (G: 0.424%; Y: 0.333%; R: 0.224%), and mineral composition (Zn, Fe, Cu, Na, K, Ca, and Mg). Additionally, total carotenoid content was detected in the Y drink (0.0595 mg/100 mL) and chlorophyll content in the G drink. The analysis results indicated that the G beverage was rich in phenolic compounds, antioxidant activity, and protein content, while the R beverage was characterized by a high anthocyanin content. The Y beverage exhibited the highest HMF level. Sensory evaluation revealed that the R and Y drinks were preferred in terms of color and taste, while the Y drink was rated highest in aroma. Although the G drink scored lower in sensory properties, it provides advantages in nutritional and functional composition. These findings highlight the potential of fruit/vegetable-based functional drinks for health-oriented product development and suggest that future studies should examine the effects of formulations in more detail.

Keywords: Fruit/vegetable-based drink, quality attributes, total phenolic content, antioxidant activity, total carotenoid content, chlorophyll, storage.

**BİTKİ BAZLI SÜT ALTERNATİFLERİ VE BİYOERİŞİLEBİLİRLİKLERİNİN
DEĞERLENDİRİLMESİ**
**NUTRITIONAL QUALITY, BIOACCESSIBILITY, AND HEALTH EFFECTS OF PLANT-
BASED MILK ALTERNATIVES**

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ÖZET

Bu çalışmada bitki bazlı süt alternatiflerinin besin bileşimleri, biyoerişilebilirliği ve sağlık üzerindeki etkileri incelenmiştir. Çalışmanın temel amacı, bitkisel süt alternatiflerinin hayvansal sütle kıyaslandığında sağladığı besin değerlerini ve potansiyel sağlık etkilerini değerlendirmektir. Yapılan incelemeler bitki bazlı sütlerin sürdürülebilirlik, etik hassasiyetler ve laktoz intoleransı gibi nedenlerle giderek daha fazla tercih edildiğini göstermektedir. Ancak protein, mineral ve bazı vitaminler açısından hayvansal sütle kıyaslandığında yetersizlikler bulunabilmektedir. Ayrıca bu ürünler bazı sağlık riskleri, düşük protein içeriği, yüksek şeker miktarı ve potansiyel alerjenler gibi faktörlerle ilişkilendirilmektedir. Buna karşın klinik ve in vitro çalışmalar, bitki bazlı süt alternatiflerinin kardiyometabolik sağlık, kemik sağlığı ve sindirim açısından olumlu etkiler gösterebileceğini ortaya koymaktadır. Bitki bazlı süt alternatiflerinin protein ve mikro besin eksikliklerinin giderilmesi, ürün formülasyonu ve teknolojik geliştirmeler yoluyla besin değerlerinin ve biyoerişilebilirliğinin artırılmasıyla mümkün olabilmektedir. Sonuç olarak, bitki bazlı süt alternatifleri hem sağlık hem de sürdürülebilirlik açısından önemli bir seçenek sunmakta olup besin kalitesinin optimize edilmesi ve farklı yaş grupları ile özel ihtiyaçlara uygun ürünlerin geliştirilmesi gelecekteki araştırmalar ve ürün tasarımı için kritik öneme sahiptir.

Anahtar kelimeler: Bitki bazlı süt alternatifleri, biyoerişilebilirlik, besin bileşimleri

ABSTRACT

This study examined the nutritional compositions, bioavailability, and health effects of plant-based milk alternatives. The primary aim of the study was to evaluate the nutritional value and potential health impacts of plant-based milk alternatives in comparison to animal milk. The review indicates that plant-based milks are increasingly preferred due to sustainability, ethical considerations, and lactose intolerance. However, they may be deficient in protein, minerals, and certain vitamins compared to animal milk. Additionally, these products may be associated with certain health risks, including low protein content, high sugar levels, and potential allergens.

On the other hand, clinical and in vitro studies have shown that plant-based milk alternatives may have positive effects on cardiometabolic health, bone health, and digestion. Addressing protein and micronutrient deficiencies in plant-based milks is possible through product formulation and technological improvements, which can enhance their nutritional value and bioavailability. In conclusion, plant-based milk alternatives provide an important option in terms of both health and sustainability. Optimizing their nutritional quality and developing products suitable for different age groups and specific needs is critical for future research and product design.

Keywords: Plant-based milk alternatives, bioaccessibility, nutritional composition.

STEARİK ASİDİN VARLIĞI OLEOJEL KALİTE PARAMETRELERİNİ İYİLEŞTİRİR
PRESENCE OF STEARIC ACID IMPROVES OLEOGEL QUALITY PARAMETERS

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ÖZET

Olejeller, sıvı yağların düşük molekül ağırlıklı veya polimerik jelatörlerle üç boyutlu bir ağ yapısı içine hapsedilmesiyle elde edilen yarı katı yapılardır. Bu sistemler, gıda formülasyonlarında doymuş ve trans yağların kısmen ya da tamamen yerine kullanılabilmesi, sağlıklı yağ bazlı ürünlerin geliştirilmesine olanak sağlamaları, yüksek oksidatif stabiliteye sahip olmaları, aroma taşıma kapasiteleri ve istenilen tekstürel özellikleri sağlayabilmeleri sayesinde hem sağlık hem de endüstriyel açıdan dikkat çekici bir potansiyele sahiptir. Mevcut çalışmada, mısır yağı, lesitin ve stearik asit kullanılarak oleojeller üretilmiştir. Formülasyonlarda mısır yağı ve lesitin oranı sabit tutulmuş, stearik asidin farklı konsantrasyonlarının oleojellerin işlevsel ve tekstürel özellikleri üzerindeki etkileri araştırılmıştır. Kontrol örneği yalnızca mısır yağı ve lesitin içeren oleojelden (OG-0), deneysel gruplar ise sırasıyla %5, %10, %15 ve %20 oranında stearik asit içeren örneklerden (OG-5, OG-10, OG-15, OG-20) oluşturulmuştur. Bulgular, stearik asit oranındaki artışın oleojellerin karakteristik özelliklerini anlamlı düzeyde etkilediğini göstermiştir. Renk parametreleri oleojelatör konsantrasyonuna bağlı olarak değişim göstermiştir. En yüksek yağ bağlama kapasitesi OG-15 (%96.72) örneğinde tespit edilmiş, bunu OG-20 (%95.63), OG-10 (%93.18), OG-5 (%73.36) ve OG-0 (%12.35) takip etmiştir. Benzer şekilde, stabilite katsayısı (%77.47–%16.87) değerlerinde de bu sıralamaya paralel sonuçlar elde edilmiştir. Tekstürel analizde, %15 stearik asit içeren OG-15 örneği istenilen sertlik değerine (7.4 N) ulaşmıştır. Daha yüksek konsantrasyonda stearik asit ilavesi ise oleojellerde arzu edilmeyen aşırı sertlik oluşumuna yol açmıştır. Genel olarak elde edilen bulgular, oleojel formülasyonlarında kullanılan oleojelatör miktarının, ürünlerin fizikokimyasal stabilitesi ve tekstürel özelliklerinin şekillenmesinde kritik öneme sahip olduğunu ortaya koymaktadır. Gıda formülasyonları açısından değerlendirildiğinde, stearik asit bazlı oleojellerin optimum düzeyde kullanımı; daha sağlıklı yağ alternatiflerinin geliştirilmesi, fonksiyonel gıda yeniliklerinin artırılması ve endüstriyel ölçekte uygulanabilecek yeni nesil yağ bazlı sistemlerin tasarlanması için önemli bir potansiyel sunmaktadır.

Anahtar Kelimeler: Oleojel, Oleojelatör, Stearik asit, Fonksiyonel özellikler, Dokusal davranış.

ABSTRACT

Oleogels are semi-solid systems obtained by immobilising liquid oils within a three-dimensional network formed by low-molecular-weight or polymeric gelators. These systems have remarkable potential from both health and industrial perspectives, as they can be used partially or completely to replace saturated and trans fats in food formulations, enable the development of healthy oil-based products, offer high oxidative stability, provide good aroma-carrying capacity, and deliver the desired textural properties. In this study, oleogels were produced using corn oil, lecithin, and stearic acid. While the ratios of corn oil and lecithin were kept constant, the effects of different concentrations of stearic acid on the functional and textural properties of oleogels were investigated. The control sample consisted of oleogel containing only corn oil and lecithin (OG-0), whereas the experimental groups were prepared with 5%, 10%, 15%, and 20% stearic acid (OG-5, OG-10, OG-15, OG-20). The results demonstrated that increasing stearic acid concentration significantly influenced the characteristic properties of oleogels. Color parameters varied depending on the oleogelator concentration. The highest oil-binding capacity was observed in OG-15 (96.72%), followed by OG-20 (95.63%), OG-10 (93.18%), OG-5 (73.36%), and OG-0 (12.35%). Similarly, the stability coefficient (77.47–16.87%) exhibited parallel trends. Textural analysis showed that OG-15, containing 15% stearic acid, had desired hardness value (7.4 N). However, higher concentrations of stearic acid resulted in undesirable excessive firmness in oleogels. Overall, the findings highlight the critical importance of oleogelator concentration in determining the physicochemical stability and textural properties of oleogel formulations. From a food formulation perspective, the optimal use of stearic acid-based oleogels offers significant potential for developing healthier fat alternatives, enhancing functional food innovations, and designing next-generation lipid-based systems for industrial applications.

Keywords: Oleogel, Oleogelator, Stearic acid, Functional properties, Textural behavior.

GİRESUN GASTRONOMİ KÜLTÜRÜNDE YENİLEBİLİR DOĞA MANTARLARI
EDIBLE WILD MUSHROOMS IN GİRESUN GASTRONOMY CULTURE

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ÖZET

Gastronomi, yiyecek ve içeceklerin belirli bir sistematik düzen içinde hazırlandığı, göze ve damak tadına hitap edecek şekilde sunulduğu, yemek ve kültür arasındaki ilişkiyi inceleyen bir disiplindir. Gastronomi kültürü, bir topluluğun veya bölgenin yemekleri ve içecekleri ile yeme içme ritüelleri ve alışkanlıkları, mutfak teknikleri ve gelenekleri, yemek yapma yöntemleri ve gıda tercihleri gibi birçok konuyu kapsayan geniş bir kavramdır. Giresun ilinin gastronomi kültürü, bitkisel ve hayvansal ürünlerin yer aldığı, hem geleneksel hem de yenilikçi lezzetleriyle dikkat çeken zengin bir mutfak geleneğine sahiptir. Giresun yemek kültüründe, yenilebilir yabani otlar, yenilebilir doğa mantarları ve sebzeler, mısır ve fındık içerikli tarifler, deniz ürünleri, peynir ve süt ürünleri ile kışa hazırlık kültürü içinde yeri olan meyveler ve sebzeler öne çıkmaktadır. Zengin Giresun mutfak kültürü mirası içinde yer alan yenilebilir doğa mantarları, yerel halk tarafından doğadan toplanıp doğrudan tüketilmekte ve ekonomik değeri olan türler yöresel pazarlarda satılmaktadır. Taze mantarlardan kavurma, köfte, pilav (dible) ve türlü gibi çeşitli yemekler yapılmaktadır. Ayrıca, mantar yemeklerinin hazırlanması sırasında veya öncesinde fırında pişirme, haşlama, ızgara, kızartma, közleme ve soteleme gibi farklı ön işlemler ve pişirme teknikleri uygulanmaktadır. Taze mantarlar dondurularak, kurutularak, konserve, salamura ve turşu yapılarak muhafaza edilmektedir. Bu derleme çalışmasında, Giresun ilinin gastronomik değere sahip yenilebilir doğa mantarı türleri, geleneksel mantar yemekleri, mantarları pişirme teknikleri ve muhafaza yöntemleri hakkında detaylı bilgi verilmesi amaçlanmıştır.

Anahtar Kelimeler: Yenilebilir doğa mantarları, Giresun, gastronomi kültürü, mantar yemekleri, pişirme teknikleri, tüketim tercihleri, muhafaza yöntemleri.

ABSTRACT

Gastronomy is a discipline that examines the relationship between food and culture, where food and beverages are prepared in a systematic manner and presented in a way that appeals to the eye and palate. Gastronomic culture is a broad concept encompassing many topics such as the foods and beverages of a community or region, eating and drinking rituals and habits, culinary techniques and traditions, cooking methods and food preferences. The gastronomic culture of Giresun province has a rich culinary tradition that includes plant and animal products and attracts attention with both traditional and innovative flavors. In Giresun's food culture, edible wild herbs, edible wild mushrooms and vegetables, recipes containing corns and hazelnuts, seafood, cheese and dairy products, and fruits and vegetables that have a place in the winter preparation culture stand out. Edible wild mushrooms, which are part of the rich culinary culture heritage of Giresun, are collected from nature and consumed directly by the local people, and species with economic value are sold in local markets. Various dishes such as roasted mushrooms, pilaf (dible) and stews are made from fresh mushrooms. In addition, different pre-

treatments and cooking techniques such as baking, boiling, grilling, frying, roasting, and sautéing are applied before or during the preparation of mushroom dishes. Fresh mushrooms are preserved by freezing, drying, canning, salting, and pickling. In this review study, it is aimed to give detailed information about the edible wild mushroom species of Giresun province with gastronomic value, traditional mushroom dishes, mushroom cooking techniques and preservation methods.

Keywords: Edible wild mushrooms, Giresun, gastronomic culture, mushroom dishes, cooking techniques, consumption preferences, preservation methods.

ALKALİ KOŞULLARDA HAZIRLANAN MİNERAL ÇÖZELTİLERİNİN PÜSKÜRTEREK KURUTMA İLE TOZLAŞTIRILMASI: KALSİYUM VE MAGNEZYUM ÇÖZÜNÜRLÜĞÜ İLE İN VİTRO BİYOERİŞİLEBİLİRLİK İNDEKSİ ÜZERİNE ETKİSİ

SPRAY DRYING OF MINERAL SOLUTIONS PREPARED UNDER ALKALINE CONDITIONS: EFFECTS ON CALCIUM AND MAGNESIUM SOLUBILITY AND IN VITRO BIOACCESSIBILITY INDEX

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ÖZET

Bu çalışmanın amacı, alkali koşulların kalsiyum ve magnezyum minerallerinin çözünürlüğü ve in vitro biyoerişilebilirlik indeksi üzerindeki etkilerini püskürterek kurutma yöntemiyle tozlaştırılmış formülasyonlar üzerinde incelemektir. Çalışmada kalsiyum kaynağı olarak kalsiyum laktat, magnezyum kaynağı olarak magnezyum sitrat, taşıyıcı olarak maltodekstrin ve pH ayarlayıcı olarak sodyum hidroksit (NaOH) kullanılmıştır. Mineral çözeltileri farklı pH değerlerinde (6, 7, 8 ve 9) hazırlanmış, maltodekstrin ilavesiyle viskozitesi püskürterek kurutma işlemine uygun hale getirilmiştir. Hazırlanan çözeltiler, laboratuvar ölçekli püskürtmeli kurutucu cihazında 140°C giriş ve 75°C çıkış sıcaklıklarında tozlaştırılmıştır. Kalsiyum ve magnezyum içeren toz formülasyonların çözünürlükleri hem kullanılan mineral türüne hem de uygulanan pH değerine bağlı olarak değişiklik göstermiştir. pH artışıyla birlikte her iki mineralin çözünürlüğü belirgin biçimde artmıştır. Kalsiyumun çözünürlüğü pH 6'da %63,66 ± 1,39 iken pH 9'da %89,35 ± 0,80'e yükselmiştir. Benzer şekilde, magnezyumun çözünürlüğü pH 6'da %56,59 ± 2,49 iken pH 9'da %83,73 ± 0,59 olarak belirlenmiştir. Biyoerişilebilirlik indeksi sonuçları çözünürlük ile doğru orantılı olup, pH artışı ile biyoerişilebilirlik indeksi oranlarında artış gözlenmiştir. Kalsiyum için biyoerişilebilirlik indeksi yüzdeleri sırasıyla pH 6'da %48,03 ± 0,62, pH 7'de %54,84 ± 0,24, pH 8'de %62,66 ± 0,43 ve pH 9'da %69,53 ± 0,15 olarak belirlenmiştir. Magnezyum için bu oranlar pH 6'da %51,49 ± 0,16, pH 7'de %56,47 ± 0,32, pH 8'de %61,69 ± 0,43 ve pH 9'da %70,40 ± 0,14'tür. pH artışı, partikül büyüklüğü ve serbest yoğunlukta azalmaya neden olurken Hausner oranında artışa yol açmıştır. Kalsiyum formülasyonlarının partikül büyüklüğü 12,80–16,50 µm aralığında, magnezyum formülasyonlarının ise 12,20–15,80 µm aralığında ölçülmüştür. Kalsiyumun serbest yoğunluk değerleri 0,46–0,52 g/mL, magnezyumun ise 0,44–0,50 g/mL aralığındadır. Sıkışmış yoğunluk değerleri kalsiyum için 0,60–0,66 g/mL, magnezyum için 0,58–0,64 g/mL arasında

değişmiştir. Her iki mineral için Carr indeksi %21,00–23,00 aralığında olup, Hausner oranı kalsiyumda 1,27–1,30, magnezyumda ise 1,28–1,32 aralığında bulunmuştur. Bu sonuçlar, alkali koşulların püskürterek kurutulmuş çözeltilerde kalsiyum ve magnezyumun çözünürlüğü ve biyoerişilebilirliğini önemli ölçüde artırdığını göstermektedir

Anahtar Kelimeler: Püskürterek kurutma, alkali koşullar, kalsiyum, magnezyum, çözünürlük, in vitro biyoerişilebilirlik indeksi.

ABSTRACT

This study aimed to investigate the effects of alkaline conditions on the solubility and in vitro bioaccessibility index of calcium and magnesium minerals in spray-dried formulations. Calcium lactate and magnesium citrate were used as mineral sources, maltodextrin served as the carrier, and sodium hydroxide (NaOH) was employed as the pH adjuster. Mineral solutions were prepared at different pH values (6, 7, 8, and 9), and their viscosity was adjusted with maltodextrin to ensure suitability for spray drying. The formulations were dried using a laboratory-scale spray dryer at an inlet temperature of 140°C and an outlet temperature of 75°C. The solubility of calcium- and magnesium-containing powders varied depending on both the mineral type and pH level. Increasing pH significantly enhanced mineral solubility. Calcium solubility increased from $63.66 \pm 1.39\%$ at pH 6 to $89.35 \pm 0.80\%$ at pH 9, whereas magnesium solubility rose from $56.59 \pm 2.49\%$ at pH 6 to $83.73 \pm 0.59\%$ at pH 9. Bioaccessibility index results showed a strong correlation with solubility, increasing consistently with higher pH levels. For calcium, bioaccessibility index percentages were $48.03 \pm 0.62\%$ (pH 6), $54.84 \pm 0.24\%$ (pH 7), $62.66 \pm 0.43\%$ (pH 8), and $69.53 \pm 0.15\%$ (pH 9). For magnesium, the respective values were $51.49 \pm 0.16\%$, $56.47 \pm 0.32\%$, $61.69 \pm 0.43\%$, and $70.40 \pm 0.14\%$. An increase in pH led to reductions in particle size and bulk density, while the Hausner ratio increased. The particle size of calcium formulations ranged from 12.80 μm to 16.50 μm , whereas magnesium formulations ranged from 12.2 μm to 15.80 μm . The bulk density values were 0.46–0.52 g/mL for calcium and 0.44–0.50 g/mL for magnesium, while tapped density ranged from 0.60–0.66 g/mL for calcium and 0.58–0.64 g/mL for magnesium. The Carr index values were between 21.00% and 23.00% for both minerals, and Hausner ratios were found to range from 1.27 to 1.30 for calcium and 1.28 to 1.32 for magnesium. These results demonstrate that alkaline conditions significantly enhance the solubility and bioaccessibility of calcium and magnesium in spray-dried solutions.

Keywords: Spray drying, alkaline conditions, calcium, magnesium, solubility, in vitro bioaccessibility index.

GIDA ALANINDA YAPAY ZEKANIN KULLANIMI VE GELECEĞİ
ARTIFICIAL INTELLIGENCE IN FOOD: CURRENT APPLICATIONS AND FUTURE DIRECTIONS

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ÖZET

Yapay zeka (AI), makineler, özellikle bilgisayar sistemleri, robotik ve dijital ekipmanlar tarafından insan düşünme süreçlerini, öğrenme yeteneği gibi yetenek süreçlerini stimüle eden bir araç olarak tanımlanmaktadır. Gıda alanında ise üretim, kalite kontrol, gıda güvenliği ve tüketici etkiletişimi için yenilikçi çözümler sunmaktadır. Yapay zeka aracılığıyla, görüntü işleme ve öngörücü analizlerden yararlanılarak gıda işleme hatlarının gerçek zamanlı izlenmesi, mikrobiyal kontaminasyonun erken tespiti, mikrobiyel gelişim tahmini, akıllı ambalaj ve sensör sistemlerinin geliştirilmesi, yapay zeka destekli duyu analizi, yeni ürün geliştirme ve fonksiyonel gıda tasarımı, proses modelleme ve optimizasyonu mümkün olmaktadır. Ayrıca Ar-Ge maliyetlerinin kontrolü, akıllı karar destek sistemleri aracılığıyla kaynak verimliliğini sağlama, talep tahmini ile gıda israfının önlenmesi, kişiselleştirilmiş beslenme planlarının genetik, metabolik ve yaşam tarzı verilerine dayalı olarak tasarımı, iklim dostu üretim yöntemlerinin ve sürdürülebilir gıda alternatiflerinin geliştirilmesi noktasında da katkı sağlar. Bunun yanı sıra tarımsal ürünlerde meydana gelen hastalıkların tespitinde ve ürün verimliliğini artırmak amacıyla kullanılmaktadır. Gıda endüstrisinde bilgi tabanlı uzman sistem, bulanık mantık, yapay sinir ağı, uyarlanabilir nöro-bulanık çıkarım sistemi (ANFIS) ve makine öğrenimi en popüler teknikler arasındadır. Bunun yanı sıra insanların algıladığı benzer kokuları veya tatları algılaması için elektronik burun (e-burun) ve elektronik dil (e-dil, çoklu duyu analizi) gibi sensörler geliştirilmiş ve uygulanmıştır. Bu çalışmada gıda alanında yapay zekanın mevcut kullanım durumu ve geleceğine dair güncel çalışmalara yer verilmiştir.

Anahtar Kelimeler: yapay zeka, gıda, sensör, duyu analizi

ABSTRACT

Artificial intelligence (AI) is defined as a tool used by machines, especially computer systems, robotics and digital equipment, to stimulate human thinking processes and skill processes such as the ability to learn. In the food field, it offers innovative solutions for production, quality control, food safety and consumer interaction. Using artificial intelligence, it is possible to monitor food processing lines in real time, detect microbial contamination early, prediction of microbial growth, development of smart packaging and sensor systems, perform AI-supported sensory analysis, develop new products and

functional food designs, process modelling and optimisation. It also contributes to controlling research and development costs, ensuring resource efficiency through intelligent decision support systems, preventing food waste through demand forecasting, designing personalised nutrition plans based on genetic, metabolic and lifestyle data, and developing climate-friendly production methods and sustainable food alternatives. In addition, it is used to detect diseases occurring in agricultural products and to increase product yield. In the food industry, knowledge-based expert systems, fuzzy logic, artificial neural networks, adaptive neuro-fuzzy inference systems (ANFIS), and machine learning are among the most popular techniques. In addition, sensors such as electronic noses (e-noses) and electronic tongues (e-tongues, multi-sensory systems) have been developed to detect similar smells or tastes perceived by humans. This study includes current studies on the current use and future of artificial intelligence in the food field.

Keywords: artificial intelligence, food, sensor, sensory analysis

**POLİKİSTİK OVER SENDROMU OLAN KADINLARDA DİYETLE ALINAN İLERİ
GLİKASYON SON ÜRÜNLERİ İLE SEMPTOMLAR VE ANTROPOMETRİK
ÖZELLİKLER ARASINDAKİ İLİŞKİ: VAKIF ÜNİVERSİTESİNDE VAKA-KONTROL
ÇALIŞMASI**

**ADVANCED GLYCATION END PRODUCTS AND THEIR ASSOCIATION WITH
SYMPTOMS AND ANTHROPOMETRIC FEATURES IN WOMEN WITH POLYCYSTIC
OVARY SYNDROME: A CASE-CONTROL STUDY AT A FOUNDATION UNIVERSITY**

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ÖZET

Polikistik over sendromu (PKOS) dünyada prevalansı giderek artan ve kadınların yaşam kalitelerini önemli ölçüde olumsuz etkileyen endokrin bir bozukluktur. PKOS; menstrüasyon düzensizlikleri, androjen fazlalılığı ve infertilite gibi sağlık problemlerine yol açabilmektedir. Birçok hastalıkta olduğu gibi beslenmenin PKOS ile ilişkisi oldukça önemlidir. Son yıllarda, PKOS ve diyet ile alınan ileri glikasyon son ürünleri (dAGE) arasında ilişki olduğunu ortaya koyan araştırmalar bulunmaktadır. AGE'ler yüksek sıcaklıkta pişirme ve kızartma gibi gıda işleme yöntemleriyle oluşan bileşiklerdir. Bu bileşikler, reaktif oksijen türleri oluşturarak hücrelerde oksidatif stresin artmasına neden olmaktadır. PKOS'u olan kadınlarda oksidatif stres ve inflamasyon düzeylerinin arttığı ve bu durumun hastalığın klinik semptomlarının ilerlemesine neden olabileceği öne sürülmektedir. Bu araştırma ile dAGE'lerin

kadınlarda hastalıkla ilişkili semptomlar, antropometrik özellikler ve yaşam kalitesi üzerindeki etkilerini incelemek amaçlanmıştır. Çalışma İstanbul'da bir vakıf üniversitesinde öğrenim gören, PKOS tanısı almış vaka grubu (n = 30) ve PKOS tanısı olmayan sağlıklı kontrol grubu (n = 109) olmak üzere toplam 139 katılımcı ile yürütülmüştür. Tüm katılımcılardan antropometrik ölçümler alınmış ve 3 günlük besin tüketim kayıtları kullanılarak diyet kaynaklı dAGE miktarları hesaplanmıştır. PKOS'a özgü Polikistik Over Sendromu Yaşam Kalitesi-50 Ölçeği (PKOSQ-50) yalnızca vaka grubuna uygulanmış ve dAGE miktarları ile hastalık semptomları ve antropometrik ölçümler arasındaki ilişkiler incelenmiştir. Ayrıca tüm katılımcılar SF-12 Yaşam Kalitesi Ölçeği'ni doldurmuş; vaka ve kontrol gruplarının yaşam kaliteleri, dAGE miktarlarına göre incelenmiştir. Çalışma bulgularında PKOS'lu kadınlarda menstrual düzensizlikler (p <0,001) ve obezite göstergeleri (BKİ p <0,001, bel çevresi p = 0,004, bel/kalça oranı p <0,001) kontrol grubuna göre anlamlı olarak daha yüksek bulunmuştur. SF-12 ölçeğinin alt boyutlarından biri olan "fiziksel yaşam kalitesi" (PCS12, p = 0,019) PKOS grubunda düşük iken, "mental sağlık kalitesi" puanları (MCS12, p = 0,977) gruplar arasında farklılık göstermemiştir. Uyku süresi, PKOS'lu kadınlarda daha kısa saptanmıştır (6,8 ± 1,4 saat vs. 7,5 ± 1,1 saat, p = 0,001). Diyetten alınan AGE miktarları (CML p = 0,192, CEL p = 0,433, MGH1 p = 0,802, toplam AGE p = 0,996) PKOS ve kontrol grubu arasında benzer bulunmuştur. PKOSQ-50 ölçeği değerlendirmelerine göre PKOS'lu kadınlarda psikososyal ve duygusal (39,0 [33,8–47,5]), fertilité (31,0 [27,0–33,0]), obezite/menstrual düzensizlikler (29,5 [22,0–35,0]) ve hirsutizm (22,0 [13,0–27,0]) alt boyutlarında orta düzeyde etkilenme olduğu gösterilmiştir. Çalışmamızda kontrol grubu ve PKOS'lu vaka grubu arasında dAGE alımlarına göre anlamlı bir ilişki saptanmazken dAGE seviyelerine göre yapılan sınıflandırmaya göre (düşük ve yüksek AGE), kontrol grubunda yüksek dAGE oluşumu daha yüksek enerji (p = 0,001) ve makro besin ögesi alımı (protein p = 0,001, yağ p = 0,002, karbonhidrat p = 0,019) ile ilişkili olup, mental sağlık puanlarını düşürmüştür (MCS12 p = 0,030). Sonuç olarak bu çalışma, PKOS'lu kadınların menstrual düzensizlik, obezite ve düşük fiziksel yaşam kalitesi açısından sağlıklı kontrollere göre daha olumsuz profillere sahip olduğunu göstermiştir. Diyetten alınan AGE miktarları PKOS'lu grupta yaşam kalitesi ve vücut kompozisyonunu etkilemezken, kontrol grubunda yüksek dAGE alımı enerji tüketimini artırıp mental sağlığı olumsuz etkileyebilmektedir. Bulgular, her ne kadar PKOS'lu grupta dAGE açısından fark olmadığını gösterse de kontrol grubundaki öne çıkan değişkenler kadın sağlığında özellikle enerji dengesi ve dAGE alımının potansiyel etkilerinin önemine dikkat çekmekte ancak konu ile ilgili daha kapsamlı klinik araştırmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Polikistik over sendromu, Semptom, İleri glikasyon son ürünleri, Yaşam kalitesi, Antropometri

ABSTRACT

Polycystic Ovary Syndrome (PCOS) is an endocrine disorder with a rising prevalence worldwide that significantly impacts women's quality of life. PCOS can lead to health problems such as menstrual irregularities, hyperandrogenism, and infertility. As with many other diseases, nutrition plays a crucial role in PCOS. Recent studies have highlighted a potential relationship between PCOS and dietary advanced glycation end products (dAGEs). AGEs are compounds formed during food processing methods such as high-temperature cooking and frying. These compounds increase reactive oxygen species, resulting in elevated oxidative stress within cells. It has been suggested that oxidative stress and inflammation are increased in women with PCOS, which may contribute to the progression of clinical symptoms. This study aimed to investigate the effects of dAGEs on disease-related symptoms, anthropometric characteristics, and quality of life in women. The study was conducted in Istanbul at a foundation university and included a total of 139 participants: a PCOS case group (n = 30) and a healthy control group without PCOS (n = 109). Anthropometric measurements were taken from all participants,

and dietary dAGE intake was calculated using 3-day food records. The PCOS-specific Polycystic Ovary Syndrome Questionnaire-50 (PCOSQ-50) was administered only to the case group, and the relationships between dAGE intake, disease symptoms, and anthropometric measurements were examined. Additionally, all participants completed the SF-12 Quality of Life Scale, and the quality of life of the case and control groups was analyzed according to dAGE intake. The study findings showed that women with PCOS had significantly higher menstrual irregularities ($p < 0.001$) and obesity indicators (BMI $p < 0.001$, waist circumference $p = 0.004$, waist-to-hip ratio $p < 0.001$) compared to the control group. Among the SF-12 subscales, physical quality of life (PCS12, $p = 0.019$) was lower in the PCOS group, whereas mental health scores (MCS12, $p = 0.977$) did not differ between groups. Sleep duration was shorter in women with PCOS (6.8 ± 1.4 hours vs. 7.5 ± 1.1 hours, $p = 0.001$). Dietary AGE intake (CML $p = 0.192$, CEL $p = 0.433$, MGH1 $p = 0.802$, total AGE $p = 0.996$) was similar between the PCOS and control groups. According to PCOSQ-50 evaluations, women with PCOS exhibited moderate impairment in psychosocial and emotional (39.0 [33.8–47.5]), fertility (31.0 [27.0–33.0]), obesity/menstrual irregularity (29.5 [22.0–35.0]), and hirsutism (22.0 [13.0–27.0]) subscales. Although no significant relationship was found between dAGE intake and study groups, categorization based on dAGE levels (low vs. high AGE) revealed that in the control group, high dAGE intake was associated with higher energy ($p = 0.001$) and macronutrient intake (protein $p = 0.001$, fat $p = 0.002$, carbohydrate $p = 0.019$) and negatively affected mental health scores (MCS12 $p = 0.030$). In conclusion, this study demonstrated that women with PCOS had less favorable profiles regarding menstrual irregularities, obesity, and lower physical quality of life compared to healthy controls. While dietary AGE intake did not affect quality of life or body composition in the PCOS group, high dAGE intake in the control group increased energy consumption and adversely affected mental health. Although no differences in dAGEs were observed in women with PCOS, the findings highlight the potential importance of energy balance and dAGE intake for women's health, emphasizing the need for more comprehensive clinical research on this topic.

Keywords: Polycystic Ovary Syndrome, Symptoms, Advanced Glycation End Products, Quality of Life, Anthropometry

**ÜNİVERSİTE ÖĞRENCİLERİNDE SAĞLIK EĞİTİMİNİN ULTRA İŞLENMİŞ BESİN
TÜKETİMİ VE SAĞLIKLI BESLENME TUTUMLARINA ETKİSİ**

**THE EFFECT OF HEALTH EDUCATION ON ULTRA-PROCESSED FOOD
CONSUMPTION AND HEALTHY EATING ATTITUDES AMONG UNIVERSITY
STUDENTS**

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ÖZET

Ultra işlenmiş besinlerin (UİB) tüketimi, yetişkinlerde ve çocuklarda çeşitli sağlık sorunlarıyla ilişkilendirilmektedir ve zamanla halk sağlığını tehdit eden bir durum haline geldiği bilinmektedir. Dolayısıyla, toplum sağlığı açısından bu tür ürünlerin yaygın tüketiminin görüldüğü genç yetişkinlik döneminde, üniversite öğrencilerinin ultra-işlenmiş besin tüketim düzeylerinin azaltılması büyük önem taşımaktadır. Bu araştırma, üniversite öğrencilerinde sağlık eğitiminin ultra işlenmiş besin tüketim sıklığı ile sağlıklı beslenmeye ilişkin tutumları üzerine etkisini incelemek amacıyla yürütülmüştür. Araştırmada katılımcılara yüz yüze görüşme yöntemi ile anket formu uygulanmıştır. Oluşturulan anket formu ile öğrencilerin sosyodemografik özellikleri, beslenme alışkanlıkları sorgulanmış, antropometrik ölçümleri alınmış ve Sağlıklı Beslenmeye İlişkin Tutum Ölçeği (SBİTÖ) ile NOVA sınıflama sistemine göre besin gruplarının tüketim sıklığı kaydedilmiştir. Araştırmaya toplam 200 öğrenci katılmış olup, bunların 100'ü sağlık eğitimi alan, 100'ü ise sağlık eğitimi almayan bireylerden oluşmaktadır. Araştırmaya katılan 200 öğrencinin %82,50'si lisans eğitimi alırken %17,50'si ön lisans eğitimi almaktadır. Sağlık eğitimi alan bireylerin Beden Kütle İndeksi (BKİ) 22,6 kg/m² iken, almayan bireylerinki 22,5 kg/m² olarak bulunmuştur. Sağlık eğitimi almayan öğrencilerin günlük ortalama enerji, protein, yağ, çoklu doymamış yağ asidi, potasyum, A vitamini ve E vitamini düzeyleri daha yüksek olarak bulunmuştur (p<0.05). Özellikle enerji ve yağ alımındaki artış uzun dönemde vücut ağırlığı artışı,

obezite ve bulaşıcı olmayan kronik hastalık riskini artırabilir. Ultra işlenmiş besin tüketim sıklıkları değerlendirildiğinde, ultra işlenmiş besinlerden yalnızca gazlı içecek tüketim sıklığı açısından istatistiksel açıdan anlamlı farklılığın olduğu, sağlık eğitimi almayan grupta daha sık tüketimin olduğu bulunmuştur ($p<0.05$). Sağlık eğitimi alan öğrencilerin SBİTÖ puanı 73,8 iken, almayan öğrencilerin ise 69,4'tür ($p<0.05$). İstatistiksel açıdan anlamlı olmasa da, sağlık eğitimi alan öğrencilerin bazı ultra işlenmiş besinleri sağlık eğitimi almayanlara göre daha az sıklıkla tükettikleri saptanmıştır. Ancak her iki grupta da fast food ve UİB tüketim oranlarının yüksek olması, üniversite öğrencilerinin sağlıklı beslenme davranışlarını geliştirmeye yönelik eğitim ve farkındalık programlarının gerekliliğini ortaya koymaktadır.

Anahtar Kelimeler: Sağlık eğitimi, Sağlıklı beslenme, Ultra işlenmiş besin, Üniversite öğrencisi

ABSTRACT

The consumption of ultra-processed foods (UPFs) has been associated with various health problems in both adults and children and, over time, has become a growing public health concern. Therefore, reducing the consumption levels of such products during young adulthood, a period characterized by widespread intake of these foods, is of great importance for public health. This study was conducted to examine the effect of health education on the frequency of ultra-processed food consumption and attitudes toward healthy eating among university students. A face-to-face questionnaire was administered to participants. The questionnaire collected data on students' sociodemographic characteristics, dietary habits, and anthropometric measurements and included the Attitude Scale for Healthy Nutrition (HEAS) as well as a food frequency questionnaire based on the NOVA classification system. A total of 200 students participated in the study, with 100 students receiving health education and 100 students not receiving health education. Among the 200 participants, 82.5% were undergraduates, while 17.5% were associate degree students. The Body Mass Index (BMI) of students receiving health education was found to be 22.6 kg/m², whereas it was 22.5 kg/m² in those without health education. Students who did not receive health education had significantly higher daily average intakes of energy, protein, fat, polyunsaturated fatty acids, potassium, vitamin A, and vitamin E ($p<0.05$). Particularly, increased intake of energy and fat may elevate the risk of weight gain, obesity, and non-communicable chronic diseases in the long term. When the frequency of ultra-processed food consumption was evaluated, a statistically significant difference was found only in the consumption frequency of carbonated beverages, which was higher in the group without health education ($p<0.05$). The ASHN score was 73.8 in the health-educated group, compared to 69.4 in the non-educated group ($p<0.05$). Although not statistically significant, it was found that students who received health education consumed some ultra-processed foods less frequently than those who did not receive health education.

However, the high rates of fast food and UPF consumption in both groups highlight the necessity of implementing nutrition education and awareness programs to improve healthy eating behaviors among university students.

Keywords: Health education, Healthy eating, Ultra-processed foods, University students

YENİLEBİLİR DOĞA MANTARLARININ ANTİOKSİDATİF FENOLİK BİLEŞİKLERİ
ANTIOXIDATIVE PHENOLIC COMPOUNDS OF EDIBLE WILD MUSHROOMS

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ÖZET

Oksidatif stres, vücuttaki serbest radikaller ve antioksidanlar arasındaki dengenin bozulması sonucu ortaya çıkmaktadır. Serbest radikaller, reaktif özellikleri nedeniyle hücre zarı yapısında hasar yaratabilir. Bu durum, hücrelerde işlev bozukluklarına, hücre ölümüne ve doku hasarına yol açarak vücutta kalp ve damar hastalıkları, kanser, diyabet ile Alzheimer ve Parkinson gibi hastalıkların ortaya çıkmasına neden olabilir. Antioksidanlar, bu dengesizliği ortadan kaldırarak serbest radikalleri nötralize etmekte ve oksidatif stresi minimize etmektedir. Antioksidanlar açısından zengin gıdalar ile beslenmek oksidatif stresi azaltmanın ve sağlığı uzun süre korumanın en etkili yollarından biridir. Yenilebilir doğa mantarları (YDM), yüksek miktarda karbonhidrat, protein, mineral ve vitamin içeren önemli bir besin kaynağıdır. Ayrıca, YDM'de β -glukanlar, esansiyel amino asitler ve yağ asitleri, fenolik bileşikler, D vitamini ve selenyum gibi sağlık açısından faydalı çeşitli biyoaktif bileşenler bulunmaktadır. YDM, bu biyoaktif bileşenler nedeniyle antioksidan, antifungal, antimikrobiyal, antiinflamatuvar, antikanser gibi biyolojik aktiviteler göstermektedir. YDM tarafından sentezlenen fenolik bileşikler; flavonoidler, oksitlenmiş polifenoller, fenolik asitler, stilbenler, lignanlar, hidroksibenzoik asitler, hidroksisinnamik asitler ve tanenler gibi çeşitli sınıflara aittir. YDM'de bulunan fenolik bileşikler, antioksidan aktivite ve DNA koruması gibi sağlığı iyileştirici etkilerle ilişkilendirilmiştir. Ayrıca, YDM fenolik bileşikleri antimikrobiyal, antialerjenik, antiinflamatuvar, antiaterojenik, antitrombotik, kardiyoprotektif ve vazodilatör etkiler gibi çeşitli fizyolojik aktiviteler göstermektedir. Çeşitli ekstraksiyon ve karakterizasyon teknikleriyle elde edilen bu bileşikler, fonksiyonel gıdalara ve nutrasötik formülasyonlara dahil edilmektedir. YDM'nin fenolik bileşikleri, gıdalarda besin kalitesini, antioksidan kapasiteyi ve fonksiyonel sağlık özelliklerini geliştirmek için kullanılmaktadır. Bu derlemede, YDM'de bulunan antioksidatif fenolik bileşikler, sağlık yararları ve gıda endüstrisinde kullanım potansiyeli üzerine odaklanılmıştır.

Anahtar Kelimeler: Oksidatif stres, serbest radikaller, yenilebilir doğa mantarları, sağlık, biyoaktif bileşenler, antioksidan aktivite, fenolik bileşikler.

ABSTRACT

Oxidative stress occurs as a result of the disruption of the balance between free radicals and antioxidants in the body. Free radicals can cause damage to cell membrane structure due to their reactive properties. This can lead to cell dysfunction, cell death and tissue damage, leading to diseases such as cardiovascular disease, cancer, diabetes, and Alzheimer's and Parkinson's disease. Antioxidants eliminate this imbalance, neutralize free radicals and minimize oxidative stress. Eating foods rich in antioxidants is one of the most effective ways to reduce oxidative stress and maintain health for a long time. Edible wild mushrooms (EWM) are an important nutritional source containing high amounts of carbohydrates,

proteins, minerals, and vitamins. Additionally, EWM contains various bioactive components that are beneficial for health, such as β -glucans, essential amino acids and fatty acids, phenolic compounds, vitamin D, and selenium. Due to these bioactive components, EWM shows biological activities such as antioxidant, antifungal, antimicrobial, anti-inflammatory, and anticancer. Phenolic compounds synthesized by EWM belong to various classes such as flavonoids, oxidized polyphenols, phenolic acids, stilbenes, lignans, hydroxybenzoic acids, hydroxycinnamic acids, and tannins. Phenolic compounds found in EWM have been associated with health-promoting effects such as antioxidant activity and DNA protection. In addition, EWM phenolic compounds show various physiological activities such as antimicrobial, antiallergenic, anti-inflammatory, antiatherogenic, antithrombotic, cardioprotective, and vasodilatory effects. These compounds, obtained by various extraction and characterization techniques, are incorporated into functional foods and nutraceutical formulations. Phenolic compounds of EWM are used to improve nutritional quality, antioxidant capacity, and functional health properties in foods. This review focuses on the antioxidative phenolic compounds found in EWM, their health benefits, and potential for use in the food industry.

Keywords: Oxidative stress, free radicals, edible wild mushrooms, health, bioactive compounds, antioxidant activity, phenolic compounds.

**ULTRA-İŞLENMİŞ GIDALAR VE NOVA SINIFLANDIRMASI: ÖLÇÜM GEÇERLİLİĞİ,
TÜKETİCİ ANLAYIŞI VE POLİTİKA SEÇENEKLERİ**

**ULTRA-PROCESSED FOODS AND NOVA: MEASUREMENT VALIDITY, CONSUMER
UNDERSTANDING, AND POLICY OPTIONS**

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ÖZET

Ultra-işlenmiş gıdalar (UPF), NOVA sınıflamasında “bileşenleri ayrıştırılıp yeniden birleştirilen, çoğu evde yapılmayan endüstriyel işlemlerden geçen ve tat/renk/kıvam vermek ya da raf ömrünü uzatmak için çeşitli katkıları eklenerek üretilen ürünler” olarak tanımlanır; ancak 2023–2025 döneminde NOVA’nın yanı sıra farklı işleme-temelli sınıflandırma önerileri ve metodolojik tartışmalar da güçlenmiştir. Geniş kapsamlı bir derlemede, UPF maruziyetinin kardiyometabolik, psikiyatrik ve mortalite dâhil birçok olumsuz sağlık çıktısıyla ilişkili olduğu bildirilmiştir. Bu çalışma, (i) NOVA ve alternatif ölçüm yaklaşımlarının güçlü/zayıf yanlarını, (ii) sıradan tüketicinin UPF kavramını ne ölçüde doğru anladığını ve yanlış sınıflama kaynaklarını, (iii) kanıta dayalı politika araçlarının (özellikle önyüz beslenme etiketleri ve pazarlama düzenlemeleri) etkinlik ve uygulanabilirliğini sentezlemeyi amaçlamaktadır. NOVA’nın kapsam ve tutarlılık sınırlamalarına ilişkin eleştirel literatür de bütüncül çerçeveye dâhil edilmiştir. 2018–2025 arasında yayımlanan epidemiyolojik, deneysel, davranışsal ve politika belgeleri taranmış; bulgular “ölçüm-sınıflama”, “tüketici anlayışı” ve “politika etkililiği” eksenlerinde katmanlı olarak özetlenmiştir. Tüketici anlayışına ilişkin veriler, terimin bilinirliği ve ürün örnekleri üzerinden değerlendirmeler yapılmıştır. Bazı bulgular şu şekildedir: (1) UPF tüketimi; kalp-damar hastalığı, tip 2 diyabet, obezite ve ölüm gibi birçok farklı sağlık sonucuyla tutarlı biçimde ilişkilidir ancak nedensellik yorumu ölçüm hataları ve tam ölçülemeyen ve kontrol edilemeyen etkenler nedeniyle dikkatli yorumlanmalıdır, (2) “UPF” terimine farkındalık artmakla birlikte, sıradan tüketicide kavramsal belirsizlik ve ürün bazlı yanlış sınıflama yaygındır, (3) Politika araçlarında, WHO’nun önerdiği yorumlayıcı önyüz etiketleri ve pazarlama kısıtlamaları reformülasyonu ve tüketici kararlarını destekler; Şili’deki zorunlu uyarı etiketleri beslenme profillerini iyileştirmiş, ABD’de FDA 2025’te zorunlu önyüz etiketleme teklifi yayımlamıştır. Sonuç olarak, UPF tartışması, işleme-temelli (NOVA/alternatifleri) ve besin profili-temelli yaklaşımların birlikte kullanıldığı, yanlış sınıflamaya dayanaklı bir politika sepetine evrilmelidir: sade dilli tüketici iletişimi, zorunlu ve yorumlayıcı önyüz etiketleri (FOP), pazarlama kısıtları ve kanıta dayalı reformülasyon. Gelecek çalışmalar, sınıflama sistemlerinin ölçüm geçerliliğini, tüketici anlaşılabilirliğini ve müdahalelerin gerçek yaşam etkisini birlikte değerlendiren tasarımlara öncelik vermelidir.

Anahtar Kelimeler: Ultra-işlenmiş gıda, NOVA sınıflandırması, tüketici anlayışı, beslenme politikası.

ABSTRACT

Ultra-processed foods (UPF) are defined in the NOVA classification as industrial formulations produced through component fractionation, reconstitution, and the use of cosmetic additives; however, between

2023 and 2025, alternative processing-based classification proposals and methodological debates have gained momentum alongside NOVA. A comprehensive umbrella review has reported associations between UPF exposure and multiple adverse health outcomes, including cardiometabolic disease, psychiatric outcomes, and mortality. This study aims to synthesize (i) the strengths and limitations of NOVA and alternative measurement approaches, (ii) the extent to which lay consumers correctly understand the UPF construct and common sources of misclassification, and (iii) the effectiveness and implementability of evidence-based policy tools—particularly front-of-pack (FOP) nutrition labels and restrictions on food marketing. Critical literature on NOVA’s scope and consistency limitations is integrated into the overarching framework. We searched epidemiological, experimental, behavioral, and policy documents published during 2018–2025 and summarized findings along three axes: measurement/classification, consumer understanding, and policy effectiveness. Consumer-understanding data are reported in terms of awareness of the term and product-level classification accuracy. Key findings are as follows: (1) UPF consumption is consistently associated with outcomes such as cardiovascular disease, type 2 diabetes, obesity, and mortality; however, causal interpretation warrants caution due to measurement error and residual confounding. (2) Although awareness of “UPF” is rising, conceptual ambiguity and product-level misclassification remain common among lay consumers. (3) In the policy domain, WHO-recommended interpretive FOP labels and restrictions on unhealthy-food marketing support reformulation and healthier consumer choices; Chile’s mandatory warning labels have improved the nutritional profile of shopping baskets, and in 2025 the U.S. FDA issued a proposal for mandatory FOP labeling. In conclusion, the UPF debate should evolve toward a misclassification-resilient policy portfolio that combines processing-based (NOVA/alternatives) and nutrient-profile-based approaches: plain-language consumer communication, mandatory interpretive front-of-pack (FOP) labels, marketing restrictions, and evidence-based reformulation. Future research should prioritize study designs that jointly assess the measurement validity of classification systems, consumer comprehensibility, and the real-world impact of interventions.

Keywords: Ultra-processed foods (UPF), NOVA classification, consumer understanding, Nutrition Policy.

**MACA, KARNIYARIK OTU VE MADIMAK TOZLARI İLE ZENGİNLEŞTİRİLMİŞ
KRAKER ÜRETİMİ VE ÖZELLİKLERİNİN BELİRLENMESİ**
**PRODUCTION AND CHARACTERIZATION OF CRACKERS ENRICHED WITH MACA,
PSYLLIUM, AND MADIMAK POWDERS**

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ÖZET

Dünyada ve ülkemizde beslenme şekilleri gün geçtikçe değişiklik göstermektedir. Farklı beslenme akımlarının temel dayanağı bireylerin farklı ilgi ve beklentileri olduğu gibi sağlıklı beslenme gayretleri de olabilmektedir. Ayrıca bireylerin beslenme alışkanlıkları çevresel, genetik veya ekonomik birçok faktörden etkilenebilmektedir. Öte yandan kişisel beslenme tercihlerinin dışında artan dünya nüfusu ve azalan kaynaklar nedeniyle dünya genelinde yetersiz ve dengesiz beslenme sorunları oluşmaktadır. Madımak, sağlığa faydaları ve geleneksel tüketim alışkanlıkları nedeniyle Türkiye sınırları içerisinde yemek ve salata olarak tüketilen bir bitkidir. Maca, son dönemlerde tüketimi yaygınlaşan sağlığa faydaları ile besin takviyesi olarak anılan bir ürün iken karnıyarık otu jelleşme ve stabilizatör etkileri ile son dönem çalışmalarına konu olmuş bir üründür. Bu çalışma kapsamında başta gençler olmak üzere tüm tüketiciler tarafından sıklıkla tüketilen krakerin ürün formülasyonuna madımak, maca ve karnıyarık otu eklenerek ürünlerde oluşan değişimler fizikokimyasal, biyokimyasal, tekstürel ve duyuşal açıdan incelenmiştir. Eklenen tüm materyallerin su bağlama özelliği ile krakerlerin nem miktarını artırdığı belirlenirken maça, karnıyarık otu tohumu ve madımak ilavesinin antioksidan aktivite değerini oldukça artırdığı gözlenmiştir. 121.35 mg GAE/100 gr fenolik madde miktarı değeri ile en yüksek sonuç maça ilaveli örnekte belirlenirken en düşük değer kontrol krakerinde 19.13 mg GAE/100 gr olarak hesaplanmıştır. Ürünlerin tekstürel özellikleri incelendiğinde ise en sert ürünler maça ve madımak ile elde edilen ürünlerken karnıyarık ilave edilen ürünlerin kontrol grubundan daha yumuşak olduğu tespit edilmiştir. Duyusal değerlendirmelerde ise renk parametresi ve dokusal farklılıklar nedeniyle kontrol örneğine en yakın ürün karnıyarık otu unu ile üretilen krakerler olmuştur.

Anahtar Kelimeler: kraker, karnıyarık otu, maça, madımak, duyuşal, tekstür

ABSTRACT

Nutritional habits are increasingly changing globally and in our country. The fundamental basis of different nutritional trends may be individuals' varying interests and expectations, as well as their efforts

for healthy eating. Furthermore, individuals' dietary habits can be influenced by many environmental, genetic, or economic factors. On the other hand, inadequate and unbalanced nutrition problems are occurring worldwide due to the increasing global population and decreasing resources, besides personal dietary preferences. Madımak is an herb consumed as a meal or salad within Turkish borders due to its health benefits and traditional consumption habits. Maca is a product known as a food supplement for its health benefits, whose consumption has recently become widespread, while Psyllium is a product that has been the subject of recent studies due to its gelling and stabilizer effects. Within the scope of this study, the changes in crackers, which are frequently consumed by all consumers, especially young people, were investigated from a physicochemical, biochemical, textural, and sensory perspective by adding madımak, maca, and psyllium to the product formulation. It was determined that all added materials increased the moisture content of the crackers due to their water-binding capacity, and the addition of maca, psyllium seed, and madımak significantly increased the antioxidant activity value. The highest result for phenolic substance content was determined in the maca-added sample with a value of 121.35 mg GAE/100 gr, while the lowest value was calculated in the control cracker at 19.13 mg GAE/100 gr. When the textural properties of the products were examined, the hardest products were those obtained with maca and madımak, while the products with psyllium addition were found to be softer than the control group. In sensory evaluations, the crackers produced with psyllium flour were the closest to the control sample due to the differences in color parameters and texture.

Keywords: cracker, psyllium, maca, madımak, sensory, texture

**FARKLI KURUTMA YÖNTEMLERİYLE ÜRETİLEN YUMURTA TOZLARININ
ÖZELLİKLERİ**
PROPERTIES OF EGG POWDERS PRODUCED BY DIFFERENT DRYING METHODS

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ÖZET

Yumurta tozları, uzun raf ömrü, kullanım kolaylığı ve emülsifiye edici, köpürme ve jelleşme gibi işlevsel özellikleri nedeniyle gıda endüstrisinde önemli bir yere sahiptir. Ancak yumurta tozunun kalitesi, uygulanan kurutma yöntemine doğrudan bağlıdır. Bu derlemede, başta sprey kurutma, dondurarak kurutma ve köpük-yatak kurutma olmak üzere farklı kurutma yöntemlerinin yumurta tozlarının fizikokimyasal, besinsel, fonksiyonel ve mikrobiyolojik özellikleri üzerine etkileri özetlenmiştir. Endüstride en yaygın kullanılan sprey kurutma yöntemi yüksek verimlilik ve mikrobiyolojik güvenlik sağlasa da protein denatürasyonu, lipid oksidasyonu ve fonksiyonel özelliklerde azalmaya yol açmaktadır. Dondurarak kurutma, protein, vitamin ve duyuşal niteliklerin korunmasında üstünlük göstermesine rağmen yüksek enerji tüketimi ve maliyet nedeniyle sınırlı kullanılmaktadır. Son yıllarda öne çıkan köpük-yatak kurutma yöntemi ise çözünürlük ve köpürme stabilitesini artırmada umut verici sonuçlar sunmakta, ancak endüstriyel ölçek için optimizasyona ihtiyaç duymaktadır. Genel olarak, uygun kurutma yönteminin seçimi, yumurta tozlarının teknolojik kalitesi, besin değeri ve gıda sistemlerindeki kullanım potansiyelini belirleyen kritik bir faktördür.

Anahtar Kelimeler: Yumurta tozu, Sprey kurutma, Dondurarak kurutma, Köpük-yatak kurutma, Fonksiyonel özellikler, Gıda işleme.

ABSTRACT

Egg powders are highly valued in the food industry due to their extended shelf life, ease of handling, and versatile functional properties such as emulsification, foaming, and gelation. However, the quality of egg powders is strongly influenced by the drying technology employed. This review summarizes current knowledge on the effects of different drying methods—primarily spray drying, freeze drying, and foam-mat drying—on the physicochemical, nutritional, functional, and microbiological properties of egg powders. Spray drying, the most widely used industrial technique, offers high efficiency and microbial safety but often leads to partial protein denaturation, lipid oxidation, and reduced functional performance. Freeze drying provides superior preservation of proteins, vitamins, and sensory attributes but is limited by high energy consumption and cost. Foam-mat drying, an emerging alternative, shows promising results in enhancing solubility and foaming stability, though optimization is needed for large-scale applications. Collectively, the choice of drying method plays a decisive role in determining the

technological quality, nutritional value, and application potential of egg powders in various food systems.

Keywords: Egg powder, Spray drying, Freeze drying, Foam-mat drying, Functional properties, Food processing.

ANTEP FISTIĞI DIŞ KABUĞUNUN ISLATMA İŞLEMİNİN OPTİMİZASYONU
OPTIMIZATION OF THE SOAKING PROCESS OF THE OUTER SHELL OF PISTACHIO

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ÖZET

Türkiye, yüksek ekonomik değere sahip Antep fıstığının (*Pistacia vera* L.) önde gelen üreticilerinden biridir. Antep fıstığının işlenmesi sırasında gıda güvenliği ve kalite açısından hassasiyet gerekmektedir. Bu çalışmada, soyulabilirliği artırmak, kırmızı zar oranını azaltmak ve mikrobiyal yük, nem ve asitlik gibi kalite/güvenlik parametrelerini değerlendirmek amacıyla bir ıslatma ön işlemi optimize edilmiştir. “Kabuklu Kırmızı” ve “Kabuklu Boz” çeşitleri, üç farklı sıcaklık seviyesinde (20 °C, 30 °C, 50 °C) ve üç farklı sürede (3, 5, 8 dk) toplam 60 farklı koşulda incelenmiştir. Her parti için su/fıstık oranı 2:1 ile 8:1 arasında tutulmuştur. En iyi sonuçların orta sıcaklık koşullarında (30 °C, 5–8 dk) elde edildiği belirlenmiştir. Bu koşullarda %100’e varan soyulma verimi, %0–5 aralığında kalan kırmızı zar oranı ve mikrobiyal yükte belirgin azalma sağlanmıştır. Ayrıca nem ve asitlik değerlerinin kabul edilebilir sınırlar içinde stabilize olduğu görülmüştür. Bulgular, ıslatma işleminin entegre kalite güvence sistemleri içerisinde kritik bir kontrol noktası olarak işlev görebileceğini ortaya koymaktadır. Islatma parametrelerinin optimize edilmesi, sadece işlem verimliliğini ve ürün kalitesini artırmakla kalmamakta, aynı zamanda mikrobiyolojik risklerin azaltılması ve tüketici güvenliğinin artırılması açısından da önemli bir strateji sunmaktadır. Genel olarak, elde edilen sonuçlar Antep fıstığı işleme süreçlerinde standartlaştırılmış ön işlemlerin geliştirilmesinin, ürün kalitesinin sürekliliğini sağlamada, raf ömrünü uzatmada ve uluslararası gıda güvenliği standartlarına uyumda kritik bir rol oynadığını göstermektedir.

Anahtar Kelimeler: Antep fıstığı; ıslatma; soyulabilirlik; mikrobiyal yük; gıda güvenliği; kalite parametreleri

ABSTRACT

Turkey is one of the leading producers of pistachio (*Pistacia vera* L.), which has a high economic value and requires particular attention in terms of food safety and quality during processing. In this study, a soaking pre-treatment was optimized to improve peelability, reduce the proportion of red skin, and evaluate quality and safety parameters such as microbial load, moisture, and acidity. Two different varieties, “Kabuklu Kırmızı” and “Kabuklu Boz,” were examined under three temperature levels (20 °C,

30 °C, 50 °C) and three soaking durations (3, 5, 8 minutes), resulting in a total of 60 different conditions. For each batch, the water-to-pistachio ratio was maintained between 2:1 and 8:1. The best results were obtained at moderate temperature conditions (30 °C, 5–8 minutes), where up to 100% peeling efficiency was achieved, the proportion of red skin was reduced to 0–5%, and a significant reduction in microbial load was observed. Furthermore, moisture and acidity values were stabilized within acceptable safety limits. These findings demonstrate that soaking can serve as a critical control point within integrated food quality and safety assurance systems. Optimizing soaking parameters not only improves process efficiency and product quality but also provides an effective strategy for minimizing microbiological risks and enhancing consumer safety. Overall, the results highlight the importance of developing standardized pre-treatment applications in pistachio processing to ensure consistent quality, extended shelf life, and compliance with international food safety standards.

Keywords: Pistachio; soaking; peelability; microbial load; food safety; quality parameters

**MISIR (ZEA MAYS L.) VERİMİNİN ARTIRILMASINDA GENETİK VE GENOMİK
YAKLAŞIMLAR: GÜNCEL BİR DEĞERLENDİRME**
**GENETIC AND GENOMIC APPROACHES TO ENHANCING MAIZE (ZEA MAYS L.)
YIELD: A CONTEMPORARY REVIEW**

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ÖZET

Mısır (*Zea mays L.*), dünya genelinde hem insan beslenmesinde hem de hayvansal üretim ve endüstriyel hammaddelerde kullanılan, stratejik öneme sahip bir tahıl türüdür. Artan dünya nüfusu, gıda talebinin sürekli yükselmesi ve iklim değişikliğine bağlı çevresel stres faktörleri, mısır üretiminde verim artışını sürdürülebilir bir hedef haline getirmiştir. Klasik ıslah yöntemleri uzun yıllardır verim artışında etkili olmuş olsa da, genetik varyasyonun sınırlı olması, çevresel koşullara duyarlılık ve uzun seleksiyon süreçleri nedeniyle bu yaklaşımların etkinliği azalmaktadır. Bu nedenle son yıllarda, mısırdaki verim artışını desteklemek amacıyla genetik mühendisliği, genom düzenleme ve omik tabanlı analizler hızla önem kazanmıştır.

Bu derleme çalışmasında, mısırın verim potansiyelini artırmaya yönelik modern genetik ve genomik yaklaşımlar ele alınmıştır. Özellikle verimle ilişkili genler, transkripsiyon faktörleri, nicel özellik lokusları (QTL) ve genomik seleksiyon (GS) stratejileri üzerinde durulmuştur. Ayrıca CRISPR/Cas9 gibi gen düzenleme sistemlerinin mısır genomunda hedefe yönelik modifikasyonlar yaparak, kuraklık, sıcaklık ve tuzluluk gibi abiyotik stres koşullarında verim istikrarını nasıl artırdığı tartışılmıştır. Bununla birlikte transkriptomik, proteomik ve metabolomik yaklaşımlar, verimle ilişkili biyokimyasal yolların aydınlatılmasında güçlü araçlar olarak değerlendirilmektedir.

Sonuç olarak, genom ölçekli verilerin entegrasyonu, yüksek verimli hibrit çeşitlerin geliştirilmesi ve stres toleransının artırılması açısından büyük bir potansiyel taşımaktadır. Genetik çeşitliliğin korunması, çoklu omik analizlerin kullanımı ve hassas gen düzenleme teknolojilerinin bir araya getirilmesi, sürdürülebilir mısır üretimi için yeni bir çağın başlangıcını temsil etmektedir.

Anahtar Kelimeler: Mısır, Genetik iyileştirme, Genomik seleksiyon, CRISPR/Cas9

ABSTRACT

Maize (*Zea mays L.*) is a cereal crop of strategic importance, widely utilized in human nutrition, livestock feed, and industrial raw materials. The growing global population, increasing food demand, and environmental stress factors associated with climate change have made yield improvement in maize

a critical and sustainable agricultural goal. Although conventional breeding methods have long contributed to yield enhancement, their effectiveness has diminished due to limited genetic variation, sensitivity to environmental fluctuations, and lengthy selection processes. Consequently, recent years have witnessed the rapid rise of genetic engineering, genome editing, and *omics*-based analyses as promising approaches to improving maize productivity.

This review highlights the modern genetic and genomic strategies employed to enhance the yield potential of maize. Particular emphasis is placed on yield-related genes, transcription factors, quantitative trait loci (QTL) mapping, and genomic selection (GS) strategies. Moreover, gene-editing systems such as CRISPR/Cas9 have enabled precise genome modifications, improving yield stability under abiotic stress conditions such as drought, heat, and salinity. In addition, *omics* technologies, including transcriptomics, proteomics, and metabolomics are recognized as powerful tools for elucidating the biochemical pathways associated with yield improvement.

In conclusion, the integration of genome-scale data, the development of high-yielding hybrid cultivars, and the enhancement of stress tolerance represent significant potential for sustainable maize production. The combination of genetic diversity preservation, multi-omic analyses, and precision genome-editing technologies marks the beginning of a new era in maize improvement aimed at achieving resilience and productivity in the face of global climatic challenges.

Keywords: Maize, Genetic improvement, Genomic selection, CRISPR/Cas9

GENETİĞİ DEĞİŞTİRİLMİŞ BUĞDAYLARDA ABİYOTİK STRESLE İLİŞKİLİ GENLER
ABIOTIC STRESS-RELATED GENES IN GENETICALLY MODIFIED WHEAT

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ÖZET

Buğday (*Triticum aestivum* L.), dünya genelinde insan beslenmesinin temelini oluşturan ve stratejik öneme sahip bir tahıl türüdür. Ancak günümüzde artan çevresel stres faktörleri, özellikle kuraklık, tuzluluk, aşırı sıcaklık, düşük sıcaklık ve ağır metal toksisitesi, buğdayın büyüme, gelişme ve verim potansiyelini önemli ölçüde kısıtlamaktadır. Bu durum, küresel iklim değişikliğiyle birlikte daha da belirgin hale gelmekte ve gıda güvenliği açısından ciddi bir tehdit oluşturmaktadır. Geleneksel ıslah yöntemleri, genetik çeşitliliğin sınırlı olması ve uzun seleksiyon süreçleri nedeniyle stres toleransının geliştirilmesinde yetersiz kalmaktadır. Bu bağlamda, moleküler genetik ve gen düzenleme teknolojileri, buğdayda abiyotik stres toleransının artırılmasına yönelik modern ve etkili araçlar olarak öne çıkmaktadır.

Bu derlemede, genetiği değiştirilmiş buğdaylarda abiyotik stres koşullarına karşı dayanıklılığın geliştirilmesinde görev alan temel genler, transkripsiyon faktörleri ve bunların moleküler etki mekanizmaları ele alınmıştır. DREB, HSP, NHX, SOS ve WRKY gibi gen ailelerinin, stres sinyal iletimi, iyon homeostazı, osmotik düzenleme ve reaktif oksijen türleri (ROS) savunma sistemleri üzerindeki rollerine odaklanılmıştır. Ayrıca, CRISPR/Cas9 ve RNAi gibi gen düzenleme yaklaşımlarıyla bu genlerin hedeflenmesi sonucu kuraklık, tuzluluk ve sıcaklık streslerine karşı dayanıklılığı artırılmış transgenik buğday hatları geliştirilmiştir. Günümüzde transkriptomik, proteomik ve metabolomik gibi omik teknolojilerin, genetik düzenlemelerin fenotipik etkilerini kapsamlı biçimde değerlendirmede önemli katkılar sunduğu bildirilmektedir.

Sonuç olarak, genetik mühendisliği ve moleküler biyoteknolojinin entegrasyonu, buğdayın abiyotik streslere karşı dayanıklılığının artırılmasında büyük bir potansiyel taşımaktadır. Bu tür çalışmalar, gelecekte iklim değişikliğine uyum sağlayabilen, yüksek verimli ve sürdürülebilir buğday çeşitlerinin geliştirilmesine yönelik önemli bir bilimsel temel oluşturmaktadır.

Anahtar Kelimeler: Buğday, Abiyotik stres, Gen düzenleme, GDO, CRISPR/Cas9

ABSTRACT

Wheat (*Triticum aestivum* L.) is a cereal crop of strategic importance and a fundamental component of human nutrition worldwide. However, increasing environmental stress factors—particularly drought,

salinity, high and low temperature extremes, and heavy metal toxicity—significantly restrict the growth, development, and yield potential of wheat. This challenge has become more pronounced under the pressure of global climate change, posing a serious threat to food security. Traditional breeding methods, limited by narrow genetic diversity and lengthy selection processes, have proven insufficient in improving stress tolerance. In this context, molecular genetics and gene-editing technologies have emerged as modern and powerful tools for enhancing abiotic stress tolerance in wheat.

This review summarizes the major genes, transcription factors, and molecular mechanisms involved in conferring abiotic stress resistance in genetically modified wheat. Particular emphasis is placed on gene families such as DREB, HSP, NHX, SOS, and WRKY, which play pivotal roles in stress signal transduction, ion homeostasis, osmotic adjustment, and reactive oxygen species (ROS) scavenging systems. Furthermore, recent advancements in CRISPR/Cas9 and RNA interference (RNAi)-based gene-editing approaches have enabled the development of transgenic wheat lines with enhanced tolerance to drought, salinity, and temperature stress. Additionally, omics technologies—including transcriptomics, proteomics, and metabolomics—have contributed significantly to understanding the phenotypic outcomes of these genetic modifications in a comprehensive manner.

In conclusion, the integration of genetic engineering and molecular biotechnology holds great promise for improving the resilience of wheat to abiotic stresses. Such advancements provide a robust scientific foundation for the development of climate-resilient, high-yielding, and sustainable wheat cultivars in the future.

Keywords: Wheat, Abiotic stress, Gene editing, GMO, CRISPR/Cas9

**SU BAZLI ENZİM DESTEKLİ YAĞ EKSTRAKSİYONU: SÜRDÜRÜLEBİLİR BİR
ALTERNATİF YAKLAŞIM**

**AQUEOUS- ASSISTED ENZYMATIC OIL EXTRACTION: A SUSTAINABLE
ALTERNATIVE APPROACH**

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ÖZET

Dünya çapında temel yağ asitleri ve yağda çözünen vitaminler gibi yüksek besin kalitesine sahip yenilebilir yağlara dayalı sağlıklı beslenmeye verilen önem giderek daha popüler hale gelmektedir. Bitkisel dokulardan yağ eldesinde mekanik presleme ve çözücü ekstraksiyonu gibi fiziksel veya kimyasal işlemlere dayalı çeşitli yöntemler kullanılmaktadır. Ancak çözücü kullanılarak yapılan geleneksel ekstraksiyon yöntemlerinde düşük ekstraksiyon verimine, içlerinde kaçınılmaz olarak bulunan organik çözücü izleri nedeniyle düşük ekstraksiyon kalitesine ve zaman alıcı olmaları gibi zorluklarla karşı karşıya kalınmaktadır. Bu nedenle, son yıllarda ekstraksiyon verimliliğini artırırken bu sınırlamaların üstesinden gelebilecek su bazlı enzim destekli ekstraksiyon, superkritik ekstraksiyon, mikrodalga destekli ekstraksiyon ve ultrason destekli ekstraksiyon gibi çeşitli yeni teknikler geliştirilmiştir. Bitkisel yağların ekstraksiyonunda verimi artırmak, kaliteyi korumak ve çevresel etkileri azaltmak amacıyla geliştirilen alternatif teknolojiler arasında su bazlı enzim destekli ekstraksiyon dikkat çekici bir yer edinmiştir. Bu yöntem, özellikle su bazlı ortamda gerçekleştirilen ve çevre dostu çözümler sunan bir ekstraksiyon yaklaşımı olan su bazlı enzim destekli ekstraksiyon ile birleştiğinde, gıda ve kozmetik sektörleri için yüksek kaliteli ürünler elde edilmesini mümkün kılmaktadır. Yenilikçi ekstraksiyon yöntemlerinden bir diğeri olan enzimdestekli ekstraksiyon metodu, biyoaktif bileşenlerin ekstraksiyonunda özellikle hücre duvarı bileşenlerini hedef alan enzimlerin (örneğin selüloz, hemiselüloz, pektinaz ve proteazlar) kullanımıyla, hücre içi lipidlerin daha verimli şekilde açığa çıkarılmasını sağlayan yeşil teknolojidir. Son yıllarda yapılan çalışmalar, ekstraksiyon veriminin %20–50 oranında arttığını ve ekstrakte edilen yağın oksidatif stabilite, renk ve biyoaktif bileşen içerikleri bakımından daha kaliteli olduğunu göstermektedir. Bu çalışmada, su bazlı enzim destekli ekstraksiyon yönteminin prensibi, avantajları, yöntemin uygulanması sırasında kullanılan enzim seçimi, yöntemin prensibi ve bu konuda yapılan çalışmalar çok yönlü olarak ele alınmıştır.

Anahtar Kelimeler: enzim destekli ekstraksiyon, bitkisel yağ, su bazlı ekstraksiyon, hücre duvarı enzimleri, yeşil teknoloji

ABSTRACT

The emphasis on healthy diets based on edible oils with high nutritional quality, such as essential fatty acids and fat-soluble vitamins, is becoming increasingly popular worldwide. Various methods based on physical and chemical processes, such as mechanical pressing and solvent extraction, are used to extract oil from plant tissues. However, traditional extraction methods using solvents face challenges such as low extraction yields, poor extraction quality due to the inevitable presence of traces of organic solvents,

and time-consuming processing. Therefore, in recent years, various new techniques, such as water-based enzyme-assisted extraction, supercritical extraction, microwave-assisted extraction, and ultrasound-assisted extraction, have been developed to overcome these limitations while increasing extraction efficiency. Among the alternative technologies developed to increase yield, maintain quality, and reduce environmental impact in the extraction of vegetable oils, water-based enzyme-assisted extraction has gained a prominent place. This method, when combined with water-based enzyme-assisted extraction, an extraction approach that offers environmentally friendly solutions, enables the production of high-quality products for the food and cosmetics industries. Another innovative extraction method, enzyme-assisted extraction, is a green technology that utilizes enzymes specifically targeting cell wall components (e.g., cellulases, hemicellulases, pectinases, and proteases) for the extraction of bioactive compounds, enabling more efficient release of intracellular lipids. Recent studies have shown that extraction yields have increased by 20–50% and the extracted oil is of higher quality in terms of oxidative stability, color, and bioactive compound content. This study examines the principle of the enzyme-assisted extraction method, its advantages, the selection of enzymes used during its application, the principle of the method, and the studies conducted on this subject from various perspectives.

Keywords: Enzyme-assisted extraction, vegetable oil, aqueous assisted enzymatic extraction, cell wall enzymes, green technology.

HİNDİSTAN CEVİZİ YAĞININ GIDALARDA KULLANIM OLANAKLARI
POSSIBILITIES FOR USING COCONUT OIL IN FOOD

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ÖZET

Farklı yağ bitkilerinden elde edilen bitkisel yağlar çoğunlukla gıda kaynağı olarak ve kozmetik, yağlayıcı, boya, ilaç, biyodizel gibi ürünlerin üretiminde kullanılmaktadır. Bu yağlar arasında önemli bir yere sahip olan hindistan cevizi yağı (*Cocos nucifera*), son yıllarda kimyasal bileşimi ve fonksiyonel özellikleri nedeniyle gıda işleme teknolojisinde ve endüstriyel gıda üretiminde artan bir ilgi görmektedir. Hindistan cevizi yağı genellikle olgun hindistan cevizi çekirdeği ve posasından mekanik veya termal işlemlerle elde edilmektedir. Sri Lankalı ve birçok Güney Asyalının beslenmesinde hayati bir rol oynamaktadır. Hazırlama yöntemine göre Hindistan cevizi yağı; kopra yağı, saf hindistan cevizi yağı ve hindistan cevizinin işlenmesinden sonra arta kalan posa yağı gibi çeşitli türlere ayrılabilir. Hindistan cevizi yağı doymuş ve doymamış yağ asiden oluşmaktadır ve % 95 kısmını doymuş yağ asitleri içermektedir. Hindistan cevizi yağında bulunan doymuş yağ asitleri kaproik, kaprilik, kaprik, laurik, miristik, palmitik ve steariktir; doymamış olanlar ise oleik ve linoleiktir. Hindistan cevizi yağı, %40'ın üzerinde konsantrasyona sahip laurik asit açısından zengindir. Bitkisel yağda bulunan uzun zincirli yağ asitlerinin aksine, orta zincirli yağ asitleri daha küçük boyuttadır ve yağ olarak depolanmak yerine anında enerji dönüşümü için daha yüksek hücre geçirgenliğine olanak tanımaktadır. Yapılan çalışmalar sonucunda rafine ve sıзма (virgin) formda tüketilebilen hindistan cevizi yağı, yüksek dumanlanma noktası sayesinde kızartmalarda ve pişirme işlemlerinde yaygın olarak kullanılabileceği belirtilmiştir. Emülsifiye edici ve stabilizatör özellikleri sayesinde soslar, dondurmalar ve süt ürünleri alternatiflerinde de işlevsel olarak değerlendirilmektedir. Bu çalışmada Hindistan cevizi yağının özellikleri, kullanım alanları ve gıda alanında kullanım olanakları ele alınacaktır.

Anahtar Kelimeler: Hindistan cevizi yağı, gıda işleme, fonksiyonel yağlar, bitki bazlı ürünler

ABSTRACT

Vegetable oils obtained from various oilseed crops are primarily used as food sources and in the production of products such as cosmetics, lubricants, paints, pharmaceuticals, and biodiesel. Coconut oil (*Cocos nucifera*), a key oil among these oils, has recently received increasing attention in food processing technology and industrial food production due to its chemical composition and functional properties. Coconut oil is generally obtained from mature coconut kernels and pulp through mechanical or thermal processes. It plays a vital role in the diet of Sri Lankans and many South Asians. Depending on the preparation method, coconut oil can be classified into various types, including copra oil, virgin coconut oil, and the pulp oil remaining after coconut processing. Coconut oil consists of saturated and unsaturated fatty acids, comprising 95% of these. The saturated fatty acids found in coconut oil are caproic, caprylic, capric, lauric, myristic, palmitic, and stearic, while the unsaturated fatty acids are oleic and linoleic. Coconut oil is rich in lauric acid, with a concentration exceeding 40%. Unlike the long-

chain fatty acids found in vegetable oil, medium-chain fatty acids are smaller and allow for greater cell permeability for immediate energy conversion rather than being stored as fat. Studies have shown that coconut oil, which can be consumed in refined and virgin forms, can be widely used in frying and cooking thanks to its high smoke point. Its emulsifying and stabilizing properties also make it a functional ingredient in sauces, ice creams, and dairy alternatives. This study will discuss the properties, uses, and potential uses of coconut oil in the food sector.

Keywords: Coconut oil, food processing, functional oils, plant-based products

**FOOD SAFETY "THINK ABOUT EASY AND EFFECTIVE APPLICATION OF THE
REGULATIONS PROVIDED FOR FOOD SAFETY"**

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ABSTRACT

Whatever the nature of the field, regulations exist and regulatory and legislative conditions and obligations exist and are applied by all means and tools.

On the other hand, our vision in relation to our environment where there is a requirement at different levels of economic, social society and especially the concerns of the citizen of a food and security nature, managing through paper, scheduling meetings, signing and other administrative and regulatory axes is not enough to guarantee excellent food safety to society. Thinking about fast and efficient management in order to involve applications, platforms and verification software from far and near. We are talking about food verification and food safety control for anybody with direct or indirect participation in the citizen.

Provide a call center by making regular phone calls to verify food products sold every 24 hours through telephone communications with any manager involved in direct or indirect sales to citizens.

Setting up a call center for each region, whether small or large, allows contact with the seller, distributor, salesperson, and individual agent who contributes to food safety. This call center helps highlight all the obstacles and constraints encountered by any organization that has a direct relationship with citizens regarding food safety.

Our goal is to establish communication through all means and tools to ensure proper enforcement of regulations.

Enforcing regulations is good, but understanding the expectations of others is also very important.

Keywords: regulation, citizen, food safety, call center

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SUSTAINABLE AGRICULTURAL PRACTICES AND THEIR IMPACT ON FOOD SECURITY IN DEVELOPING NATIONS

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ABSTRACT

Sustainable agricultural practices are increasingly recognized as essential in addressing food insecurity, particularly in developing nations where climate change, resource depletion, and poor agricultural policies are exacerbating food security challenges. This paper investigates various sustainable agricultural practices—including agroecology, organic farming, conservation tillage, and integrated pest management—and their impact on food production, environmental resilience, and local economies in developing countries. Case studies from Sub-Saharan Africa and Southeast Asia are analyzed to highlight the role of these practices in enhancing productivity and sustainability. The research emphasizes the need for innovation, policy reform, and community involvement to scale sustainable agriculture, focusing on the barriers and opportunities for implementing these practices in resource-constrained settings. The paper further discusses the integration of technology in sustainable agriculture and its role in achieving food security in the face of global challenges.

Keywords: *Sustainable agriculture, Food security, Climate change, Agroecology*

**EFFECTS OF THREE PHYTOGENIC AQUEOUS BLENDS ON NUTRIENT UTILISATION
EFFICIENCY OF BROILER CHICKEN**

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ABSTRACT

The poultry industry faces increasing demand for natural feed additives that enhance nutrient utilization while reducing reliance on synthetic growth promoters. Phytogenic plants such as garlic (*Allium sativum*), ginger (*Zingiber officinale*), and onion (*Allium cepa*) possess bioactive compounds with antioxidant, and digestive-stimulant properties that may improve feed utilisation efficiency in broiler production. This study was conducted to evaluate the effect of aqueous extracts of garlic, ginger, and onion on the nutrient digestibility of broiler chickens. A total of 120-day-old broilers were allocated into four treatment groups with three replicates each. Treatments consisted of aqueous blend prepared at 20 g, 30 g, and 40 g of each spice per litre of water, administered at 1 ml/litre (T1, T2, and T3), while the control group (T4) received plain water with antibiotics. Faecal samples were collected for proximate composition to determine nutrient excretion and digestibility in the laboratory. The results were subjected to one way analysis of variance. The results revealed significant differences ($p < 0.05$) among treatments in crude-protein, fat, ash, and nitrogen-free extract. Broilers in T1 exhibited the lowest faecal NFE (65.94%) and moderate crude protein excretion (10.46%), indicating superior carbohydrate and protein digestibility. T2 and T3 had higher crude protein excretion, suggesting reduced nitrogen retention, while the control group recorded the highest NFE (73.39%) and lowest protein utilization. Although T1 showed higher fat excretion, its overall balance in nutrient utilization was superior. It was concluded that moderate inclusion of aqueous extracts of garlic, ginger, and onion at 40g/L is optimal for improving nutrient digestibility in broilers. The study recommends the adoption of phytogenic extracts in poultry production to enhance feed efficiency, reduce nutrient losses, and support sustainable, residue-free poultry farming.

KEYWORDS: feed, garlic, ginger, onion, water

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ABSTRACT

Global food security has significant challenges due to climate change, which affects food production, storage, and preservation by altering temperatures, humidity, and precipitation. Increased temperatures speed up food deterioration, encourage microbial growth, and increase the risk of contamination, while extreme weather events disrupt refrigeration supply chains and infrastructure. In response, new and innovative methods of food preservation, such as advanced packaging, controlled atmosphere storage, refrigeration powered by renewable energy sources, and natural antimicrobial agents, are increasingly being developed to extend the preservation period and ensure safety. The incorporation of sustainable conservation technology is crucial for both reducing food loss and waste and increasing resilience to climate-related disruptions. Long-term environmental sustainability and global food security are both aided by the development of these approaches.

Keywords: Food security, Climate change, sustainability, resilience, environmental preservation.

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ABSTRACT

The whole world is facing the deadly disease termed as 'Cancer'. It is the 2nd prime cause of fatality in the world, after coronary infarction. According to the Global Burden of Disease, about 10 million people die prematurely as a result of cancer every year. Because of increase in death rate, cancer is accounting for one out of every six fatalities. There are many gene alterations for conversion of normal cell to cancerous cell. These unwanted shifts occur for a variety of causes. Environmental exposure to cancer-causing substances, as well as lifestyle decisions and genes acquired from our parents all plays a key role in resulting cancer. Frequently, there is no obvious cause. One of the world's most critical health problems is occurrence of cancer. The majority of patients are diagnosed late in life, with a dismal prognosis. Consequently, identifying modifiable risk factors for primary cancer prevention is critical. However, various health practices in low & middle-income nations are incapable to handle cope with this load, further a huge percentage of cancer patients all-around the globe lack timely approach for exclusive diagnosis as well as therapy. Several kinds of cancer survivability rates are progressing in countries with sturdy health practices, recognition to initial identification, quality treatment, and survivorship care. By altering or avoiding important risk factors and following existing evidence-based preventative methods, between 30 & 50 percent of cancer fatalities could be avoided. Initial recognition of cancer and therapy of patients who acquire cancer also assist to reduce the cancer problem. In the long run, avoidance is also the most cost-effective technique for control of cancer. We summarized and assessed observational studies linking diet, including specific functional food groups, and dietary patterns, which helps in mitigation of emerging cancer in this review. Although there are significant gaps in our comprehension of the association between nutrition and cancer risk. Nevertheless, this study can suggest that diet plays an important role in cancer progression as well as prevention.

Keywords: Gene alterations, normal cell, cancerous cell, dismal prognosis, life style, diet, functional food groups, nutrition.

**AWARENESS AND USE OF UNIVERSAL PRODUCT CODES AS A CATALYST FOR
GROWTH IN OMANI SMALL SCALE FARMING**

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ABSTRACT

In modern food, supply chains Universal Product Codes (UPCs) play an essential and centered role, which enable efficient product identification, inventory management, and traceability from producer to consumer. Universal Product Codes operations in smart and organized way can open doors to new markets for local farmers, especially those running small to medium sized enterprises (SSEs, SMEs). The farmers can control in an easier way their operations both nearby and farther when working with retailers and customers in tracking, selling and managing their products. Universal Product Codes are equipped and attributed with many advantages and hence by adopting UPCs, the farmers can improve their business efficiency, build trust with buyers, and expand their reach beyond local markets. Through this paper, the authors at one hand want to make aware of UPCs technology to gross root farmers and get them know how skills to develop mobile-based applications that are helpful in their agricultural products business. On the other hand making aware of the UPCs how they can associate with local,

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regional (within nation), countries in region and globally in the world. The paper will also present a prototype model results.

Keywords: Universal Product Code (UPC), Food Entrepreneurship, Traceability, GS1 Standards, Supply Chain Management, Digital Labeling, Smart Packaging

DIETARY SHIFTS IN THE POST-PANDEMIC WORLD

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ABSTRACT

The COVID-19 pandemic profoundly reshaped global food environments, revealing vulnerabilities in supply chains while simultaneously influencing individual and collective dietary behaviors. This presentation explores how the pandemic has altered eating patterns, nutritional choices, and food access across different socio-economic and cultural contexts. Lockdowns and public health restrictions led to increased home cooking, a rise in snack and comfort food consumption, and a growing interest in immunity-boosting diets and supplements. Simultaneously, disruptions in food supply chains and economic hardship heightened food insecurity, disproportionately affecting vulnerable populations. The acceleration of digital food platforms, from grocery delivery to online nutrition education, also played a pivotal role in reshaping food consumption.

Drawing on recent global studies, this session will examine the dual impact of the pandemic: fostering both positive shifts toward health-conscious eating in some communities, while exacerbating nutritional disparities in others. The discussion will also consider how governments, health professionals, and the food industry are responding to these shifts, and what this means for the future of sustainable and equitable food systems.

By analyzing these dynamics, this session aims to contribute to a deeper understanding of how major global disruptions influence dietary behavior and public health, and to identify opportunities for more resilient and inclusive food policy design moving forward.

Keywords:

- Post-pandemic diets
- Food behavior change
- Nutrition and health
- Food insecurity
- Digital food systems

**THE ROLE OF PUBLIC GOVERNANCE IN ADVANCING FOOD SAFETY AND HEALTHY
NUTRITION POLICIES: A REGIONAL CASE STUDY OF SAMTSKHE-JAVAKHETI**

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ABSTRACT

Food safety and healthy nutrition are fundamental pillars of public health and well-being. Public administration plays a central role in managing these systems: it is responsible not only for reducing food-related risks through the enforcement and execution of regulations but also for developing nutrition policies aimed at the prevention of non-communicable diseases (including cardiovascular diseases, diabetes, and obesity). This paper examines the dual responsibility of public administration in ensuring food safety and implementing effective nutrition policies, with a particular focus on the specific context of the Samtskhe-Javakheti region. This borderland, multiethnic, and remote region, distinguished by its harsh climatic conditions, poses unique challenges in terms of local food production, supply chains, quality control, and access to healthy nutrition for the population. Taking into account international practices and local challenges, the study analyzes how public administration should adapt to local conditions and leverage the region's agricultural potential to strengthen food systems. The paper confirms that effective governance at the local level is essential not only for reducing risks but also for fostering a traditional, sustainable, and healthy food culture that takes ethnic diversity into consideration.

Keywords: Public Governance, Regional Governance, Healthy Nutrition, Non-Communicable Diseases

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ABSTRACT

In many low- and middle-income countries, the paradoxical coexistence of undernutrition and obesity—known as the **double burden of disease**—presents a growing public health challenge. While undernutrition continues to threaten child growth and development, rapid urbanization, economic transitions, and changes in food environments have led to rising rates of overweight and obesity across all age groups. This dual crisis is increasingly observed within the same communities, households, and even individuals, reflecting deep systemic inequalities in food access, education, and healthcare.

This presentation explores the complex, interconnected drivers behind the double burden, including shifts toward ultra-processed diets, the nutrition transition, sedentary lifestyles, and persistent poverty. It highlights case studies from various regions where both forms of malnutrition are prevalent, and critically examines current policy responses and health interventions. Particular attention will be given to how globalization, food marketing, and inequitable food systems contribute to the simultaneous rise in diet-related non-communicable diseases and nutrient deficiencies.

By unpacking the socio-political, economic, and cultural factors behind this phenomenon, the session will propose integrated, cross-sectoral strategies that address the root causes of malnutrition in all its forms. This includes promoting sustainable food systems, strengthening early nutrition programs, regulating unhealthy food environments, and ensuring equitable access to nutritious food for all.

Keywords:

- Double burden of malnutrition
- Obesity and undernutrition
- Nutrition transition
- Global health disparities
- Food system inequality

**PERCEPTION OF CLIMATE VARIABILITY BY YAM (*Dioscorea* spp) FARMERS IN
NIGERIA**

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ABSTRACT

The importance of yam productions as main source of food and income to farmers cannot be over emphasised therefore, there is a need to salvaged its production from effects of climate variability

A quantitative research approach was used to collect data from yam farmers A multi-stage sampling technique was employed to select 150 respondents. Primary data were collected using a structured questionnaire.

The results showed that 70.1% of the respondents were male, and 44.2% were aged between 40–49 years. Most had secondary education (46.9%) and operated small-scale farms with 95.9% cultivating on less than or equal to one hectare. An overwhelming 93.9% reported delayed rainfall, 91.2% noted increased drought, and 94.6% observed rising temperatures — reflecting a widespread perception of climate variability.

The study concluded that while awareness of climate variability is high among yam farmers, several barriers hinder effective adaptation. These include inadequate extension support, poor access to accurate climate information, and lack of capital. Strengthening extension services, promoting affordable climate-smart technologies, and enhancing access to weather information are recommended to improve resilience in yam production systems.

Keywords: Perception, Climate Variability, Yam Production, Adaptation Strategies, Constraints.

**IMPACT OF THE HARVESTING REGION ON THE PHYTOCHEMICAL COMPOSITION
AND NUTRITIONAL POTENTIAL OF *FUMARIA PARVIFLORA* IN MOROCCO**

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ABSTRACT

Species of the genus *Fumaria* are widely recognized for their medicinal properties, notably their anti-inflammatory, antioxidant, and antidiabetic effects. Among them, *Fumaria parviflora*, an annual ubiquitous herb, is distributed across Europe, Africa, America, Australia, as well as several Asian countries such as India, Pakistan, and Iran. Locally known under various names, this species grows in wheat fields, plains, and hills, and holds an important place in traditional medicine, where it is used for the treatment of various disorders, ranging from digestive and hepatic problems to dermatological, infectious, and metabolic diseases.

Despite this therapeutic potential, few scientific studies have thoroughly investigated its chemical composition and biological activities. In this context, the present research aims to compare the phytochemical composition of *F. parviflora* collected from three Moroccan regions (Casablanca, El Jadida, and Khouribga). Macronutrients (lipids, carbohydrates, proteins), minerals, and pigments were determined using standard methods, while secondary metabolites were evaluated through screening. The results revealed significant variability depending on the harvesting region, with a particularly high polyphenol content in the Casablanca sample.

Beyond its pharmacological properties, *F. parviflora* also presents promising nutritional value, attributable to its richness in phenolic compounds and essential nutrients. These characteristics suggest a dual potential, both therapeutic and nutritional, paving the way for future valorization of this species in health and nutrition industries.

Keywords: *Fumaria*; chemical composition; harvesting region; comparative study; nutritional potential.

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FOOD SAFETY & PHARMACOVIGILANCE

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ABSTRACT

Food safety is an essential part of public health, as contaminated or adulterated food can lead to severe health problems. Pharmacovigilance, which mainly focuses on monitoring the safety of medicines, can also play an important role in food safety. Many foods may interact with drugs, cause allergies, or lead to toxic effects when consumed in unsafe forms. For example, pesticide residues, adulterated milk products, or unhygienic street foods can result in adverse health outcomes. By linking food safety with pharmacovigilance, it is possible to detect, report, and prevent such adverse effects in the community. Pharmacists can educate people about food-drug interactions, ensure proper reporting of food-related adverse events, and support regulatory authorities in monitoring the quality of food products. Strengthening this system will not only protect consumers but also improve overall health outcomes.

KEYWORDS: Food safety, Pharmacovigilance, Adverse events, Drug-food interactions, Public health, Pharmacist role

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ADVANCING FOOD STUDIES THROUGH MOLECULAR BIOLOGY: TOOLS, APPLICATIONS, AND PERSPECTIVES

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ABSTRACT

Recent advancements in molecular biology have significantly revolutionized the discipline of food studies, providing innovative methodologies to elucidate the intricacies of food systems from production to consumption. Techniques like DNA barcoding, next-generation sequencing, transcriptomics, and proteomics changed the way we study food by making it possible to accurately identify microbial and plant species, learn more about food composition, make food safer, and improve food authentication and traceability. The incorporation of molecular methodologies has elucidated novel insights into the role of microorganisms in fermentation, the effects of processing on nutritional and functional attributes, and the interactions between food constituents and human health.. These methodologies not only enhance food safety but also contribute to the valorization of local and artisanal products by safeguarding biodiversity and cultural heritage. This contribution underscores the increasing significance of molecular biology in the development of sustainable and innovative food systems, thereby affirming its critical role within the interdisciplinary framework of food studies.

Key words: Molecular biology , Food quality, Food safety, Omics technologies, Innovation

PHARMACOLOGICAL POTENTIAL OF CYNARA CARDUNCULUS L. FROM MOROCCO: TOXICOLOGICAL, ANTIDIABETIC, AND ANTIMICROBIAL INSIGHTS

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ABSTRACT

INTRODUCTION

Cynara cardunculus L. (Asteraceae) is a Mediterranean species distinguished by its remarkable resilience to diverse edaphic and climatic conditions, including abiotic stressors such as high salinity and water scarcity (Benlloch-González et al., 2005; Ceccarelli et al., 2010; Pagnotta et al., 2017). In Morocco, cardoon has been traditionally esteemed both as a culinary element in local gastronomy and as a medicinal plant. Prior studies have demonstrated a wide range of pharmacological effects, encompassing hepatoprotective, antitumor, antibacterial, and anti-HIV activities, as well as the modulation of cholesterol biosynthesis and inhibition of LDL oxidation.

METHODS

This study aimed to comprehensively evaluate the toxicological profile, antidiabetic potential, and antimicrobial activity of *C. cardunculus*. Acute oral toxicity was assessed in murine models via a single administration, followed by a 14-day monitoring period incorporating clinical observations, serum biochemical assays, and histopathological examinations. Antidiabetic activity was explored *in vitro* using hepatic enzymes derived from type 2 diabetic rats. The phenolic composition was thoroughly characterized, while antimicrobial properties were examined through agar diffusion and broth microdilution methodologies.

RESULTS

The plant material exhibited no observable toxicity at the administered doses (500 and 1000 mg/kg), with biochemical and histological analyses indicating the absence of hepatotoxic or nephrotoxic effects. *C. cardunculus* demonstrated noteworthy antidiabetic potential through inhibition of the polyol pathway, α -amylase, and α -glucosidase. Additionally, it presented a rich and diverse phenolic profile and pronounced antimicrobial efficacy.

CONCLUSION

These findings underscore the potential of *C. cardunculus* from Morocco as a valuable natural source

of bioactive compounds with therapeutic promise in the management of type 2 diabetes, supported by its antimicrobial properties. Further rigorous investigations are warranted to substantiate its pharmacological efficacy and safety for clinical applications.

Keywords : *Cynara cardunculus* ; Morocco ; Type 2 diabetes ; Antidiabetic activity ; Antimicrobial activity ; Toxicity ; Bioactive compounds.

**ESSENTIAL NUTRIENTS AND DIETARY RECOMMENDATIONS FOR WOMEN'S
HEALTH ACROSS THE LIFESPAN**

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ABSTRACT

Proper nutrition is essential for women's health throughout different life stages due to their unique physiological and hormonal changes. This comprehensive review synthesizes current knowledge on critical nutrients necessary for maintaining and enhancing women's physical and mental well-being, with a focus on iron, calcium, folate, vitamin D, vitamin E, magnesium, and omega-3 fatty acids. Women's nutritional requirements differ significantly from men's, particularly owing to menstruation, pregnancy, lactation, and menopause, which influence risks of anemia, osteoporosis, and psychological disorders. Iron is vital for oxygen transport and prevention of anemia, especially in reproductive-age women, with recommended daily intakes ranging from 18 mg to 27 mg during pregnancy. Calcium and vitamin D are fundamental for bone health and prevention of osteoporosis, requiring daily intakes of up to 1200 mg calcium and 600 IU vitamin D, particularly critical after menopause. Folate (vitamin B9) is crucial for fetal neural development and reducing congenital disabilities, with daily needs increasing during pregnancy and breastfeeding. Vitamin E acts as a potent antioxidant supporting immune function and hormonal balance. Magnesium supports enzymatic activities related to protein synthesis and neuromuscular functions, while omega-3 fatty acids contribute to cardiovascular, neurological, and hormonal health and may alleviate premenstrual syndrome symptoms. A balanced diet incorporating diverse food groups—including lean proteins, whole grains, fruits, vegetables, and healthy fats—is recommended to meet these nutritional requirements. Lifestyle factors such as regular physical activity and avoidance of smoking and excessive alcohol intake further promote optimal health outcomes. Public health initiatives should focus on education and accessibility to nutrient-rich foods to reduce the prevalence of micronutrient deficiencies and chronic diseases among women. This review emphasizes the importance of tailored dietary strategies for women to enhance quality of life, prevent chronic diseases, and support physiological functions across the lifespan. The integration of nutrition counseling and policy measures is imperative for advancing women's health globally.

**DOMESTICATION EFFECTS ON THE PHYTOCHEMICAL COMPOSITION AND
ANTIBACTERIAL ACTIVITY OF *THYMUS* ESSENTIAL OILS IN MOROCCO**

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ABSTRACT

The genus *Thymus* comprises aromatic and medicinal plants characterized by a high degree of endemism in North Africa and the Iberian Peninsula. Among these, *Thymus maroccanus* Ball, endemic to Morocco, and *Thymus zygis* L. subsp. *gracilis*, endemic to Morocco and the Iberian Peninsula, are of particular interest. These taxa have long been exploited for their ethnopharmacological applications, culinary uses, and essential oils with recognized antiseptic and disinfectant properties. However, the increasing demand for these resources has resulted in intensive harvesting, thereby threatening the sustainability of wild populations.

In this context, the present study assessed the effects of domestication on the yield, chemical profile, and biological activity of *Thymus* essential oils. Gas chromatography–mass spectrometry (GC-MS) analyses revealed high concentrations of major bioactive constituents, notably Carvacrol (1.69–66.77%), Thymol (0.48–34.92%), o-Cymene (5.44–24.98%), and γ -Terpinene (8.66–19.21%). Aromatogram assays further demonstrated that essential oils derived from domesticated plants exhibited enhanced antibacterial activity relative to their wild counterparts.

Overall, the results indicate that domestication exerts a significant influence on the phytochemical composition and biological efficacy of *Thymus* essential oils. Beyond improving their pharmacological potential, domestication constitutes a sustainable alternative to the overexploitation of natural populations and represents a strategic approach for the conservation, valorization, and large-scale utilization of aromatic and medicinal plants.

Key words: *Thymus*, Domestication, essential oil, yield, chemical composition, antibacterial activity, Morocco.

QUALITY ASSESSEMENT OF SUYA (TSIRE) AS AFFECTED BY CORIANDER
(*Coriandrum sativum*)

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ABSTRACT

This study evaluates the impact of *Coriandrum sativum* (coriander) inclusion on the quality attributes of Suya, a traditional Nigerian street food. Dried coriander was purchased thoroughly cleaned and dried under shade. The dried coriander were then pounded and sieved with 0.2mm fine mesh to obtain the coriander powder which were then stored in air tight containers and properly labeled. The meat was deboned and trimmed of all connective tissues. It was cut into pieces and sliced in the same direction of the muscle fiber. Meat was staked on already tag slender wooden sticks, meat sheets were weighed and randomly assigned into five treatments with ten replicates. Various levels of coriander (2.5%, 5.0%, 7.5%, and 10.0%) were incorporated into Suya, and their effects on product yield, microbial count, physicochemical properties, and sensory attributes (color, aroma, flavor, juiciness, texture, hotness, saltiness, and overall acceptability) were assessed. The results indicated significant differences ($p < 0.05$) across all parameters with varying coriander levels. Suya with 5.0% coriander exhibited the highest product yield (85.33%), the lowest microbial count (2.10 CFU/ml), and favorable sensory attributes, making it the optimal inclusion level. Suya with 10.0% coriander recorded the highest color and overall acceptability scores, while 2.5% coriander had the highest aroma and flavor ratings. The findings suggest that a 5.0% coriander inclusion offers a balanced enhancement of Suya's quality attributes, leveraging coriander's antioxidant and antimicrobial properties to improve safety, flavor, and consumer satisfaction.

**IN-SILICO AND TOXICOLOGY ASSESSMENT ON ANTI-CANCER (BREAST CANCER)
EFFECTS OF OREGANO SPICE (*Origanum vulgare*) USE IN ANIMAL PRODUCTS FOR
THE DEVELOPMENT OF FUNCTIONAL FOODS**

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ABSTRACT

Breast cancer is globally the most common invasive cancer in women and remains one of the leading causes of cancer-related deaths. Surgery, radiotherapy, chemotherapy, immunotherapy, and endocrine therapy are currently the main treatments for this cancer type. However, some breast cancer patients are prone to drug resistance related to chemotherapy or immunotherapy, resulting in limited treatment efficacy. This study explores the significance of spices used in animal products in the human diet, highlighting their role as a vital source of bioactive substances. Seventeen phytochemicals of oregano, sourced from ethnobotanical databases, were prepared using the Ligprep module for molecular docking. The crystal structures of the Glucagon Receptor (GCGR) was obtained from the RCSB protein data bank (PDB) with PDB ID of 5NWH was employed molecular docking using the Glide ligand docking in Schrödinger Suite 2023. The absorption, distribution, metabolism, excretion and toxicity (ADMET) properties were determined using in silico integrative model predictions at the SwissADME and ProTox-II online servers. Toxicity assessments were conducted using the ProTox-II web servers. Eleven compounds extracted from the oregano plant were compared with standard drug (Trastuzumab, Palbociclib and Abemaciclib). Among these, only eleven compounds exhibited docking scores superior to the standard drug, which are Quercetin, Rutin, Pulegone, Carvacrol, Thymol, Scorpione, P-cymene, and Bisabolene. The ligands interact with hydrogen bonds, pi-cation interactions, and pi-pi stacking bond. The toxicity classes of the ligands were evaluated based on their LD50 values, with toxicity class 1 indicating highly toxic compounds and toxicity class 5 indicating extremely toxic compounds. Both the standard drug and ligands from plant source has affinity for GLU 166. The ADME properties of the ligands were assessed. Trastuzumab, a monoclonal antibody used to treat breast cancer, has a docking score of -4.306 and is classified as not toxic. Palbociclib, a CDK4/6 inhibitor, has a docking score of -4.08 and is classified as extremely toxic. Quercetin, a flavonoid with anti-cancer and anti-inflammatory properties, has the highest docking score of -5.845 and is classified as slightly toxic. Based on the docking scores, toxicity classes, ADME properties, and toxicity evaluations, the best ligand is Quercetin. It has the highest docking score (-5.845), is classified as slightly toxic (toxicity class 3), has a bioavailability score of 0.55, and is active against various types of toxicity.

**IN-SILICO AND TOXICOLOGY ASSESSMENT ON ANTI-ULCER EFFECTS OF
CABBAGE JUICE USE IN ANIMAL PRODUCTS FOR THE DEVELOPMENT OF
FUNCTIONAL FOODS**

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ABSTRACT

Animal products are an excellent source of proteins, vitamins, minerals, and micronutrients that are essential for maintaining good healthy. Functional foods are those that contain bioactive compounds that offer health benefits beyond basic nutritional values. Cabbage juice is a functional food that has shown promising anti-ulcer effects in animals. Molecular docking is a method which predicts the preferred orientation of one molecule to a second when a ligand and a target are bound to each other to form a stable complex. The absorption, distribution, metabolism, excretion and toxicity (ADMET) properties were determined using in silico integrative model predictions at the SwissADME and ProTox-II online servers. Toxicity assessments were conducted using the Protox-II web servers. Famotidine has a docking score of -5.847, an LD50 of 4000 mg/kg, and is classified as toxicity class 5. Benzaldehyde has a docking score of -6.281, an LD50 of 28 mg/kg, and is classified as toxicity class 2. beta-Cyclocitral compound has a high docking score of -7.094. Its LD50, the lethal dose for 50% of the population, is 2300 mg/kg. Chlorogenic acid has a docking score of -6.665. Famotidine has a hydrogen bond with the amino acid ARG183, inducing a positive charge at the interaction site. Beta-cycloitral interacts with unspecified amino acids, with bonding and charge. Chlorogenic acid forms hydrogen bonds with SER211 and PHE201, enhancing both hydrophobic and polar. Famotidine exhibits low gastrointestinal absorption and does not permeate the blood-brain barrier (BBB), whereas Beta-Cyclocitral, 4-Ethyl Benzaldehyde, Carveol, P-Coumaric Acid, Ferulic Acid, Myristicin, and Elemicin display high GI absorption and BBB permeability. Most compounds exhibit no Lipinski rule violations; however, several have Ghose, Veber, Egan, and Muegge rule violations. Bioavailability scores range from 0.11 to 0.85, with synthetic accessibility scores between 1 and 4.16. Toxicity profiling indicates various activities across hepatotoxicity, neurotoxicity, nephrotoxicity, respiratory toxicity, cardiotoxicity, carcinogenicity, immunotoxicity, mutagenicity, and ecotoxicity. Famotidine, Chlorogenic Acid, 4-Ethyl Benzaldehyde, and Benzaldehyde show nephrotoxicity, while Famotidine, 3,5-Dihydroxy-Benzoic Acid, Ferulic Acid, Myristicin, and Elemicin are carcinogenicity active. Most compounds are inactive for cytotoxicity, nutritional toxicity, and HSE response. Based on the evaluation, Beta-Cyclocitral appears to be the best ligand due to its strong docking score of -7.094, reasonable LD50 of 2300 mg/kg, and acceptable toxicity profile.

**LEPIDIUM SATIVUM: A FUNCTIONAL PLANT WITH UNDERESTIMATED
NUTRITIONAL AND THERAPEUTIC POTENTIAL**

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ABSTRACT

Lepidium sativum, commonly known as garden cress, is a herbaceous plant belonging to the Brassicaceae family, traditionally used in various regions of the world for its medicinal properties and taste. Despite its wide availability and long history of use, *Lepidium sativum* remains under-exploited scientifically, particularly as a functional food with high nutritional and therapeutic potential. This work aims to highlight its nutritional properties (rich in vitamins, minerals, and essential fatty acids) and its biological activities demonstrated by scientific studies, such as its antioxidant, anti-inflammatory, antidiabetic, and antimicrobial effects, as well as its possible role in the prevention of certain chronic diseases. In addition, the plant is of interest in the context of food security, thanks to its ease of cultivation, rapid growth, and ability to adapt to various climates. The integration of *Lepidium sativum* into diets and its development as a nutraceutical or dietary supplement represents a promising opportunity to promote healthy, sustainable, and preventive nutrition. However, excessive consumption can cause adverse effects, hence the need for moderate and supervised use. This presentation provides an overview of this plant in the field of functional nutrition and health.

Keywords: *Lepidium sativum*, biological activities, dietary supplement, nutritional, prevention, therapeutic,

**IN VITRO EVALUATION OF POLYOL PATHWAY INHIBITION, CYTOTOXICITY, AND
ANTIMICROBIAL ACTIVITY OF *EPHEDRA FRAGILIS***

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ABSTRACT

Introduction

The polyol pathway is involved in diabetic complications through glucose conversion to sorbitol, causing oxidative stress and tissue damage. Medicinal plants such as *Ephedra fragilis* are promising candidates for natural inhibitors, but their effects on this pathway are not well explored.

Materials and Methods

Aqueous preparations of *E. fragilis* were tested for inhibition of aldose reductase and sorbitol dehydrogenase. Cytotoxicity was evaluated by the MTT assay, and antimicrobial activity was determined against bacteria and fungi using diffusion and MIC methods.

Results

E. fragilis significantly inhibited both aldose reductase and sorbitol dehydrogenase. Cytotoxicity assays revealed dose-dependent effects, with moderate selectivity toward cancer cells. Antimicrobial testing showed strong activity against Gram-positive bacteria and *Candida albicans*.

Conclusion

These results suggest that *E. fragilis* may serve as a potential natural source of polyol pathway inhibitors with additional antimicrobial and cytotoxic activities. Further studies are needed to confirm its therapeutic potential.

Keywords: *Ephedra fragilis*; polyol pathway; cytotoxicity; antimicrobial activity; natural products.

**YENİLEBİLİR YAĞLARIN OKSİDATİF STABİLİTESİNİN ARTIRILMASINDA DOĞAL
LİPOFİLİK ANTİOKSİDANLARIN ROLÜ**

**THE ROLE OF NATURAL LIPOPHILIC ANTIOXIDANTS IN ENHANCING THE
OXIDATIVE STABILITY OF EDIBLE OILS**

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ÖZET

Yenilebilir yağlarda oksidasyonun önlenmesi, gıda kalitesi, güvenliği ve tüketici sağlığı üzerindeki doğrudan etkisi nedeniyle giderek daha fazla önem kazanmaktadır. Isıl işlem, depolama koşulları ve ışığa maruz kalma gibi çevresel faktörler, yağlarda radikal oluşumunu hızlandırarak besinsel bileşenlerin kaybına ve raf ömrünün kısalmasına neden olmaktadır. Bu nedenle, oksidatif süreci yavaşlatacak güvenilir ve etkili yaklaşımların geliştirilmesi büyük önem taşımaktadır. Son yıllarda yapılan çalışmalar, doğal lipofilik antioksidanların yağ oksidasyonunun kontrolünde önemli bir rol oynayabileceğini göstermektedir. Tokoferoller, karotenoidler, flavonoidler, askorbil palmitat, lipofilik fenolik türevler ve bitkisel ekstraktlar gibi bileşiklerin, serbest radikal süpürme, metal iyonu şelasyonu, hidroperoksitlerin parçalanmasını önleme ve singlet oksijen giderme gibi farklı mekanizmalarla etki gösterdiği bilinmektedir. Ayrıca bu bileşiklerin birlikte kullanılması, tekli uygulamalara kıyasla daha güçlü bir koruma sağlayabilmektedir. Bununla birlikte, bu bileşiklerin yağ matrisindeki davranışları, uygun konsantrasyon sınırları, ısıl dayanıklılıkları ve duyuşal özelliklere olası etkileri tam olarak açıklığa kavuşturulamamıştır. Çeşitli çalışmalar, aynı antioksidanın yağ bileşimi ve çevresel koşullara bağlı olarak değişken sonuçlar verebileceğini göstermiştir. Bu nedenle doğal lipofilik antioksidanların etkinliği yalnızca bileşiğin yapısına değil, kullanılan yağ türüne ve uygulama koşullarına da bağlıdır. Bu çalışmada, yağların oksidatif stabilitesini etkileyen mekanizmalar ve doğal lipofilik bileşiklerin potansiyel katkıları değerlendirilmiştir. Sonuç olarak, doğal lipofilik antioksidanların oksidatif kararlılığın korunmasındaki rolü umut verici görünmekte olup, bu bileşiklerin etkili kullanımını yönlendirecek daha kapsamlı çalışmalara ihtiyaç bulunmaktadır.

Anahtar Kelimeler: Oksidatif stabilite, doğal bileşikler, lipofilik antioksidanlar, antioksidan sinerjisi, sürdürülebilir gıda sistemleri.

ABSTRACT

Preventing oxidation in edible oils has gained increasing attention due to its direct impact on food quality, safety, and consumer health. Environmental factors such as thermal processing, light exposure, and storage conditions accelerate radical formation in oils, leading to the deterioration of nutritional components and shortening of shelf life. Therefore, developing reliable and effective approaches to slow down the oxidative process is of great importance. Recent investigations indicate that natural lipophilic antioxidants may play a crucial role in controlling lipid oxidation. Compounds such as tocopherols, carotenoids, flavonoids, ascorbyl palmitate, lipophilic phenolic derivatives, and plant-based extracts act through multiple mechanisms, including free radical scavenging, metal ion chelation, inhibition of

hydroperoxide decomposition, and singlet oxygen quenching. Moreover, combinations of these compounds often provide stronger protection compared to their individual applications. However, the behavior of these compounds within the oil matrix, their optimal concentration limits, thermal stability, and potential influence on sensory properties have not been fully clarified. Various studies have shown that the same antioxidant can produce variable results depending on oil composition and environmental conditions. Thus, the efficiency of natural lipophilic antioxidants depends not only on their molecular structure but also on the oil type and processing parameters. This study evaluates the mechanisms influencing oxidative stability in oils and the potential contribution of natural lipophilic compounds. In conclusion, the role of natural lipophilic antioxidants in maintaining oxidative stability appears promising, yet more comprehensive studies are required to guide their effective utilization.

Keywords: Oxidative stability, natural compounds, lipophilic antioxidants, antioxidant synergy, sustainable food systems.

**EMÜLSİFİKASYON–İYONİK JELASYON YÖNTEMİYLE ÜRETİLEN KARVAKROL
YÜKLÜ KİTOSAN NANOPARÇACIKLARININ ÇOKLU YANIT OPTİMİZASYONU**

**MULTI-RESPONSE OPTIMIZATION OF CARVACROL-LOADED CHITOSAN
NANOPARTICLES PREPARED BY EMULSIFICATION–IONIC GELATION**

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ÖZET

Bu çalışmada, emülsifikasyon–iyonik jelasyon yöntemiyle karvakrol yüklü kitosan nanoparçacıklarının (KKNP) formülasyon ve işlem faktörleri istatistiksel olarak optimize edilmiştir. Nanoenkapsülasyon su bazlı ortamda yürütülmüş ve suda dağılılabılır nanopartiküller elde edilmiştir. Beş faktörlü iki düzeyli kesirli faktöriyel tasarım (2^{5-1}) uygulanmıştır. Yanıt değişkenleri hidrodinamik parçacık boyutu (nm), zeta potansiyeli (mV) ve enkapsülasyon verimi (%) olarak seçilmiştir. Çoklu yanıt istenirlik yaklaşımıyla eşzamanlı olarak optimize edilmiştir. Yanıtlar küçük parçacık boyutu, yüksek büyüklükte zeta potansiyeli ve yüksek enkapsülasyon verimi şeklinde belirlenmiştir. Doğrulama deneylerinde $386,2 \pm 50,4$ nm hidrodinamik boyut, $+30,5 \pm 0,7$ mV zeta potansiyeli ve $\%57,9 \pm 0,4$ enkapsülasyon verimi elde edilmiş ve polidispersite indeksi $0,392 \pm 0,010$ bulunmuştur. Enkapsülasyon verimi, kitosan, karvakrol, Tween 80 ve sodyum tripolifosfat (TPP)'ın ana etkileri ile kitosan×karvakrol ve karvakrol×Tween 80 etkileşimlerinden anlamlı biçimde etkilenmiştir. Karvakrol artışı verimi yükseltmiş, Tween 80 artışı verimi düşürmüş, TPP artışı ise çalışılan aralıkta verimi artırmıştır. Parçacık boyutu için kitosan, karvakrol, Tween 80 ve TPP ana etkileri ile sıcaklık×karvakrol, kitosan×TPP, karvakrol×Tween 80 ve Tween 80×TPP etkileşimleri anlamlı bulunmuştur. Kitosan ve Tween 80 artışı boyutu yükseltmiş, karvakrol ve TPP artışı boyutu azaltmıştır. Zeta potansiyeli için kitosan, karvakrol, Tween 80 ve TPP ana etkileri ile kitosan×TPP, kitosan×Tween 80 ve karvakrol×Tween 80 etkileşimleri anlamlıdır. Kitosan artışı zeta potansiyelini yükseltmiş, Tween 80 ve TPP azalmaya yol açmıştır. Karvakrol artışı ise düşük Tween 80 düzeylerinde zeta potansiyelini sınırlı ölçüde artırmıştır. Optimum çözüm için istenirlik 0,934 olarak bulunmuştur. Deneysel doğrulama model öngörülerıyla uyumlu olup göreceli hatalar parçacık boyutu için $\%8,78$, zeta potansiyeli için $\%1,73$ ve enkapsülasyon verimi için $-\%0,72$ 'dir. Bu bulgular, KKNP üretiminde formülasyon ve işlem faktörlerinin, tekil etkileri ve ikili etkileşimleriyle, parçacık boyutu, zeta potansiyeli ve enkapsülasyon verimi üzerinde belirleyici olduğunu göstermiştir.

Anahtar Kelimeler: kitosan; karvakrol; nanoenkapsülasyon; iyonik jelasyon; kesirli faktöriyel tasarım.

ABSTRACT

Carvacrol-loaded chitosan nanoparticles (CCNPs) were prepared by emulsification–ionic gelation, and formulation and process factors were statistically optimized. Nanoencapsulation was carried out in an aqueous medium, yielding water-dispersible nanoparticles. A two-level fractional factorial design (2^{5-1}) with five factors was applied. Response variables were hydrodynamic particle size (nm), zeta

potential (mV), and encapsulation efficiency (%). Simultaneous multi-response optimization was performed using the desirability approach, targeting small particle size, a high-magnitude zeta potential ($|\text{zeta}| \geq 30$ mV), and high encapsulation efficiency. In confirmation runs under the optimum, a hydrodynamic size of 386.2 ± 50.4 nm, a zeta potential of $+30.5 \pm 0.7$ mV, and an encapsulation efficiency of $57.9 \pm 0.4\%$ were obtained; the polydispersity index was 0.392 ± 0.010 . Encapsulation efficiency was significantly influenced by the main effects of chitosan, carvacrol, Tween 80, and TPP, and by the chitosan $\times$ carvacrol and carvacrol $\times$ Tween 80 interactions; carvacrol increased efficiency, Tween 80 decreased it, and TPP increased it within the studied range. For particle size, significant main effects were chitosan, carvacrol, Tween 80, and TPP, with significant interactions temperature $\times$ carvacrol, chitosan $\times$ TPP, carvacrol $\times$ Tween 80, and Tween 80 $\times$ TPP; chitosan and Tween 80 increased size, whereas carvacrol and TPP decreased size. For zeta potential, significant main effects were chitosan, carvacrol, Tween 80, and TPP, with significant interactions chitosan $\times$ TPP, chitosan $\times$ Tween 80, and carvacrol $\times$ Tween 80; chitosan increased zeta potential, while Tween 80 and TPP decreased it, and increasing carvacrol produced a slight rise at low Tween 80. The global desirability of the optimum was 0.934. Experimental validation agreed with model predictions, with relative errors of 8.78% for size, 1.73% for zeta potential, and -0.72% for encapsulation efficiency. These results quantitatively defined an operating window in which formulation and process factors, alone and through two-way interactions, govern particle size, zeta potential, and encapsulation efficiency in CCNP production.

Keywords: chitosan; carvacrol; nanoencapsulation; ionic gelation; fractional factorial design.

GIDA SEKTÖRÜNDE KULLANILAN KİMYASAL KATKI MADDELERİ
CHEMICAL ADDITIVES USED IN THE FOOD INDUSTRY

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ÖZET

Besleyici değeri olsun veya olmasın, tek başına gıda olarak tüketilmeyen ve gıdanın karakteristik bileşeni olarak kullanılmayan, teknolojik bir amaç doğrultusunda üretim, muamele, işleme, hazırlama, ambalajlama, taşıma veya depolama aşamalarında gıdaya ilave edilmesi sonucu kendisinin ya da yan ürünlerinin, doğrudan ya da dolaylı olarak o gıdanın bileşeni olması beklenen maddeler gıda katkı maddesi olarak adlandırılır (Türk Gıda Kodeksi Yönetmeliği, 2023).

Dünya nüfusunun artmasına bağlı olarak gıdanın hızla sanayileşmesi, gıda sektörünü gıda katkı maddelerine bağımlı hale getirmiştir. Endüstriyel gıda üretiminde ürün kalitesini koruma, raf ömrünü uzatma, mikrobiyal güvenliği sağlama ve duyuşsal özellikleri iyileştirme gibi işlevleriyle yaygın olarak kullanılmaktadır. Gıda katkı maddeleri kaynakları sınıflandırıldığında doğal, doğal kaynaklı ve kimyasal katkı maddeleri olarak gruplandırılabilir.

Kimyasal gıda katkı maddeleri genellikle laboratuvar ortamında sentezlenen veya doğal kaynaklardan kimyasal yollarla elde edilen bileşiklerdir. Doğal katkı maddelerine göre stabilite, düşük maliyet ve kontrollü etki gibi avantajları bulunmaktadır. Koruyucular (Sodyum benzoat, nitritler), renklendiriciler (tartrazin), antioksidanlar (BHA, BHT), tatlandırıcılar (aspartam, sakarin) ve emülgatörler (mono ve digliseridler) gibi gruplar hem teknik etkinlik hem de üretim verimliliği açısından yaygın olarak tercih edilmektedir. Bu bileşiklerin gıda matrisi içindeki davranışları; pH, su aktivitesi, bileşen yapısı gibi faktörlere bağlı olarak değişkenlik göstermektedir.

Gıda sektöründe kullanılan kimyasal katkı maddelerini konu alan bu çalışma, katkıların yapısal özellikleri, işlevsel davranışları ve tüketici odaklı değerlendirme kriterleri üzerine yapılacak disiplinlerarası araştırmalara kaynak oluşturmaktadır.

Anahtar Kelimeler: Kimyasal gıda katkı maddeleri, gıda katkı maddeleri, gıda sektörü.

ABSTRACT

Food additives are substances that are not consumed as food on their own or used as a characteristic component of food, whether they have nutritional value or not, but are expected to become components of that food, either directly or indirectly, by themselves or their by-products, when added to food during the production, handling, processing, preparation, packaging, transportation, or storage stages for a technological purpose (Turkish Food Codex Regulation, 2023).

The rapid industrialization of food due to the increasing world population has made the food sector dependent on food additives. They are widely used in industrial food production for their functions such as preserving product quality, extending shelf life, ensuring microbial safety, and improving sensory properties. When classified by source, food additives can be grouped as natural, naturally derived, and chemical additives.

Chemical food additives are generally compounds synthesized in laboratories or obtained chemically from natural sources. Compared to natural additives, they offer advantages such as stability, low cost, and controlled effects. Groups such as preservatives (sodium benzoate, nitrites), colorants (tartrazine), antioxidants (BHA, BHT), sweeteners (aspartame, saccharin), and emulsifiers (mono- and diglycerides) are widely preferred for both technical effectiveness and production efficiency. The behavior of these compounds within the food matrix varies depending on factors such as pH, water activity, and component structure.

This study, which focuses on chemical additives used in the food industry, provides a basis for interdisciplinary research on the additives' structural properties, functional behaviors, and consumer-focused evaluation criteria.

Keywords: Chemical food additives, food additives, food industry.

**SUCUL EKOSİSTEMLERDEN İZOLE EDİLEN BAKTERİLERİN ASTAKSANTİN
ÜRETİMİNİN HPLC İLE SAPTANMASI**
**EVALUATION OF ASTAXANTHIN PRODUCTION BY BACTERIA ISOLATED FROM
AQUATIC ECOSYSTEMS USING HPLC**

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ÖZET

Son yılların en gözde pigmentlerinden biri olan astaksantin; turuncu-kırmızımsı renge sahip lipofilik bir ketokarotenoittir. Somon, alabalık, karides gibi hayvanlara canlı kırmızı rengini sağlamak amacıyla, akuakültürlerde yem takviyesi olarak yaygın kullanılmaktadır. Aynı zamanda yüksek antioksidan aktivitesi ve antitümör, antidiyabetik, antienflamatuvar özellikleriyle nutrasötik ve farmasötik olarak pazarda geniş yer bulan bir bileşiktir. Sentetik astaksantin, toksik bileşikler içermesi nedeniyle insan tüketiminde kullanılamamaktadır. Dolayısıyla, doğal kaynaklardan astaksantin üretilmesi konusunda yürütülen çalışmalar ivme kazanmıştır. Alglerden, mayalardan, mantarlardan, bazı bitkilerden ve bakterilerden astaksantin üretimi üzerine çalışmalar mevcuttur. Hızlı üreme döngüleri, faydalı biyoaktif bileşikler sentezleme konusunda yetenekleri ve genetik manipülasyonlara uygunluğu sebebiyle bakteriler, bu alanda öne çıkan canlı grubunu oluşturmaktadır.

Bu çalışmada; Erzurum ve çevresindeki sucul ekosistemlerden renkli (turuncu, kırmızı, sarı) koloniler oluşturan bakteriler izole edilmiştir. Pigment ekstraksiyonu işlemi gerçekleştirilerek, pigmentlerin astaksantin üretimlerinin incelenmesi için HPLC (Yüksek Performanslı Sıvı Kromatografisi) cihazında, standart astaksantin kullanılarak değerlendirme gerçekleştirilmiştir. Elde edilen sonuçlar; bazı izolatlardan elde edilen pigmentlerin astaksantin olduğunu doğrulamıştır. Bu sonuçlar, 2030 yılına kadar pazar payının 3,4 milyar dolara ulaşması beklenen astaksantin için son derece umut vadeci bir gelişme olarak görülmektedir.

Anahtar Kelimeler: Astaksantin, Bakteriyel Pigment, HPLC

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ABSTRACT

Astaxanthin, one of the most popular pigments in recent years, is a lipophilic ketocarotenoid with an orange-reddish color. It is widely used as a feed supplement in aquaculture to give animals such as salmon, trout and shrimp their vivid red colour. It is also a compound widely available in the nutraceutical and pharmaceutical markets due to its high antioxidant activity and antitumor, antidiabetic, and anti-inflammatory properties. Synthetic astaxanthin cannot be used for human consumption due to its toxic compounds. Therefore, research on the production of astaxanthin from natural sources has gained momentum. Studies exist on the production of astaxanthin from algae, yeasts, fungi, certain plants, and bacteria. Due to their rapid reproduction cycles, their ability to synthesise beneficial bioactive compounds, and their suitability for genetic manipulation, bacteria constitute the leading group of organisms in this field.

In this study, bacteria forming coloured (orange, red, yellow) colonies were isolated from aquatic ecosystems in and around Erzurum. Pigment extraction was performed, and the pigments were evaluated using HPLC (High Performance Liquid Chromatography) with standard astaxanthin to investigate their astaxanthin production. The results obtained confirmed that the pigments obtained from some isolates were indeed astaxanthin. These results are seen as an extremely promising development for the domestic and national production of astaxanthin, whose market share is expected to reach \$3.4 billion by 2030.

Keywords: Astaxanthin, Bacterial Pigments, HPLC

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BİYOBOZUNUR GIDA AMBALAJLARI İÇİN ZEOLİT TAKVİYELİ FİLMLER
ZEOLITE-REINFORCED FILMS FOR BIODEGRADABLE FOOD PACKAGING

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ÖZET

Günümüzde gıda sektörü, artan çevre kirliliği ve plastik atık sorunları karşısında sürdürülebilir ambalaj çözümlerine her zamankinden daha fazla gereksinim duymaktadır. Biyobozunur ve çevre dostu film yapıları hem gıda güvenliğini sağlamakta hem de çevresel etkileri minimize etme potansiyeli sunmaktadır. Bu çalışmada, Polivilalkol (PVA) polimerinin üstün film oluşturma yeteneği ile Sodyum Kazeinat (NaCAS) proteininin doğal özelliklerini birleştirerek sağlam ve fonksiyonel biyobozunur filmler geliştirilmiştir. Çevre dostu gıda ambalajlarının tasarımı amacıyla, PVA/NaCAS (60/40, ağırlıkça, w/w) matrisine farklı oranlarda (%2.5, 5 ve 10) zeolit eklenmiş ve çözeltiden döküm yöntemiyle elde edilen filmlerin karakterizasyonu sağlanmıştır. Ayrıca NaCAS'ın kırılma yapısını azaltmak için plastikleştirici olarak gliserol (GLY, ağırlıkça %25) kullanılmıştır. Zeolit katkısı filmlerin termal ve mekanik dayanımını artırmış ve gaz ile nem bariyer özelliklerini geliştirmiştir. TGA analizi, saf zeolit tozunun nem kaybına bağlı iki kütle kaybı aşaması gösterdiğini ve artan zeolit içeriğinin filmlerin termal kararlılığını güçlendirdiğini ortaya koymuştur. Çekme testinde, %5 zeolit içeren filmlerde maksimum 32.4 MPa dayanım elde edilmiş, ancak %10 zeolit eklenmesi matris bütünlüğünü bozarak çekme dayanımında hafif bir azalmaya yol açmıştır. Oksijen geçirgenliği (OTR) ve su buharı geçirgenliği (WVP) üzerinde de önemli etkiler görülmüştür. %5 zeolit içeren filmlerde OTR 37.58 cm³/m²·24h·0.1 MPa ve WVP 2519 g/m²·day ile maksimuma ulaşırken, %10 zeolit eklenmesi, aglomerasyon ve polimer zincir hareketliliğinin kısıtlanması nedeniyle OTR'yi 20.51 cm³/m²·24h·0.1 MPa ve WVP'yi 770 g/m²·day seviyelerine düşürerek bariyer performansını iyileştirmiştir. Geliştirilen biyobozunur film yapıları, PVA ve NaCAS bileşenlerinin özellikleriyle, zeolit katkısı sayesinde hem fonksiyonel hem de çevre dostu bir ambalaj çözümü sunmakta ve gıda paketlenme uygulamalarında gelecek vadetmektedir.

Anahtar Kelimeler: PVA, NaCAS, Zeolit, Gıda Ambalajı, Film.

ABSTRACT

Today, the food industry increasingly requires sustainable packaging solutions in the face of rising environmental pollution and plastic waste issues. Biodegradable and eco-friendly film structures not only ensure food safety but also offer the potential to minimize environmental impacts. In this study, strong and functional biodegradable films were developed by combining the superior film-forming ability of Polyvinyl Alcohol (PVA) with the natural properties of Sodium Caseinate (NaCAS) protein. For the design of environmentally friendly food packaging, zeolite was incorporated into the PVA/NaCAS (60/40, w/w) matrix at different ratios (2.5%, 5%, and 10%), and the films obtained by the solution casting method were characterized. Additionally, glycerol (GLY, 25% w/w) was used as a plasticizer to reduce the brittle nature of NaCAS. The addition of zeolite enhanced the thermal and mechanical stability of the films, improving their gas and moisture barrier properties. TGA analysis revealed that pure zeolite powder exhibited two mass loss stages due to moisture loss, and increasing zeolite content strengthened the thermal stability of the films. Tensile testing showed a maximum strength of 32.4 MPa in the film containing 5% zeolite; however, adding 10% zeolite slightly reduced the tensile strength due to the disruption of matrix integrity. Significant effects were also observed on oxygen permeability (OTR) and water vapor permeability (WVP). Films containing 5% zeolite reached maximum OTR ($37.58 \text{ cm}^3/\text{m}^2 \cdot 24\text{h} \cdot 0.1 \text{ MPa}$) and WVP ($2519 \text{ g}/\text{m}^2 \cdot \text{day}$), while the addition of 10% zeolite reduced OTR to $20.51 \text{ cm}^3/\text{m}^2 \cdot 24\text{h} \cdot 0.1 \text{ MPa}$ and WVP to $770 \text{ g}/\text{m}^2 \cdot \text{day}$ due to agglomeration and restricted polymer chain mobility, thereby improving barrier performance. The developed biodegradable film structures, combining the properties of PVA and NaCAS and the functional contribution of zeolite, provide both functional and eco-friendly packaging solutions and show promise for food packaging applications.

Keywords: PVA, NaCAS, Zeolite, Food Packaging, Film.

YENİ GELİŞTİRİLEN BİYOBOZUNUR PVA/NACAS–ZEOLİT FİLMİNİN YABAN MERSİNİ SOĞUK DEPOLAMASINDAKİ ETKİNLİĞİNİN DEĞERLENDİRİLMESİ
EVALUATION OF A NEWLY DEVELOPED BIODEGRADABLE PVA/ NaCas –ZEOLITE FILM IN THE COLD STORAGE OF BLUEBERRIES

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ÖZET

Son yıllarda plastik kullanımının çevre ve insan sağlığını tehdit edecek düzeyde artması nedeniyle, plastik ambalajlara alternatif, biyobozunur ambalajların geliştirilmesi önem kazanmıştır. Bu çalışmada yüksek oranda biyobozunur bir ambalaj materyalinin geliştirilmesi amaçlanmış ve ambalajın performansı yaban mersini meyveleri kullanılarak değerlendirilmiştir. Çalışmada, PVA–sodyum kazeinat (NaCas) matrisine %5 zeolit eklenerek oluşturulan film (5zeo-CF) ile kontrol olarak zeolitsiz (Raw-CF) film kullanılarak oluşturulan ambalajların etkinliği soğuk depolamada test edilmiştir. Her bir ambalaj materyaline ‘Brigitta’ çeşidi yaban mersini meyveleri 20’şer adet olacak şekilde yerleştirilmiş ve 0, 12, 24, 36 ve 48. günlerde ağırlık kaybı, basma direnci ile glukoz, fruktoz ve toplam şeker içerikleri ölçülmüştür. Veriler ambalaj tipi ve depolama süresi faktörlerini içeren iki yönlü ANOVA ile analiz edilmiş ve uygulamalar arasındaki farklılık Duncan çoklu karşılaştırma testine ($p<0,05$) tabi tutulmuştur. Ambalaj tipi x depolama süresi intereksiyonu, ağırlık kaybı ve şeker içeriği parametrelerinde önemli bulunurken; ambalaj tipi ağırlık kaybı ve şeker profillerini anlamlı düzeyde etkilemiş, depolama süresi ise tüm parametrelerde belirleyici olmuştur. 5zeo-CF ambalajı su kaybını sınırlayarak, depolamanın 12. (erken dönem) ve 48. (son dönem) günlerinde ağırlık kayıplarını (12. gün 5zeo-CF’de %16,1 iken, Raw-CF’de %19,4; 48. gün 5zeo-CF’de %35,1 iken, Raw-CF’de %38,1) Raw-CF’ye göre önemli düzeyde azaltmıştır. Meyvelerin kompresyon direnci olarak ölçülen sertlik değerleri zamana bağlı olarak özellikle dehidrasyon dolayısıyla artmış, şeker içerikleri ise genel olarak yükselmiştir. Buna karşılık, 5zeo-CF ambalajı son dönemde meyvelerin glukoz, fruktoz ve toplam şeker birikimini daha düşük seviyede tutmuştur. Bulgular, PVA/NaCas filmine zeolit ilavesi, ambalaj materyalinde mikroporöz ve nemi dengeleyici bir yapı oluşmasını sağlayarak, yaban mersini kalitesinin uzun depolamada daha iyi korunmasına olanak verdiğini göstermektedir. PVA/NaCas–zeolit sisteminin aktif gıda ambalajında ilk

uygulamasını sunan bu çalışma, hassas meyvelerde raf ömrünü iyileştirirken plastik atığını azaltmaya yönelik özgün ve sürdürülebilir bir seçenek ortaya koymaktadır.

Anahtar Kelimeler: Aktif biyobozunur ambalaj, kompozit film, ağırlık kaybı, basma sertliği, glukoz, fruktoz, *Vaccinium corymbosum*.

ABSTRACT

The extensive use of plastics in recent decades has reached levels that threaten both environmental and human health, emphasizing the urgent need for sustainable and biodegradable alternatives in food packaging. This study aimed to develop a highly biodegradable packaging material and to evaluate its performance using blueberry (*Vaccinium corymbosum* L.) fruits as a model. Packaging films were prepared from a polyvinyl alcohol–sodium caseinate (PVA–NaCas) matrix with or without 5% zeolite, referred to as 5zeo-CF and Raw-CF, respectively. Twenty fruits of the ‘Brigitta’ cultivar were placed in each packaging material and stored under cold conditions. Weight loss, compression resistance, and sugar profiles (glucose, fructose, and total sugars) were measured on days 0, 12, 24, 36, and 48. The data were subjected to two-way ANOVA, with packaging type and storage time as factors, and treatment means were compared using Duncan’s multiple range test ($p < 0.05$). Significant interactions between packaging type and storage duration were observed for weight loss and sugar contents. The 5zeo-CF film effectively limited water loss and significantly reduced weight loss compared to Raw-CF (16.1% vs. 19.4% on day 12; 35.1% vs. 38.1% on day 48). Fruit firmness, measured as compression resistance, increased over time mainly due to dehydration, while sugar contents generally rose during storage. However, the 5zeo-CF packaging maintained lower glucose, fructose, and total sugar accumulation at the end of the storage period. The inclusion of zeolite in the PVA/NaCas matrix provided a microporous and moisture-regulating structure, contributing to better preservation of blueberry quality during extended storage. These findings demonstrate that PVA/NaCas–zeolite films represent a novel, sustainable, and biodegradable alternative for active food packaging applications, effectively reducing plastic waste while improving the shelf life and quality of perishable fruits.

Keywords: Active biodegradable packaging, composite film, weight loss, compression firmness, glucose, fructose, *Vaccinium corymbosum*.

**PSİKOBİYOTİK LAKTİK ASİT BAKTERİLERİNİN YOĞURT KAYNAKLI YENİ NESİL
ANTİOKSİDANLAR OLARAK DEĞERLENDİRİLMESİ**

**FUNCTIONAL INSIGHTS INTO PSYCHOBOTIC LACTIC ACID BACTERIA ISOLATED
FROM YOGURTS: ANTIOXIDANT AND HEALTH-PROMOTING POTENTIAL**

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ÖZET

Yapılan mevcut çalışmada, Gümüşhane ve çevresinden toplanan geleneksel yoğurt örneklerinden, psikobiyotik laktik asit bakterilerinin (LAB) izole edilerek antioksidan potansiyelleri araştırılmıştır. Elde edilen LAN izolatları, morfolojik ve biyokimyasal testlerle seçilerek tür düzeyinde tanımlama için MALDI-TOF kütle spektrometresi kullanılarak tanımlanmıştır. Seçilen izolatların antioksidan aktiviteleri; Difenil-1-pikrihidrazil (DPPH) serbest radikal süpürme aktivitesi, troloks eşdeğeri antioksidan kapasite (ABTS) ve ferrik indirgeme antioksidan gücü (FRAP) yöntemleriyle belirlenmiştir. Sonuçlara göre, özellikle *Lactobacillus plantarum* ve *Lacticaseibacillus rhamnosus* suşlarının yüksek antioksidan aktivite gösterdiği tespit edilmiştir. Bu izolatlarda DPPH serbest radikal süpürme aktivitesi sırasıyla 78.6 ± 0.18 ve 83.5 ± 0.18 ; ABTS inhibisyonu 71.8 ± 0.19 ve 73.2 ± 0.19 ; FRAP değerleri ise 355 ± 0.6 $\mu\text{mol Fe}^{2+}/\text{mL}$ ve 421 ± 0.6 $\mu\text{mol Fe}^{2+}/\text{mL}$ olarak bulunmuştur. Ayrıca bazı izolatların in vitro gastrointestinal koşullarda yüksek hayatta kalma oranı gösterdiği (%85'in üzerinde) belirlenmiş, bu da onların güçlü psikobiyotik adaylar olarak potansiyelini ortaya koymuştur.

Anahtar Kelimeler: Psikobiyotik, laktik asit bakterileri (LAB), yoğurt, antioksidan aktivite, bağırsak-beyin eksen

ABSTRACT

This study investigated the antioxidant capacity of psychobiotic lactic acid bacteria (LAB) isolated from conventional yogurt samples. After examining their morphology and gram stain characteristics, MALDI-TOF mass spectrometry was employed to identify the species of each of the 15 LAB isolates. We employed the DPPH radical scavenging activity, Trolox equivalent antioxidant capacity (ABTS), and ferric reducing antioxidant power (FRAP) tests to see how effectively the chosen isolates acted as antioxidants. The results showed that *Lactobacillus plantarum* and *Lacticaseibacillus rhamnosus* strains have a lot of antioxidant activity. The FRAP values for these isolates were 355 ± 0.6 $\mu\text{mol Fe}^{2+}/\text{mL}$ and 421 ± 0.6 $\mu\text{mol Fe}^{2+}/\text{mL}$, the DPPH radical scavenging activity was $78.6 \pm 0.18\%$ and $83.5 \pm 0.18\%$, and the ABTS inhibition was $71.8 \pm 0.19\%$ and $73.2 \pm 0.19\%$, respectively. Furthermore, many isolates exhibited improved survival rates in simulated in vitro gastrointestinal environments (exceeding 85%), underscoring their potential as robust psychobiotic candidates.

Keywords: Psychobiotics, lactic acid bacteria, yogurt, antioxidant activity, gut-brain axis

TARIMSAL ATIKLARDAN KATMA DEĞERE: SÜRDÜRÜLEBİLİR GELECEK İÇİN GERİ DÖNÜŞÜM YAKLAŞIMLARI
FROM AGRICULTURAL WASTE TO ADDED VALUE: RECYCLING APPROACHES FOR A SUSTAINABLE FUTURE

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ÖZET

Tarımsal faaliyetler sonucunda ortaya çıkan atıklar, hem miktar hem de çeşitlilik bakımından giderek artmakta ve çevresel sorunların önemli bir kaynağı haline gelmektedir. Türkiye’de yalnızca bitkisel üretimden kaynaklanan yıllık atık miktarı milyonlarca tonu bulmakta, ancak bu değerli kaynakların büyük bir kısmı hâlâ etkili bir şekilde geri kazanılamamaktadır. Çoğu zaman tarla bırakılan veya yakılan bu atıklar, toprak verimliliğinin azalmasına, su ve hava kirliliğine, ayrıca sera gazı emisyonlarının artmasına yol açmaktadır. Bu durum, hem çevresel sürdürülebilirlik hem de iklim değişikliğiyle mücadele açısından ciddi bir sorun teşkil etmektedir. Oysa tarımsal atıklar, enerji üretimi, organik gübre, biyoplastik, hayvan yemi veya biyoaktif bileşikler gibi katma değeri yüksek ürünlerin üretiminde kullanılabilecek zengin bir hammadde kaynağıdır. Bu materyallerin uygun biyoteknolojik ve kimyasal yöntemlerle geri dönüştürülmesi, sadece çevre kirliliğini önlemekle kalmaz, aynı zamanda döngüsel ekonomi ve sürdürülebilir tarım uygulamalarını da destekler. Dünya genelinde pek çok ülke, bu alanda teknolojik yatırımlar yaparak hem ekonomik kazanç hem de ekolojik fayda elde etmektedir. Bu çalışma kapsamında, tarımsal atıkların değerlendirilme düzeyi, mevcut uygulamalar ve sürdürülebilir kalkınma açısından taşıdığı önem ele alınmaktadır. Literatür ve örnek uygulamalar incelenmiş, tarımsal atıkların geri kazanımı yoluyla çevre koruma, enerji verimliliği ve ekonomik gelişmeye katkı sağlama potansiyeli ortaya konmuştur. Bulgular, tarımsal atıkların doğru yöntemlerle dönüştürülmesinin yalnızca ekolojik fayda sağlamadığını, aynı zamanda tarım ve endüstri alanında yeni fırsatlar yarattığını göstermektedir. Bu nedenle, tarımsal atık yönetiminin geliştirilmesi ve yaygınlaştırılması, hem çevresel hem de ekonomik sürdürülebilirlik açısından stratejik bir öncelik olarak değerlendirilmektedir.

Anahtar Kelimeler: Tarımsal atıklar, geri dönüşüm, sürdürülebilir tarım, döngüsel ekonomi, çevre koruma

ABSTRACT

Waste generated from agricultural activities is increasing both in quantity and diversity, contributing significantly to environmental problems. In Türkiye, plant-based agricultural residues alone reach millions of tons annually, yet a substantial portion of these valuable resources remains underutilized. Frequently left in fields or burned, these wastes reduce soil fertility, pollute air and water, and contribute to greenhouse gas emissions, thereby exacerbating climate change and posing serious environmental sustainability challenges. Agricultural wastes, however, represent a rich source of raw materials that can be converted into high-value products such as energy, organic fertilizers, bioplastics, animal feed, and bioactive compounds. Recycling these materials through appropriate biotechnological and chemical methods not only mitigates environmental pollution but also strengthens circular economy practices and

sustainable agriculture. Globally, many countries invest in technological innovations in this area, achieving both economic gains and ecological benefits. This study examines the utilization level of agricultural wastes, current practices, and their significance for sustainable development. Literature reviews and practical examples are analyzed to demonstrate how recovering agricultural residues can contribute to environmental protection, energy efficiency, and economic growth. The findings highlight that proper conversion of agricultural wastes not only generates ecological benefits but also creates new opportunities for agriculture and industry. Consequently, enhancing and promoting effective agricultural waste management emerges as a strategic priority for both environmental and economic sustainability. The study underscores the critical role of integrating innovative recycling technologies and awareness-raising initiatives to fully exploit the potential of agricultural residues, supporting a more resilient and resource-efficient agricultural sector.

Keywords: Agricultural wastes, recycling, sustainable agriculture, circular economy, environmental protection

SAĞLIKLI VE SÜRDÜRÜLEBİLİR BİR LEZZET: TAZE OTLU HAMSI
A HEALTHY AND SUSTAINABLE FLAVOR: ANCHOVY WITH FRESH HERBS

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ÖZET

Bu çalışmada, su ürünleri içerisinde, yüksek besin değeri ve zengin omega-3 içeriğiyle Türk mutfağında özellikle Karadeniz Bölgesi'nde önemli bir yere sahip olan hamsi balığı (*Engraulis encrasicolus*) ile altı farklı taze ot (taze soğan, kekik, biberiye, fesleğen, maydanoz, dereotu) kullanılarak yeni modern, sağlıklı ve sürdürülebilir bir lezzet ortaya koyulmuştur. Ürün besinsel kompozisyonu ve 18 panelist tarafından değerlendirilmiş anket sonucunda duyu analizi yapılmıştır. Taze otlu hamsinin besinsel kompozisyon analizi sonucunda %17,07±0,77 ham protein, %21,42±0,33 ham yağ, %1,79±0,02 ham kül ve %53,76±0,15 oranında nem içerdiği belirlenmiştir. Yapılan ankette taze otlu hamsi koku, sertlik, sululuk, tuzluluk, yağlılık, acılık, aroma, görünüş, genel beğeni ve satın alma isteği yönünden değerlendirilmiştir. Genel beğeni değerlendirmesinde panelistlerin %44,44'ü "çok beğendim", %33,33'ü "beğendim" ve %22,22'i "biraz beğendim" şeklinde görüş belirtmiştir. Ayrıca, panelistlerin satın alma isteği oranı %100 olarak tespit edilmiştir. Sonuç olarak, ülkemiz için geleneksel bir besin olan hamsi, taze otlar kullanılarak modern ve sürdürülebilir bir ürün haline getirilmiş; farklı aromatik otların kullanımıyla hamsi tüketiminin artmasına ve daha sağlıklı beslenme alışkanlıklarının gıda tüketimine teşvik edilmesine katkı sağlayacağı düşünülmektedir.

Anahtar kelimeler: Hamsi, taze otlar, besinsel analiz, duyu analizi, sağlıklı beslenme.

ABSTRACT

In this study, a modern, healthy, and sustainable flavor was developed using anchovy (*Engraulis encrasicolus*), a fish with high nutritional value and rich omega-3 content that holds an important place in Turkish cuisine, especially in the Black Sea Region, along with six different fresh herbs (spring onion, thyme, rosemary, basil, parsley, and dill). The product's proximate composition and sensory analysis were investigated based on the results of a survey evaluated by 18 panelists. The proximate composition analysis of the fresh herbed anchovy determined that it contains 17.07±0.77% crude protein, 21.42±0.33% crude fat, 1.79±0.02% crude ash, and 53.76±0.15% moisture. In the conducted survey, the fresh herbed anchovy was evaluated based on odor, hardness, juiciness, saltiness, oiliness, bitterness, aroma, appearance, overall liking, and purchase intention. In the overall liking evaluation, 44.44% of the panelists stated "I liked it very much," 33.33% stated "I liked it," and 22.22% stated "I liked a little." Furthermore, the purchase intention rate of the panelists was determined to be 100%. In conclusion, anchovy, a traditional food for our country, has been transformed into a modern and sustainable product using fresh herbs. It is thought that the use of different aromatic herbs will contribute to increasing anchovy consumption and promoting healthier eating habits in food consumption.

Keywords: Anchovy, fresh herbs, proximate analysis, sensory analysis, healthy nutrition.

**HAMSİ KULLANILARAK GELİŞTİRİLEN HAMSİLİ TUZLU KEKİN BESİN BİLEŞİMİ
VE DUYUSAL ÖZELLİKLERİ**
**NUTRITIONAL COMPOSITION AND SENSORY EVALUATION OF ANCHOVY-BASED
SAVORY CAKE**

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ÖZET

Bu çalışma, yüksek besin değerine sahip hamsi balığının (*Engraulis encrasicolus* Linnaeus, 1758) kullanımıyla geliştirilmiş yenilikçi bir ürün olan hamsili kekin hazırlanması, kimyasal bileşiminin belirlenmesi ve duysal özelliklerinin değerlendirilmesi amacıyla yürütülmüştür. Araştırmada, geleneksel bir fırın ürünü formuna balık etinin eklenmesiyle hem besin değeri yüksek hem de duysal açıdan kabul edilebilir bir gıda ürünü elde edilmesi hedeflenmiştir. Yapılan kimyasal analizler sonucunda hamsili kekin besin bileşimi şu şekilde belirlenmiştir: protein %14,10, yağ %18,22, kül %2,10, nem %50,14, karbonhidrat %15,43 ve enerji 282,16 kcal/100 g. Bu değerler, ürünün dengeli bir besin içeriğine sahip olduğunu ve özellikle protein ile yağ açısından zengin bir kaynak sunduğunu göstermektedir. Duysal değerlendirme, yaşları 28–52 arasında değişen, %72,22'si erkek ve %27,78'i kadın olan 25 panelist tarafından gerçekleştirilmiştir. Panelistler ürünü koku, sertlik, sululuk, tuzluluk, yağlılık, acılık, aroma, görünüm, genel beğeni ve satın alma isteği kriterleri açısından değerlendirmiştir. Sonuçlara göre ürünün hafif kızarmış balık kokusuna, orta sertliğe, dengeli tuz ve yağ oranına ve hoş aromatik özelliklere sahip olduğu belirlenmiştir. Genel beğeni düzeyi yüksek bulunmuş, satın alma isteği ise %100 olarak kaydedilmiştir. Sonuç olarak, hamsili kekin hem fonksiyonel hem de katma değerli bir deniz ürünü türevi olarak, sağlıklı beslenmeyi destekleyebilecek ve ticari üretim açısından potansiyel taşıyan yenilikçi bir alternatif olduğu sonucuna varılmıştır.

Anahtar Kelimeler: Hamsili kek, *Engraulis encrasicolus*, duysal analiz, besin bileşimi, fonksiyonel gıda.

ABSTRACT

This study was conducted to develop, analyze, and evaluate a novel food product known as anchovy cake, prepared using European anchovy (*Engraulis encrasicolus* Linnaeus, 1758), a marine species of high nutritional and economic value. The aim was to produce a product with enhanced nutritional quality and acceptable sensory properties by incorporating anchovy meat into a traditional bakery formulation. Proximate composition analysis revealed that the anchovy cake contained 14.10% protein, 18.22% fat, 2.10% ash, 50.14% moisture, and 15.43% carbohydrates, with a calculated energy value of 282.16 kcal/100 g. These results indicate that the product provides a balanced macronutrient profile and is particularly rich in protein and lipids, suggesting its potential as a functional and nutrient-dense food. Sensory evaluation was carried out with 25 trained panelists aged 28–52 years, of whom 72.22% were male and 27.78% were female. The product was evaluated based on odor, firmness, juiciness, saltiness, oiliness, bitterness, aroma, appearance, overall acceptability, and purchase intention. Results indicated that the product exhibited a mild fried-fish odor, moderate texture, balanced salt and oil content, and a

pleasant aroma. The overall acceptance was high, and the purchase intention reached 100%, reflecting complete consumer approval. In conclusion, the anchovy cake demonstrates significant potential as an innovative, functional, and value-added seafood-based food product that may promote healthier eating habits and expand the utilization of marine resources in both household and commercial production.

Keywords: Anchovy cake, *Engraulis encrasicolus*, sensory analysis, proximate composition, functional food.

**YERLİ MUZ KABUĞUNDAN ELDE EDİLEN PEKTİNİN KURABIYE ÜRETİMİNDE
KULLANIMI**
USE OF PECTIN OBTAINED FROM LOCAL BANANA PEELS IN COOKIE PRODUCTION

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ÖZET

İşlenmiş meyve ürünlerinin üretiminin artmasıyla birlikte muz meyvesinden büyük miktarlarda kabuk atığı oluşmaktadır. Türkiye’de muz ithal ürün olsa da yerli üretimi artış göstermektedir. Bu çalışmada yerli muz kabuğundan pektin elde edilerek gıda işlemede uygulanabilirliği değerlendirilmiştir. Pektin ekstraksiyonu sülfirik asit (1M, pH 1,5-2) kullanılarak gerçekleştirilmiştir. Pektin örneğinin kimyasal bileşimi incelendiğinde, nem oranı $2,33 \pm 0,17$, kül oranı $3,81$ ve protein oranı $0,83$ olarak belirlenmiştir. Yapılan çalışmada % anhidroüronik asit (AÜA) içeriği $70,07$, % Metoksil içeriği (Mİ) $9,05$ ve % Esterleşme derecesi (ED) $73,2$ belirlenmiştir. Çıkarılan pektini değerlendirmek amacıyla glutensiz kurabiye üretiminde kullanılmıştır. Pektin ilave edilen kurabiye örneklerinde yayılma oranı arttığı gözlemlenmiştir. Kontrol grubu kurabiyelerde %nem içeriği ($3,51 \pm 0,02$), ve % kül oranı ($2,58 \pm 0,08$) en düşük değerde iken pektin miktarına bağlı olarak artış göstermiştir. Kurabiyelerde protein içeriği $17,04$ -% $19,94$ aralığında, yağ içeriği $11,87$ -% $20,80$ belirlenmiştir. Toplam fenolik içeriği $8,00$ -% $27,86$ mg GAE/g, antioksidan sonuçları (%DPPH) $13,72$ ile $27,86$ aralığında belirlenmiştir. Elde edilen pektin katma değerli bir ürünü üretme olanağı olarak katkı maddesi olarak ticari bir öneme sahip alternatif bir kaynak olarak görülebilir.

Anahtar Kelimeler: muz, kabuk, pektin, kurabiye, glutensiz un

ABSTRACT

With the increasing production of processed fruit products, large amounts of banana fruit peel waste are generated. Although bananas are imported into Turkey, local production is increasing. This study evaluated the applicability of pectin to food processing by extracting it from local banana peels. Pectin extraction was carried out using sulfuric acid (1M, pH 1.5-2). When the chemical composition of the pectin sample was examined, and the moisture content was determined as 2.33, the ash content as 3.81 and the protein content as 0.83%. In the study, % anhydrouronic acid (AÜA) content was determined as 70.07, % Methoxyl content (MI) was determined as 9.05 and % Esterification degree (ED) was determined as 73.24. It was used in the production of gluten-free cookies to evaluate the pectin removed. An increase in spreading was observed in the pectin-containing cookie samples. In the control group cookies, the % moisture content (3.51) and % ash content (2.58) were at their lowest values, while they increased depending on the amount of pectin. The protein and fat contents of the cookies were 17.04%–19.94% and 11.87%–20.80%, respectively. The total phenolic capacity 8.00-27.86 mg GAE/g antioxidant results (%DPPH) were between 13.72% and 27.86%. The obtained pectin can be viewed as

an alternative source of commercial importance as an additive and an opportunity to produce a value-added product.

Keywords: banana, peel, pectin, cookie, gluten free

**GIDA ATIKLARINDAN BİYOBOZUNUR MALZEME ÜRETİMİ: TÜRKİYE VE
DÜNYA'DAN ÖRNEKLER**

**PRODUCTION OF BIODEGRADABLE MATERIALS FROM FOOD WASTE: EXAMPLES
FROM TÜRKİYE AND THE WORLD**

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ÖZET

Plastik ambalaj atıklar dünya çapında geri dönüşümü zor olması doğada biyolojik olarak parçalanmaması nedenlerden dolayı ciddi bir endişe konusu olmuştur. Geri dönüştürülmeyen plastiğin çoğunluğu doğada biyolojik olarak parçalanamayan petrokimya bazlı ambalaj malzemeleridir. Öte yandan gıda atıklarının bertarafı ve değerlendirilmesi de ayrı bir sorundur. Son yıllarda gıda atıklarından biyobozunur malzeme özellikle ambalaj malzemelerine dönüştürülmesi hız kazanmıştır. Gıda atıklarından (kayısı çekirdeği atığı, şeker endüstrisi atığı, patetes atığı , muz kabuğu vb) biyopolimer üretimi üzerine ülkemizde ve dünyada çalışmalar yapılmaktadır.

Biyobozunur malzeme üretiminde; fermantasyon, ekstraksiyon, polimerizasyon ve film oluşturma gibi adımlar vardır. Elde edilen biyoplastikler genellikle PLA (polilaktik asit), PHA (polihidroksialkanoat), nişasta bazlı plastikler, protein-polimer karışımları gibi formülasyonlara sahiptir. Bu malzemeler, özellikle gıda ambalajı, tek kullanımlık ürünler ve tarımsal uygulamalar gibi alanlarda kullanılabilir.

Bu çalışmada özellikle gıda atıklarından biobozunur malzeme üretimi özellikle biyoplastik ve ambalaj malzemesi üretimine ülkemiz ve dünyadan örnekler verilerek güncel yaklaşım ve uygulamalara yer verilecektir. Sürdürülebilir çevre açısından özellikle mikroplastik oluşumunun azalması, daha düşük karbon ayak izi, biyolojik çözünürlük ve kompostlanabilirlik açısından üstünlüklere sahip iken, üretimlerinin maliyetli olması , fiziksel dayanıklılık açısından dezavantajlıdır. Atıkların değerlendirilmesi ve döngüsel ekonomi açısından biyobozunur malzeme üretimi gittikçe önem kazanmaktadır.

Anahtar kelimeler: Biyomalzeme, sürdürülebilir çevre, gıda atıkları

ABSTRACT

Plastic packaging waste has become a serious concern worldwide because it is difficult to recycle and does not biodegrade in nature. The majority of non-recycled plastic is petrochemical-based packaging materials that are not biodegradable in nature. On the other hand, the disposal and utilization of food waste is also a separate problem. In recent years, the conversion of food waste into biodegradable materials, especially packaging materials, has gained momentum. Studies are being carried out in our country and around the world on the production of biopolymers from food waste (apricot kernel waste, sugar industry waste, potato waste, banana peel, etc.).

In biodegradable material production; There are steps such as fermentation, extraction, polymerization and film formation. The resulting bioplastics generally have formulations such as PLA (polylactic acid), PHA (polyhydroxyalkanoate), starch-based plastics, and protein-polymer mixtures. These materials can be used especially in areas such as food packaging, disposable products and agricultural applications.

In this study, current approaches and practices will be included, especially in the production of biodegradable materials from food waste, especially in the production of bioplastics and packaging materials, by giving examples from our country and the world. While it has advantages in terms of a sustainable environment, especially in terms of reduced microplastic formation, lower carbon footprint, biodegradability and compostability, it is disadvantageous in terms of cost of production and physical durability. The production of biodegradable materials is becoming increasingly important in terms of waste utilization and circular economy.

Key words: Biomaterial, sustainable environment, food waste,

**DETERMINATION AND EVALUATION OF COPPER AND MANGANESE CONTENTS OF
SOME PROPOLIS SAMPLES**

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ABSTRACT

Propolis is a natural mixture of wax and resin collected by honeybees from various natural products, such as flowers and plant resins. Propolis is known to contain many bioactive compounds, including secondary metabolites, vitamins, essential minerals, and oils. In recent years, with reports of the positive health effects of natural food products, consumption of these products has begun to increase significantly. However, natural food products such as propolis can pose health risks. Especially in industrially intense regions, natural vegetation is polluted due to environmental pollution, and consequently, natural food products can become contaminated with toxic or trace elements. Therefore, natural food products should be checked periodically for toxic or trace elements. In this study, the copper and manganese contents of propolis samples obtained from the Ankara and Konya provinces of Türkiye were determined. The copper and manganese element results were evaluated considering the importance of these elements in the daily diet for adults. Based on the tolerable limits for these elements, it was determined that the propolis samples did not pose any risk.

Keywords: Propolis, copper, manganese, risk.

RESVERATROL-MEDIATED REDOX MODULATION AND CYTOTOXICITY IN GLIOMA CELLS: A COMPARATIVE IN VITRO STUDY

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ÖZET

Gliomlar, merkezi sinir sisteminin en yaygın ve en agresif primer tümörleri olup kontrolsüz proliferasyon, apoptoza direnç ve yüksek nüks oranları ile karakterizedir. Konvansiyonel kemoterapi genellikle uzun dönem etkinlik sağlayamadığından, anti-glioma potansiyeli bulunan doğal bileşiklerin araştırılması önem kazanmıştır. Doğada bulunan bir polifenol olan resveratrol, çeşitli hücre tipleri üzerinde antioksidan ve antiproliferatif etkileriyle bilinmektedir. Bununla birlikte, resveratrolün doz ve zamana bağlı sitotoksik etkileri ile bu etkilerle ilişkili oksidatif yanıtların nöral ve fibroblast hücre hatlarında tam olarak aydınlatılmadığı bildirilmektedir. Buna göre çalışma kapsamında, resveratrolün C6 (rat glioma) ve L929 (fare fibroblast) hücre hatlarında zamana ve doza bağlı sitotoksik etkilerinin değerlendirilmesi ve bu etkilerle ilişkili oksidatif stres belirteçlerindeki değişimlerin araştırılması amaçlanmıştır. C6 ve L929 hücreleri, 10–1000 μ M arasındaki resveratrol konsantrasyonları ile 24, 48 ve 72 saat süreyle muamele edilmiştir. Sitotoksik aktivite MTT analizi ile değerlendirilmiş ve IC₅₀ değerleri belirlenmiştir. IC₅₀ dozlarında, katalaz (CAT), glutatyon (GSH), glutatyon-S-transferaz (GST), malondialdehit (MDA), inorganik fosfat (Pi) ve laktat dehidrogenaz (LDH) düzeyleri spektrofotometrik yöntemle ölçülmüştür. Resveratrol uygulaması her iki hücre hattında da zamana bağlı sitotoksikite oluşturmıştır. C6 hücreleri için IC₅₀ değerleri sırasıyla 24., 48. ve 72. saatte 58,89 μ M, 23,19 μ M ve 18 μ M olarak bulunmuştur. L929 hücre hattında ise IC₅₀ değerleri sırasıyla 118,6 μ M, 77,58 μ M ve 56,3 μ M olarak saptanmıştır. Kontrol hücreleriyle karşılaştırıldığında, resveratrol uygulanan C6 ve L929 hücrelerinde LDH, GSH, MDA ve inorganik fosfat düzeylerinin azaldığı; CAT aktivitesinin ise her iki hücre hattında anlamlı derecede arttığı belirlenmiştir. Dikkat çekici olarak, GST aktivitesi C6 hücrelerinde azalırken L929 hücrelerinde artış göstermiştir. Resveratrol, doz ve zamana bağlı olarak sitotoksik etkiler göstermekte ve bu etkiler oksidatif stres belirteçlerindeki değişikliklerle birlikte seyretmektedir. C6 ve L929 hücreleri arasındaki farklı GST yanıtları, resveratrolün uyardığı antioksidan savunma mekanizmalarının hücre tipine özgü olabileceğini göstermektedir. Bu bulgular, resveratrolün glioma araştırmalarında ve redoks hedefli kanser tedavilerinde potansiyel bir ajan olabileceğini desteklemektedir.

Anahtar Kelimeler: Resveratrol; Glioma; Sitotoksikite; Oksidatif stres; Antioksidan enzimler

ABSTRACT

Gliomas are the most common and aggressive primary tumors of the central nervous system, characterized by uncontrolled proliferation, resistance to apoptosis, and high recurrence rates. As conventional chemotherapy often fails to provide long-term efficacy, the investigation of natural compounds with anti-glioma potential has gained significant importance. Resveratrol, a naturally occurring polyphenolic compound, is known for its antioxidant and antiproliferative properties in various cell types. However, the dose- and time-dependent cytotoxic effects of resveratrol and the oxidative responses associated with these effects have not been fully elucidated in neural and fibroblast cell lines. Accordingly, this study aimed to evaluate the dose- and time-dependent cytotoxic effects of resveratrol on C6 (rat glioma) and L929 (mouse fibroblast) cell lines and to investigate the alterations in oxidative stress markers associated with these effects. C6 and L929 cells were treated with resveratrol at concentrations ranging from 10 to 1000 μM for 24, 48, and 72 hours. Cytotoxic activity was assessed using the MTT assay, and IC_{50} values were determined. At the IC_{50} concentrations, the levels of catalase (CAT), glutathione (GSH), glutathione-S-transferase (GST), malondialdehyde (MDA), inorganic phosphate (Pi), and lactate dehydrogenase (LDH) were measured spectrophotometrically. Resveratrol treatment induced time-dependent cytotoxicity in both cell lines. The IC_{50} values for C6 cells were found to be 58.89 μM , 23.19 μM , and 18 μM at 24, 48, and 72 hours, respectively. For the L929 cell line, the IC_{50} values were 118.6 μM , 77.58 μM , and 56.3 μM , respectively. Compared with control cells, resveratrol-treated C6 and L929 cells exhibited decreased levels of LDH, GSH, MDA, and inorganic phosphate, whereas catalase activity significantly increased in both cell lines. Interestingly, GST activity decreased in C6 cells but increased in L929 cells. Resveratrol demonstrated dose- and time-dependent cytotoxic effects accompanied by changes in oxidative stress parameters. The distinct GST responses observed between C6 and L929 cells suggest that the antioxidant defense mechanisms activated by resveratrol may be cell type-specific. These findings support the potential of resveratrol as a promising agent in glioma research and in redox-targeted cancer therapies.

Keywords: Resveratrol; Glioma; Cytotoxicity; Oxidative Stress; Antioxidant Enzymes

**ALLIUM POLYANTHUM EXTRACT INDUCES OXIDATIVE STRESS-MEDIATED CELL
DEATH IN RAT GLIOMA CELLS VIA IMPAIRMENT OF ANTIOXIDANT DEFENSE
SYSTEMS**

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ÖZET

Glioblastoma, prognozu son derece kötü olan, yüksek dereceli bir primer beyin tümörüdür. Mevcut standart tedavilere karşı gelişen direnç, yeni terapötik stratejilerin geliştirilmesini zorunlu kılmaktadır. Bu bağlamda, doğal bileşikler önemli bir kaynak oluşturmaktadır. Zengin fenolik, flavonoid ve organokükürtlü bileşenleri ile bilinen *Allium polyanthum* bitkisinin antikanser potansiyeli ve etki mekanizması bu çalışmanın odağını oluşturmaktadır. Bu çalışmanın amacı, *Allium polyanthum* ekstresinin sıçan glioma (C6) ve fare fibroblast (L929) hücre hatları üzerindeki sitotoksik etkilerini ve bu etkilerde oksidatif stres parametrelerinin rolünü araştırmaktır. Hücreler, 10-1000 µM konsantrasyon aralığındaki *Allium polyanthum* ekstresi ile 24, 48 ve 72 saat süreyle inkübe edilmiştir. Hücre canlılığı MTT testi ile değerlendirilmiş ve IC₅₀ değerleri hesaplanmıştır. IC₅₀ konsantrasyonlarında, hücresel stres yanıtını değerlendirmek için katalaz (CAT) aktivitesi, glutatyon (GSH) seviyesi, glutatyon-S-transferaz (GST) aktivitesi, malondialdehit (MDA) miktarı, inorganik fosfat (Pi) ve laktat dehidrogenaz (LDH) salınımı gibi biyokimyasal belirteçler spektrofotometrik olarak analiz edilmiştir. *Allium polyanthum* ekstresi, her iki hücre hattında da zamana ve doza bağlı belirgin bir sitotoksikite indüklemiştir. Hesaplanan IC₅₀ değerleri, ekstrenin C6 glioma hücrelerinde (24, 48, 72. saatte sırasıyla 178,3 µM, 65 µM, 39,05 µM) L929 fibroblastlarına (86,19 µM, 68,82 µM, 57,7 µM) kıyasla daha etkili olduğunu göstermiştir. Bulgular, *Allium polyanthum*'un özellikle glioma hücrelerinde seçici sitotoksik etki gösterdiğini ve bu etkinin oksidatif stres aracılı bir mekanizmayla gerçekleştiğini ortaya koymuştur. Artan LDH, MDA ve Pi düzeyleri hücre hasarı ve lipid peroksidasyonunu; azalan CAT, GST ve GSH seviyeleri ise zayıflamış antioksidan savunmayı göstermektedir. Sonuç olarak, *Allium polyanthum* ekstresi gliomlara karşı umut verici doğal bir terapötik ajan potansiyeline sahiptir.

Anahtar Kelimeler: Glioma; Fenolik bileşikler; Lipid peroksidasyonu; Antioksidan savunma

ABSTRACT

Glioblastoma is a high-grade primary brain tumor with an extremely poor prognosis. Resistance to current standard therapies necessitates the development of new therapeutic strategies. In this context, natural compounds represent a valuable source of potential anticancer agents. *Allium polyanthum*, known for its rich content of phenolic, flavonoid, and organosulfur compounds, has drawn attention for its possible anticancer potential and underlying mechanisms of action. The present study aimed to

investigate the cytotoxic effects of *Allium polyanthum* extract on rat glioma (C6) and mouse fibroblast (L929) cell lines, and to elucidate the role of oxidative stress parameters in these effects. Cells were incubated with *Allium polyanthum* extract at concentrations ranging from 10 to 1000 μM for 24, 48, and 72 hours. Cell viability was assessed by the MTT assay, and IC_{50} values were determined. At IC_{50} concentrations, biochemical markers reflecting cellular stress responses catalase (CAT) activity, glutathione (GSH) levels, glutathione-S-transferase (GST) activity, malondialdehyde (MDA) content, inorganic phosphate (Pi), and lactate dehydrogenase (LDH) release were analyzed spectrophotometrically. *Allium polyanthum* extract induced a significant time and dose dependent cytotoxicity in both cell lines. The calculated IC_{50} values demonstrated greater cytotoxic efficacy in C6 glioma cells (178.3 μM , 65 μM , and 39.05 μM at 24, 48, and 72 hours, respectively) compared to L929 fibroblast cells (86.19 μM , 68.82 μM , and 57.7 μM). The findings revealed that *Allium polyanthum* exhibits a selective cytotoxic effect on glioma cells, mediated by oxidative stress mechanisms. Elevated LDH, MDA, and Pi levels indicated membrane damage and enhanced lipid peroxidation, while decreased CAT, GST, and GSH levels reflected a weakened antioxidant defense system. In conclusion, *Allium polyanthum* extract demonstrates promising potential as a natural therapeutic agent against gliomas by inducing oxidative stress-mediated cell death.

Keywords: Glioma; Phenolic compounds; Lipid peroxidation; Antioxidant defense

**MENTHA LONGIFOLIA EKSTRAKTININ C6 VE L-929 HÜCRE HATLARINDA
ANTIÖKSİDAN ENZİM AKTİVİTELERİ ÜZERİNE ETKİSİNİN İNCELENMESİ**
**INVESTIGATION OF THE EFFECTS OF MENTHA LONGIFOLIA EXTRACT ON
ANTIOXIDANT ENZYME ACTIVITIES IN C6 AND L-929 CELL LINES**

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ÖZET

Doğal bitki ekstraktlarının tümör hücreleri üzerindeki biyolojik etkilerinin araştırılması, alternatif antikanser ajanların geliştirilmesi açısından önemli bir yaklaşımdır. *Mentha longifolia* (yabani nane) fenolik bileşenlerce zengin olup antioksidan, antienflamatuar ve antiproliferatif özellikleriyle dikkat çekmektedir. Bu çalışmada, *Mentha longifolia* ekstraktının C6 (rat glioma) ve L-929 (fare fibroblast) hücre hatlarında zamana bağlı sitotoksik etkileri ile bu etkilerle ilişkili antioksidan enzim aktivitelerindeki değişimlerin değerlendirilmesi amaçlanmıştır. C6 ve L-929 hücreleri, 0,5–250 µM aralığındaki ekstrakt konsantrasyonlarıyla 24, 48 ve 72 saat süreyle inkübe edilmiştir. Hücre canlılığı MTT yöntemiyle belirlenmiş, elde edilen doz–yanıt eğrilerinden IC₅₀ değerleri hesaplanmıştır. C6 hücreleri için IC₅₀ değerleri sırasıyla 44,69 µM, 42,21 µM ve 32,34 µM; L-929 hücre hattı için ise 175,3 µM, 118,5 µM ve 42,41 µM olarak bulunmuştur. IC₅₀ konsantrasyonlarında gerçekleştirilen biyokimyasal analizlerde, katalaz (CAT), glutatyon (GSH), glutatyon-S-transferaz (GST), malondialdehit (MDA), inorganik fosfat (Pi) ve laktat dehidrogenaz (LDH) aktiviteleri spektrofotometrik olarak ölçülmüştür. Sonuçlar, *Mentha longifolia* ekstraktının hücre canlılığını konsantrasyon ve zamana bağlı olarak azalttığını göstermiştir. C6 hücrelerinde CAT ve GST aktivitelerinde anlamlı artış gözlenirken, MDA, GSH ve LDH düzeylerinde düşüş saptanmıştır. L-929 hücrelerinde ise bu değişimlerin daha sınırlı olduğu belirlenmiştir. İnorganik fosfat düzeylerindeki azalma, ekstraktın enerji metabolizması ve fosforilasyon süreçleri üzerinde etkili olabileceğini düşündürmektedir. Bu bulgular, *Mentha longifolia* ekstraktının oksidatif stres dengesini modüle ederek glioma hücrelerinde seçici sitotoksik etki gösterebileceğini ve redoks hedefli antitümör stratejilerde potansiyel bir aday olabileceğini ortaya koymaktadır.

Anahtar Kelimeler: *Mentha longifolia*; C6 hücre hattı; L-929 hücre hattı; Antioksidan enzimler; Oksidatif stres; Sitotoksikite

ABSTRACT

The investigation of the biological effects of natural plant extracts on tumor cells represents an important approach for the development of alternative anticancer agents. *Mentha longifolia* (wild mint) is rich in phenolic compounds and is known for its antioxidant, anti-inflammatory, and antiproliferative properties. In this study, it was aimed to evaluate the time-dependent cytotoxic effects of *Mentha*

longifolia extract on C6 (rat glioma) and L-929 (mouse fibroblast) cell lines and to investigate the associated changes in antioxidant enzyme activities. C6 and L-929 cells were treated with extract concentrations ranging from 0.5 to 250 μ M for 24, 48, and 72 hours. Cell viability was determined by the MTT assay, and IC₅₀ values were calculated from the dose–response curves. The IC₅₀ values were found to be 44.69 μ M, 42.21 μ M, and 32.34 μ M for C6 cells, and 175.3 μ M, 118.5 μ M, and 42.41 μ M for L-929 cells, respectively. At IC₅₀ concentrations, biochemical analyses were performed spectrophotometrically to measure the activities of catalase (CAT), glutathione (GSH), glutathione-S-transferase (GST), malondialdehyde (MDA), inorganic phosphate (Pi), and lactate dehydrogenase (LDH). The results demonstrated that *Mentha longifolia* extract decreased cell viability in a concentration- and time-dependent manner. Significant increases in CAT and GST activities were observed in C6 cells, while MDA, GSH, and LDH levels were reduced. These changes were less pronounced in L-929 cells. The decrease in inorganic phosphate levels suggests that the extract may influence energy metabolism and phosphorylation processes. Overall, these findings indicate that *Mentha longifolia* extract exerts selective cytotoxic effects on glioma cells by modulating oxidative stress balance and may serve as a potential candidate for redox-targeted antitumor strategies.

Keywords: *Mentha longifolia*; C6 cell line; L-929 cell line; Antioxidant enzymes; Oxidative stress; Cytotoxicity

GIDA ENDÜSTRİSİNDE MİKRODALGA UYGULAMALARI

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ÖZET

Bu derlemede mikrodalga enerjisinin gıda endüstrisindeki kullanım alanları ve teknolojik gelişimi ele alınmıştır. Mikrodalga enerjisi, gıdaların hızlı, homojen ve enerji verimli şekilde işlenmesini sağlayan bir ısıtma işlemi yöntemidir. Mikrodalga enerjisi, elektromanyetik spektrumun 300 MHz ile 300 GHz arasındaki frekans aralığını kapsayan bir enerji türüdür. Günümüzde mikrodalga teknolojisi, iletişimden savunmaya kadar birçok alanda kullanılmakla birlikte, gıda endüstrisinde de önemli uygulamalara sahiptir. Mikrodalgalar, gıdanın iç yapısına nüfuz ederek moleküler seviyede ısı üretimi sağlar ve bu sayede gıda işlemleri çok daha hızlı ve homojen biçimde gerçekleştirilebilir. Bu derleme çalışmasında, mikrodalga teknolojisinin gıda endüstrisindeki kullanım alanları, temel prensipleri, kullanılan matematiksel modeller ve güncel... Bu teknoloji, kurutma, sterilizasyon, pastörizasyon ve ekstraksiyon gibi birçok uygulama alanında kullanılmakta olup, ürün kalitesi ve enerji tasarrufu açısından önemli avantajlar sağlamaktadır. Mikrodalga teknolojisi, gıda endüstrisinde hem proses verimliliğini artırması hem de ürün kalitesini koruması açısından dikkat çeken bir ısıtma işlemi yöntemidir. Bu derlemede, mikrodalga enerjisinin temel prensipleri, gıdalarda kullanım alanları, süreç modelleri ve son yıllarda yayımlanmış örnek akademik çalışmalar detaylı bir şekilde ele alınmıştır. Yapılan analizlerden ve derlenen çalışmalardan elde edilen genel çıkarımlar şunlardır: Verimlilik ve Enerji Tasarrufu: Mikrodalga işlemleri, geleneksel yöntemlere göre daha kısa sürede işlem tamamlamakta, bu da enerji tüketimini azaltmaktadır. Sonuç olarak mikrodalga teknolojisi, sürdürülebilir gıda üretimi ve kalite optimizasyonu açısından modern endüstride öne çıkan bir yöntem olarak değerlendirilmektedir.

Anahtar Kelimeler: mikrodalga enerjisi, gıda endüstri, dielektrik ısıtma, mikrodalga kurutma, mikrodalga sterilizasyonu

ABSTRACT

These sections address the food consumption, uses, and technological advancements of microwave energy. Microwave energy is a thermal processing method that enables rapid, uniform, and energy-efficient processing of food. Microwave energy encompasses the frequency range between 300 MHz and 300 GHz. Today's microwave technology has significant applications in the food industry, with applications ranging from communications to defense. Microwaves generate extensive heat through the internal space of food, allowing for much faster and more uniform processing. This expansion highlights the applications of modern technology in food economics, its basic principles, models used, and

current... This technology is used in many applications such as drying, sterilization, pasteurization, and extraction, providing significant benefits in terms of product quality and energy savings. Microwave technology is a thermal processing method that prioritizes both extending process life and preserving food products. This comprehensive review covers the basic principles of microwave energy, its uses in food, process components, and exemplary academic studies published in recent years. The general conclusions drawn from the analyses and compilations are as follows: Efficiency and Energy Savings: Microwave processing takes less time than traditional methods, reducing energy consumption. Consequently, microwave technology is considered a prominent method in modern industry for sustainable food production and quality diversity.

Keywords: microwave energy, food industry, dielectric heating, microwave drying, microwave sterilization

**TÜRKİYE BAHARAT BİTKİLERİ ÜRETİM TRENDLERİNİN SÜRDÜRÜLEBİLİRLİK
PERSPEKTİFİYLE İNCELENMESİ: LSTM DERİN ÖĞRENME MODELİ İLE 2030
TAHMINLERİ**

**ANALYSIS OF SPICE CROP PRODUCTION TRENDS IN TÜRKİYE WITH A
SUSTAINABILITY PERSPECTIVE: FORECASTING 2030 WITH THE LSTM DEEP
LEARNING MODEL**

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ÖZET

Türkiye gibi hızla büyüyen ülkelerde baharat bitkileri üretimi ve üretildiği tarım alanları, tarımsal ekonominin stratejik bir parçasıdır ve baharat sektöründeki stratejik planlamalar sürdürülebilirlik hedeflerine ulaşmada kritik bir role sahiptir. Bu ürünler, yüksek katma değerli ihracat potansiyelleri, yurt içi sanayiye hammadde temini ve kırsal bölgelerdeki istihdamı desteklemeleri açısından ulusal ekonomiye önemli ölçüde katkı sağlamaktadır. İhracattan elde edilen döviz geliri, ülkenin ödemeler dengesi üzerinde olumlu bir etki yaratmakta ve ithal ikameci bir rol oynamaktadır. Ayrıca, bu bitkilerin yetiştirildiği marjinal arazilerde dahi getirisi yüksek bir tarım faaliyeti sunması, kırsal kalkınmayı destekleyerek sosyo-ekonomik sürdürülebilirliğe hizmet etmektedir.

Bu çalışma, Türkiye İstatistik Kurumu (TÜİK) tarafından yayınlanan verilerden Türkiye'de 1988-2024 yılları arasında yetiştirilen kırmızıbiber, anason ve kimyon gibi baharat bitkilerinin üretim trendlerini sürdürülebilir bir perspektifle incelemeyi amaçlamaktadır. Veriler incelendiğinde her bir baharat türü için farklı sürdürülebilirlik dinamikleri tespit edilmiştir. Kırmızıbiber üretimi ve ekildiği alan yıllar içerisinde artış göstermiştir ve iklim değişikliğine bağlı olarak artan kuraklık stresinin verim üzerindeki olumsuz etkileri büyük risk olarak öne çıkmamıştır. Anason üretiminde ise, azalan üretim dalgalanmalarına paralel olarak ekim alanlarında yaşanan dalgalı azalma, üretici gelirlerinde düzenli arz güvenliğinin sağlanamamasına neden olmuştur. Kimyon ise son dönemde gösterdiği yıllar içerisindeki azalış ile dikkat çekmiştir.

Araştırmamız, geleneksel istatistiksel yöntemlerin ötesine geçerek, uzun vadeli zaman serisi verilerindeki karmaşık desenleri yakalayabilme becerisiyle öne çıkan bir Derin Öğrenme modeli olan Uzun Kısa-Vadeli Bellek (LSTM) ağlarını kullanmaktadır. LSTM modelinde her biri veri için en uygun epoch sayısı ve katman belirlenmiştir. Farklı LSTM metodlarının sonuçları MSE (Mean Square Error) değerleri üzerinden karşılaştırılmıştır. Sonuç olarak bu baharatlara ait dikim alanlarının ve üretim miktarlarının 2030 yılında ne kadar olacağının tahmin edilmesi amaçlanmıştır.

Sonuç olarak, bu çalışma, LSTM, karmaşık ve doğrusal olmayan zaman serisi verilerindeki uzun vadeli bağımlılıkları yakalama yeteneğiyle gibi yapay zekâ modellerinin tarımsal planlama ve politika

oluşturma süreçlerinde ne denli değerli birer tahmin aracı olabileceğini ortaya koymaktadır. Türkiye'nin baharat bitkileri sektörünün potansiyelini tam anlamıyla gerçekleştirebilmesi ve ulusal ekonomiye olan katkısını sürdürülebilir bir şekilde planlanması için, bu analizler ışığında önerilen, iklimle dayanıklı çeşitlerin geliştirilmesi, üreticiyi ve piyasaları öngörülebilir hale getirecek politika mekanizmalarının kurulması ve hızlı büyümenin çevresel etkilerinin yönetilmesi gibi adımların atılması büyük önem taşımaktadır.

Anahtar Kelimeler: Tarım Sürdürülebilirliği, Kırmızıbiber, Anason, Kimyon, Baharat Tarım Üretim Tahmini, LSTM, Zaman Serisi Analizi.

ABSTRACT

In rapidly economic growing countries like Turkey, the production of spice plants and the agricultural lands they cultivate are a strategic part of the agricultural economy. Strategic planning in the spice sector plays a critical role in achieving sustainability goals. These products contribute significantly to the national economy through their high value-added export potential, supply of raw materials to the domestic industry, and support for employment in rural areas. The foreign exchange revenue from exports has a positive impact on the country's balance of payments and plays an import-substituting role. Furthermore, offering a high-yield agricultural activity even on marginal lands where these plants are cultivated supports rural development and contributes to socio-economic sustainability.

This study aims to examine the production trends of spice plants such as red pepper, anise, and cumin cultivated in Turkey between 1988 and 2024 from a sustainable perspective, using data published by the Turkish Statistical Institute (TURKSTAT). When the data is examined, different sustainability dynamics have been identified for each type of spice. Red pepper production and the area it was cultivated in showed an increase over the years, and the negative effects of increasing drought stress on yield due to climate change have not emerged as a major risk. In anise production, the fluctuating decrease in cultivation areas parallel to declining production fluctuations has led to instability in producer incomes and prevented a secure supply. Cumin has drawn attention with its decrease in recent years.

Our research goes beyond traditional statistical methods and uses a Deep Learning model called Long Short-Term Memory (LSTM) networks, which is prominent for its ability to capture complex patterns in long-term time series data. In the LSTM model, the optimal number of epochs and layers for each data set was determined. The results of different LSTM methods were compared based on MSE (Mean Square Error) values. Consequently, the aim was to forecast the cultivation areas and production quantities of these spices for the year 2030.

In conclusion, this study demonstrates how valuable artificial intelligence models like LSTM with their capability to capture long-term dependencies in complex and non-linear time series data, can be as forecasting tools in agricultural planning and policy-making processes. For Turkey to fully realize the potential of its spice plants sector and to sustainably plan its contribution to the national economy, it is of great importance to take the steps proposed in light of these analyses, such as developing climate-resistant varieties, establishing policy mechanisms that will make producers and markets more predictable, and managing the environmental impacts of rapid growth.

Keywords: Agricultural Sustainability, Red Pepper, Anise, Cumin, Spice Agricultural Production Forecast, LSTM, Time Series Analysis.

**DIGITAL MICROINTERVENTIONS IN NUTRITION: EFFECTIVENESS OF VIRTUAL
CULINARY MEDICINE PROGRAMS IN PROMOTING PLANT-BASED DIETS**

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ABSTRACT

Background: Plant-based diets are associated with reduced risk of chronic diseases and improved health outcomes. However, sustaining long-term dietary changes remains challenging. Digital microinterventions—including virtual culinary medicine programs, web-based nutrition coaching, SMS and email reminders, mobile app-based self-management, and hybrid community programs—offer promising strategies to support dietary behavior change and enhance adherence.

Methods: A narrative review was conducted of studies published between 2000 and 2025 in PubMed, Scopus, and Web of Science. Populations included healthy adults and individuals with chronic conditions. Interventions were categorized by modality (SMS, email, web platforms, mobile apps, virtual culinary programs, and hybrid formats). Outcomes assessed included diet quality, cooking skills, nutritional self-efficacy, and psychosocial well-being.

Results: Most studies reported significant improvements in diet quality, cooking skills, and psychosocial outcomes. Virtual cooking programs enhanced dietary adherence and engagement, particularly among individuals at cardiovascular risk. SMS/email reminders and mobile apps supported self-monitoring and goal tracking, while hybrid programs combining online and in-person components increased motivation, social support, and long-term adherence. Reported barriers included limited technological access, lack of personalization, and privacy concerns.

Conclusions: Digital microinterventions—especially virtual culinary medicine programs—are effective tools for promoting plant-based diets across diverse populations. Future interventions should prioritize personalization, accessibility, and hybrid formats to optimize engagement and sustain long-term dietary changes.

Keywords: culinary medicine; virtual cooking programs; digital health; plant-based diet; microintervention; behavior change; SMS; email; mobile application; hybrid community programs

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**CIRCULAR ECONOMY IN RUMINANT PRODUCTION VIA RUMEN MODULATION:
WASTE-TO-FEED STRATEGIES WITH MICROBIAL INOCULANTS FOR SUSTAINABLE
NUTRIENT RECYCLING**

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ABSTRACT

The future of global food security depends on livestock systems that are both productive and environmentally sustainable. Ruminant production, while central to animal-source food supply, faces challenges of resource competition, waste generation, and greenhouse gas emissions. Integrating circular economy principles into ruminant feeding offers a viable solution by transforming agricultural residues, food waste, and alternative protein sources such as insect meals into valuable feed resources. However, the effective utilization of these unconventional feedstuffs requires strategic rumen modulation to ensure efficient fermentation, nutrient recovery, and minimal anti-nutritional effects. Microbial inoculants, including probiotics, enzymes, and fibre-degrading consortia, play a critical role in enhancing digestibility, balancing rumen microbial ecosystems, and reducing methane emissions associated with poor fermentation. Such innovations not only recycle nutrients back into the production system but also reduce environmental footprints, lower feed costs, and enhance food chain resilience. Importantly, Valorizing waste streams into ruminant diets aligns with sustainable development goals by mitigating food–feed competition, promoting resource efficiency, and advancing climate-smart livestock production. This integrated approach strengthens the circular economy by linking waste reduction, sustainable feeding, and improved animal performance within a single framework. The present paper emphasizes the potential of waste-to-feed strategies, supported by microbial rumen modulators, as transformative tools for future livestock systems. Harnessing these synergies ensures that ruminant production contributes positively to sustainable nutrient cycling, food security, and environmental stewardship, paving the way for a “Food Right for Future” paradigm.

Keywords: circular economy, ruminant nutrition, rumen modulation, waste-to-feed, microbial inoculants, sustainability

**INTEGRATED BIOSECURITY AND RUMEN MODULATION APPROACHES: LINKING
RUMEN HEALTH WITH FOOD SAFETY, ANTIMICROBIAL RESISTANCE (AMR)
REDUCTION, AND ONE HEALTH FRAMEWORKS**

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ABSTRACT

Ensuring sustainable ruminant production in the face of growing global food demand requires innovative strategies safeguarding animal and human health. Integrated biosecurity and rumen modulation approaches present a promising pathway toward achieving this balance. Rumen health is central to animal productivity, nutrient utilization, and disease resilience. However, conventional reliance on antibiotics as growth promoters and disease preventives has raised concerns over antimicrobial resistance (AMR), posing significant risks to food safety and public health under the One Health framework. Emerging research highlights the potential of phytochemicals, probiotics, prebiotics, and microbial inoculants to modulate rumen fermentation while simultaneously reducing dependence on antibiotics beneficially. When combined with strict biosecurity measures—such as controlled animal movement, vector management, and hygienic feeding systems—these strategies minimize pathogen load, improve feed conversion efficiency, and enhance overall herd immunity. Furthermore, integrated approaches align with sustainable food system goals by reducing greenhouse gas emissions, optimizing resource utilization, and promoting resilience under climate change stressors. Linking rumen modulation with biosecurity provides a holistic framework to address multiple challenges: ensuring safe and nutritious animal-source foods, curbing AMR transmission across the animal–human–environment interface, and supporting sustainable livestock systems. This paper underscores the importance of interdisciplinary research and policy alignment in promoting integrated biosecurity–rumen modulation models as a “Food Right for Future” strategy. Such innovations hold promise in transforming ruminant production into a safer, climate-smart, and health-conscious enterprise for global food security.

Keywords: Rumen modulation, biosecurity, antimicrobial resistance, One Health, food safety, sustainable livestock

**VALORIZATION OF AGRO-INDUSTRIAL BYPRODUCTS IN RUMINANT DIETS:
ENHANCING RUMEN FERMENTATION THROUGH INNOVATIVE USE OF BREWERY
BYPRODUCTS, FRUIT PEELS, AND OILSEED RESIDUES**

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ABSTRACT

Sustainable ruminant production requires feed innovations that reduce reliance on conventional grains while addressing environmental concerns associated with Agro-industrial waste. Valorization of byproducts such as brewery spent grains, fruit peels, and oilseed residues offers a cost-effective and eco-friendly pathway to improve livestock nutrition within a circular economy framework. These byproducts are rich in fibre, secondary metabolites, and residual nutrients that, when properly processed and integrated into ruminant diets, can enhance rumen fermentation and microbial efficiency. Innovative treatments—including ensiling, microbial inoculation, and enzymatic preconditioning- further improve digestibility, reduce anti-nutritional factors, and increase the bioavailability of essential nutrients. Incorporating these alternative feed resources not only lowers feeding costs but also supports waste management, reduces greenhouse gas emissions, and minimizes food-feed competition. Additionally, specific bioactive compounds in fruit peels and oilseed residues can beneficially modulate rumen microbiota, suppress methane-producing archaea, and improve feed conversion efficiency. Valorization strategies therefore, hold promise in enhancing animal performance, promoting environmental sustainability, and contributing to food security goals. This paper highlights the critical role of Agro-industrial byproducts as innovative feed inputs that align with global sustainability agendas. By leveraging rumen modulation and resource-efficient feeding, ruminant production can be repositioned as a driver of waste-to-nutrition transformation. Ultimately, the valorization of these byproducts presents a resilient and climate-smart approach to ensuring “Food Right for Future.”

Keywords: Agro-industrial byproducts, rumen fermentation, brewery spent grains, fruit peels, oilseed residues, sustainability

**TOXICOLOGICAL AND HEALTH IMPLICATIONS OF TARTRAZINE (E102)
CONSUMPTION FROM FOOD PRODUCTS**

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ABSTRACT

Tartrazine (E102) is one of the most widely used synthetic azo dyes in the food industry, providing a bright yellow color to a variety of processed products such as soft drinks, confectionery, sauces and baked goods. Despite its technological advantages, tartrazine consumption has raised considerable public health concerns. Scientific evidence suggests potential links between tartrazine consumption and adverse reactions, including allergic reactions, asthma, hyperactivity in children and possible genotoxic and cytotoxic effects. In addition to clinical observations in humans, studies in laboratory animals have revealed histological and biochemical changes in vital organs, including the liver, kidneys and brain. Experimental research has also shown that exposure to tartrazine can induce oxidative stress, disrupt enzyme activity and cause structural tissue alterations. The toxicological implications are strongly influenced by individual sensitivity, dose levels and the presence of other additives in the diet. The

purpose of this paper is to summarize and analyze current findings regarding the toxicological and health effects of tartrazine consumption in food products.

Keywords: Tartrazine, food additives, health risks, toxicology, azo dyes, food safety

**A GREEN ECONOMY FOR TOURISM AND FOOD: SUCCESSFUL DEVELOPMENT OF
SUSTAINABLE AND ECOLOGICAL DESTINATIONS**

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ABSTRACT

This study explores the relationship between sustainable tourism and local foods, focusing on their impact on environmental protection and the development of rural economies. In a world facing significant ecological and socio-economic challenges, the green economy offers new opportunities for the development of sustainable destinations and the promotion of a tourism model that supports ecological practices and the use of traditional products. Through an in-depth analysis of the scientific literature and case studies, this paper highlights how the use of local foods and the promotion of ecological practices in tourism contribute to the preservation of biodiversity, the growth of rural economies, and the reduction of negative environmental impacts. The integration of these sustainable strategies enables the creation of authentic tourism experiences that combine culture, gastronomy, and nature, while also contributing to the preservation of cultural heritage and the development of a green economy. The results of this research suggest that sustainable tourism and local foods are key elements in the transformation of tourism destinations, offering new opportunities for the sustainable development of rural communities and local industries. This study contributes to existing knowledge on how ecological practices can be integrated into the development of tourism and food, ensuring a sustainable and balanced future for the sectors involved.

Keywords: Sustainable tourism, local food, green economy, ecological practices, environment, biodiversity, rural communities, cultural heritage, sustainable strategies, tourism industry.

**MONITORING MEAT FRESHNESS IN SMART PACKAGING USING ANTHOCYANINS
FROM RED CABBAGE**

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ABSTRACT

Food safety is a major global concern, particularly for perishable products such as meat. These are susceptible to microbiological and chemical spoilage, processes that cause changes in pH, color, and odor. Classical monitoring methods (pH sensors, gas sensors, biosensors, electronic noses) are effective, but their implementation is often difficult and costly. Initially, these systems used synthetic colorants (bromothymol blue), but concerns about their toxicity have led to their replacement by natural, biodegradable compounds such as anthocyanins, water-soluble pigments of the flavonoid class. They can be extracted from a variety of plant sources such as fruits, vegetables, flowers or agri-food waste (e.g. peelings), which can account for 30-50% of the food mass.

In this study, anthocyanins were extracted from red cabbage using maceration with ethyl alcohol and ultrasound-assisted extraction (US). The resulting samples were subjected to physicochemical analyses, and their color response was evaluated as a function of pH variations (1–12). A distinct color transition from red in acidic conditions to violet, blue, and finally yellow in alkaline conditions was observed, confirming the pH indicator potential of the extract.

With the ability to interact with various biopolymers (such as starch or alginate), anthocyanins can be used to develop pH-sensitive films that visually indicate changes during meat spoilage. In this way, consumers can easily identify altered products without opening the packaging.

The results obtained support the applicability of red cabbage anthocyanins in the development of pH-sensitive biodegradable films with direct applications in meat packaging. These systems can provide a visual, rapid and reliable means of assessing freshness. Smart anthocyanin-based packaging is becoming a necessity to combat food waste and reduce public health risks.

Keywords: anthocyanins, intelligent packaging, meat, red cabbage

**AN OVERVIEW OF PHYTOCHEMICAL, ETHNOPHARMACOLOGICAL, AND
BIOLOGICAL CHARACTERIZATION OF SAME RARE PLANT SPECIES: LITERATURE
REVIEW**

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ABSTRACT

In recent years, there has been growing interest in the interdisciplinary exploration of biologically active compounds derived from medicinal plants traditionally used in herbal medicine. This trend reflects increasing global demand for ecologically sustainable, health-promoting substances. Against this backdrop, the present study aims to examine and characterize six medicinal plants for potential biotechnological applications. The species, collected from southeastern Tunisia, are: *Atriplex halimus* (L.), *Teucrium polium* (L.), *Haplophyllum tuberculatum* Forssk. (A. Juss.), *Moricandia arvensis* L. (DC.), *Polygonum equisetiforme* (Sm.), and *Deverra tortuosa* (DC.). Initially, we conducted an ancient ethnobotanical survey to assess the therapeutic and ethnopharmacological properties of the selected taxa within the local community. Data were analyzed using ethnobotanical indicators, including use value (UV), frequency of citation (FC), and informants' consensus factor (ICF), to gauge the presenters' perceived effectiveness of the six species. This study emphasizes the phytochemical, ethnopharmacological, and biological attributes of the chosen species. A comprehensive literature search identified relevant works, including an ethnobotanical survey of the local population and phytochemical characterizations of the target species. Both lines of evidence were contextualized within the scope of our doctoral program. Overall, the findings support the therapeutic potential of the six plants and offer insights into their traditional medicinal uses by indigenous communities. The results indicate opportunities for further investigation and applications across diverse domains, including cosmetics, pharmacology and nutrition.

Keywords: Medicinal plants, therapeutic properties, phytochemical, ethnopharmacological, biological characterization.

**LEAF STRUCTURAL AND FUNCTIONAL MODIFICATION OF *IPOMOEA CARNEA*
JACQ. AN INVASIVE PLANT SPECIES, UNDER DIVERSE SALINITY GRADIENT**

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ABSTRACT

The role of structural and functional plasticity of *Ipomoea carnea* for invasion in diverse saline environments was investigated. The populations were collected from 30 different habitats of Pakistan. The populations were divided into 3 groups based on the extent of salinity in their natural habitat. The non-saline habitats ($EC_e > 4 \text{ dS m}^{-1}$) were Kohala, Islamabad, Pahari Nala, Pir Kot, Nerian Sharif, Daska, Dhir Kot, Namal, Lower Jhelum and Majuhan. Moderately saline habitats ($EC_e 4-8 \text{ dS m}^{-1}$) were Mong Depo, Pasrur, Layyah, Mana Wala, Phularwan Roadside, Kharian Wala, Phulrwan canal, Rasool, Puran and Shah Kot. Highly saline habitats ($< 8 \text{ dS m}^{-1}$) included Gunjal, Gutwala, Skindar Pura, Choa Sadien Shah, Phid, Buchal, Kallar Kahar, Cholistan Desert, Sangla Hills and Sahian Wala. The hyper-saline population accumulated more compatible solutes like total soluble sugars, phenolics and flavonoids linked to osmoprotection. Increased sclerification and phloem thickness in hyper-saline and moderately saline populations. Increased density of trichomes and salt excretory glands prevented water loss and excreted toxic ions through leaf surface. In conclusion, *I. carnea* populations adopted different strategies like water conservation via water storage in parenchymatous tissues, accumulation of compatible solutes (total soluble sugars) and allelochemicals (flavonoids and phenolics) for chemical defense. All these aspects were key factors for survival and invasive success in a variety of habitat types and environmental conditions.

Keywords: Environmental heterogeneity, Invasive species, *Ipomoea carnea*, Sclerification, Trichomes.

**SAFEGUARDING THE MEDITERRANEAN: ADDRESSING POLLUTION FROM
INDUSTRIAL AND URBAN SOURCES**

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ABSTRACT

The Mediterranean Sea is one of the world's most unique and sensitive ecosystems, hosting exceptional biodiversity and supporting the livelihoods of millions of people across its coasts. However, increasing pressures from industrial effluents, agricultural run-off, maritime traffic, and urban discharges threaten its ecological balance. The semi-enclosed nature of the basin exacerbates the accumulation of pollutants, including heavy metals, plastics, hydrocarbons, and nutrients, leading to habitat degradation, biodiversity loss, and risks to human health. Effective protection of the Mediterranean requires coordinated regional strategies that integrate monitoring programs, advanced depollution technologies, and sustainable management practices. This work highlights the urgent need for transboundary collaboration to mitigate pollution, preserve marine biodiversity, and ensure the resilience of coastal communities. By strengthening regulatory frameworks and promoting eco-innovative solutions, the Mediterranean can serve as a model for sustainable sea management in the face of global environmental challenges.

Keywords : Mediterranean Sea, pollution, biodiversity, depollution, sustainability, marine protection

**NANOENCAPSULATION STRATEGIES IN FUNCTIONAL BEVERAGES: OPTIMIZING
FORMULATION AND BIOAVAILABILITY FOR CARDIOVASCULAR HEALTH**

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ABSTRACT

Cardiovascular diseases remain a leading global health concern, necessitating the development of innovative dietary interventions with proven therapeutic efficacy. Functional beverages, particularly plant-based formulations, have emerged as promising carriers of bioactive compounds due to their consumer acceptability and nutritional value. However, challenges such as poor stability, low solubility, and limited bioavailability of lipid-based nutraceuticals hinder their effective utilization. Nanoencapsulation presents a cutting-edge strategy to overcome these limitations by protecting sensitive bioactives, enhancing controlled release, and improving physiological absorption. This review critically evaluates the role of nanoencapsulation in functional beverage development, with specific emphasis on almond milk as a plant-based matrix and flaxseed oil as a rich source of omega-3 fatty acids. Current gaps in research include inadequate exploration of formulation parameters, insufficient in vitro–in vivo correlation studies and limited long-term stability assessments under commercial storage conditions. Methodological approaches discussed encompass nanoemulsion preparation, encapsulation efficiency evaluation, physicochemical stability analysis, and bioavailability studies using simulated gastrointestinal models. The findings highlight that nanoencapsulation not only improves oxidative stability and sensory attributes of functional beverages but also significantly enhances the bioaccessibility of cardioprotective compounds. Despite these advances, large-scale processing challenges, cost-effectiveness, and regulatory standardization remain barriers to commercial translation. Future research should focus on integrating green encapsulation technologies, conducting clinical trials to establish health claims, and designing multifunctional delivery systems capable of targeting multiple risk factors for cardiovascular health. By bridging formulation science with nutritional functionality, nanoencapsulation-based beverages hold transformative potential in preventive cardiology and functional food innovation.

Keywords: Nanoencapsulation, Functional beverages, Cardiovascular health, Bioavailability, Almond milk–flaxseed oil systems.

**PHARMACOLOGICAL POTENTIAL OF RANDIA DUMETORUM FOR TREATING
DIABETES MELLITUS**

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ABSTRACT

Randia dumetorum (family Rubiaceae), commonly known as the emetic nut or “Madanphal,” is a traditional medicinal plant widely used in Ayurveda and folk medicine. Recent pharmacological investigations have highlighted its potential in the management of diabetes mellitus, a chronic metabolic disorder characterized by hyperglycemia and associated complications. Phytochemical analysis of *R. dumetorum* fruit, seeds, and bark has revealed the presence of bioactive constituents such as saponins, flavonoids, alkaloids, glycosides, and phenolic compounds, which exhibit antioxidant, hypoglycemic, and antihyperlipidemic activities. Preclinical studies suggest that extracts of *R. dumetorum* may improve glucose tolerance, enhance insulin sensitivity, and modulate carbohydrate-metabolizing enzymes. Its antioxidant properties further contribute to reducing oxidative stress, a key factor in diabetic complications. Although the plant demonstrates promising therapeutic efficacy, clinical validation, standardization of extracts, and mechanistic insights are still limited. Hence, *R. dumetorum* represents a potential phytotherapeutic agent for the development of safe and effective antidiabetic formulations.

Keywords: *Randia dumetorum*, diabetes mellitus, hypoglycemic activity, antioxidant, herbal medicine.

**THE ROLE OF NUTRITION IN TYPE 2 DIABETES MANAGEMENT: FINDINGS FROM
THE DIAMED MEDICAL CLINIC TIRANA**

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ABSTRACT

Introduction: In Albania, the prevalence of type 2 diabetes mellitus (T2DM) is steadily increasing, posing a significant public health concern. Nutrition plays a central role in the management of this chronic condition. The Diamed Medical Clinic, conducted at a specialized endocrinology clinic in Tirana, aimed to explore the effectiveness of dietary interventions in improving clinical outcomes among T2DM patients.

Objective. The primary objective of this study was to evaluate the impact of structured nutritional therapy on glycemic control, anthropometric parameters, and cardiovascular risk indicators in patients with type 2 diabetes.

Methodology This was a prospective interventional study carried out over a 12-month period. Participants were adult patients diagnosed with T2DM, attending regular consultations at the Diamed endocrinology clinic. They were divided into two groups: the intervention group received individualized dietary plans based on Mediterranean and DASH diet principles, combined with periodic nutrition education sessions, while the control group continued with standard medical care and general dietary advice. Clinical and biochemical parameters, including HbA1c, fasting blood glucose, body weight, body mass index (BMI), waist circumference, and lipid profile, were recorded at baseline, at 6 months, and at 12 months. Adherence to the dietary regimen was monitored throughout the study period.

Results Patients who received the structured nutritional intervention showed a statistically significant reduction in HbA1c levels (average decrease of 1.0–1.5%) compared to the control group. Improvements were also observed in body weight, BMI, and waist circumference. The intervention group demonstrated better lipid profiles, with reduced LDL and triglycerides and increased HDL levels. Dietary adherence was notably higher among patients who received individualized counseling and follow-up support.

Conclusion The findings from the Diamed medical clinic underscore the importance of personalized nutritional interventions in the effective management of type 2 diabetes. Incorporating diet therapy into standard diabetes care, especially when adapted to the patient's cultural and lifestyle context, can lead to significant improvements in metabolic control and overall health outcomes. These results support the need for multidisciplinary approaches that include dietitians as integral members of diabetes care teams.

Keywords: Type 2 Diabetes, Nutritional Therapy, Glycemic Control, Mediterranean Diet, Patient Adherence.

**TECHNICAL EFFICIENCY AND DIFFERENTIAL RESOURCE USE ALONG THE
ARTISANAL FISH VALUE CHAIN IN KWARA STATE, NIGERIA**

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ABSTRACT

This study was on differential resource use along the artisanal fish value chain in Edu and Patigi local government areas of Kwara state. The study specifically analyzed the technical efficiency at each node of the value chain in the study area. Through a multi-stage random sampling technique, 120 respondents were sampled consisting 52 fishermen and 68 fish processors. Descriptive statistics and stochastic frontier production function were used to analyze the data. The findings showed that the mean age of the participants was 49years and 53years for fishermen and fish processors respectively and the average years of experience were 24years and 32years respectively. About 36% of fishermen and 67% of fish processors had primary school education. The stochastic frontier analysis indicated that factors such as number of fishing net ($p \leq 0.01$), number of canoes ($p \leq 0.05$), fuel cost per fishing trip, and labour ($p \leq 0.01$) significantly influenced the output levels of fishermen while that of fish processors was influenced by number of smoking kiln ($p \leq 0.01$), labour ($p \leq 0.05$) and quantity of fish processed ($p \leq 0.01$). The most serious challenges encountered by the actors along the value chain were the high cost of fuel and inadequate processing facilities. The study recommended policies that address resource use efficiency and promote more sustainable practices along the value chain.

Keywords: Artisanal fishery, resource utilization, value chain, economic factors, stochastic frontier.

**FROM WASTE TO WELLNESS: GREEN EXTRACTION OF BIOACTIVE COMPOUNDS
FOR FUNCTIONAL FOODS**

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ABSTRACT

The growing interest in functional foods, which offer health benefits beyond basic nutrition, has led to the exploration of novel ingredients derived from food waste. By utilizing bioactive compounds extracted from food by-products, the food industry can create value-added products that align with consumer demands for healthier, more sustainable options. This review discusses the potential of green extraction technologies for the recovery of bioactive molecules—such as polyphenols, fibers, vitamins, and antioxidants—from food waste, and their subsequent application in the formulation of functional foods.

Green extraction methods like enzymatic extraction, pressurized liquid extraction, and microwave-assisted extraction are highlighted for their efficiency in isolating functional ingredients while minimizing environmental impact. These processes enable the production of natural additives without the use of harmful chemicals, contributing to cleaner label products that appeal to increasingly health-conscious consumers. In particular, the paper examines how extracts from food waste can be incorporated into functional foods to enhance their nutritional value, improve digestive health, boost immunity, and even promote skin health.

Additionally, this review investigates the role of circular economy principles in the development of functional food products. By transforming food waste into valuable resources, food manufacturers can close the loop on resource use, reduce waste, and contribute to a more sustainable food production system. The use of these natural, bioactive extracts not only supports a greener food industry but also helps reduce the ecological footprint of food production, making functional foods a key element in the future of sustainable eating. The potential for integrating these waste-derived ingredients into mainstream food products offers a transformative opportunity for the industry, paving the way for more sustainable and health-oriented food solutions.

Keywords: functional foods, food waste valorization, green extraction, natural additives, clean-label, bioactive compounds, circular economy.

**DIGITIZATION AS A STRATEGIC TRANSITION IN THE MANAGEMENT OF
HOUSEHOLD AND SIMILAR WASTE IN ALGERIA**

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ABSTRACT

Waste management appears to be a key issue both at the international level and in Algeria. Technological advances have accelerated rapidly, and the progression towards a digital world has become increasingly rapid. Finding the best way to use these new technologies to ensure effective ecological waste management is essential.

This guide has been designed to offer a comprehensive roaMSWp for decision-makers, waste managers, government actors, and all stakeholders involved in waste management in Algeria. It covers the different facets of the digital transition, highlighting the opportunities it presents while offering practical solutions to overcome the inherent challenges.

We aim to provide in-depth information, practical guidance, and concrete examples to help conceptualize, plan, and implement digital transition initiatives tailored to Algeria's specific context. We encourage collaboration between the public and private sectors, the active participation of local communities, and informed decision-making based on international best practices.

The digital transition in waste management is not only a matter of operational efficiency but also an opportunity to reduce environmental impact, meaningfully engage the population, and create resilient systems capable of facing future challenges.

Keywords: Waste Management, Digital Transition, Government Actors, Decision-Makers, Public and Private Sectors, Local Communities, Environmental Impact.

**TRAINING OF *TRIGONA ITAMA* STINGLESS BEE CULTIVATION INCREASES THE
KNOWLEDGE AND INCOME OF BEEKEEPERS IN INDONESIA AND MALAYSIA**

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ABSTRACT

Improving community skills through *Trigona itama* bee cultivation training was carried out by the University of Sumatera Utara (USU), Indonesia and the University of Technology Mara Cawangan Terengganu, Malaysia to identify feed sources and appropriate Trigona cultivation. Productive activities were carried out in August 2025 in Indonesia and September 2025 in Malaysia aimed at motivating the entrepreneurial spirit of 20 participants in identifying locations, hives, food sources, water availability, care and monitoring. Participants were trained to be able to separate and maintain *T. itama* bee colonies to meet family nutrition, preserve the environment and increase household income. The activity began with a site review in the Pasar Rawa mangrove, Gebang, Northern Sumatra and the UiTM Cawangan Terengganu campus location, identifying available food sources (flowers, fruit, resin, and water). Next, discussions and coordination were held to establish procedures for observing and maintaining *T. itama* bees from disturbances by ants, flies, beetle and lizard. At the end of the activity, monitoring and evaluation were carried out. The training participants (men and women) were very enthusiastic about learning bee cultivation and how to split *T. itama* bee colonies and move them to a new home or place. The progress of honey bee cultivation in Pasar Rawa Village has begun to be seen during the mentoring conducted in September 2025, there were 3 honey setups producing around 250 ml of trigona honey.

Key words: Training, Trigona itama, knowledge, Indonesia, Malaysia

**FACTORS INFLUENCING SCHOOLCHILDREN PARTICIPATION IN NATIONAL
SCHOOL FEEDING PROGRAMME(NSFP) IN SOUTHWESTERN NIGERIA**

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ABSTRACT

The study conducted in south-western Nigeria focused on assessment of nutritional status of public-school pupils under the National School Feeding Programme (NSFP). The research aimed to understand how poor nutrition impacts pupils' efficiency, learning, wellbeing, performance, and productivity. Anthropometric measurements were employed to assess nutritional status, and a total of 798 pupils in treatment states and 399 in control states were selected using proportional sampling. During the 2022/2023 academic session, data were collected using a semi-structured questionnaire. Regression analyses for stunting shows that age, weight, height of the pupils and the value of the coefficient of parental education were important in Ondo and Ekiti states. In Kwara state, pupils' household size and parental education were the only significant factors. On factors affecting wasting, age, height and weight are main factors among pupils in Ondo state. On the other hand, wasting in Ekiti state was influenced by age, height of pupils, and parent access to remittance. In Kwara, the age of the pupils and their parents access to remittance was also significant at 10% and 5% respectively. The study recommends compulsory implementation of NSFP nationwide, ensuring meals are served in the required quantity and quality. Additionally, policies and strategies for effective monitoring, and legal framework ensuring adequate funding and consistent meal supply must be established to enhance the nutritional status of school pupils.

Keywords: Anthropometric scores, NSFP, nutritional status, Pupils, WHO Anthro plus.

**REGIONAL BIOASSAY-BASED INDICATORS OF SEDIMENT QUALITY ALONG THE
MOROCCAN ATLANTIC COAST**

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ABSTRACT

Discharging anthropogenic activities into aquatic environments raises significant environmental and health concerns, as they can lead to long-lasting degradation of these critical resources. Industrial effluents often contain a mix of contaminants and pollutants, necessitating a thorough assessment of their potential dangers and risks before release into aquatic ecosystems. However, the ecotoxicological approach is used to determinate the toxic effects on organisms pertaining to various ecosystems and supplies information about the contaminants bioavailability, in different matrices as sediments.

The use of a single species for a correct evaluation of the toxicity levels can be reductive, concerning the complexity of the ecosystem. In this work, a bioassay battery consisting of three different species representing different trophic levels, algae *Tetraselmis suecica*, crustacean *Artemia salina*, and echinoids *Paracentrotus lividus*, has been used to assess the toxicity of sediment elutriate, porewater, and whole sediment. The sediment samples were collected from four sampling stations along the North Atlantic Coast of Morocco. The test battery used in this study allowed us to screen the ecotoxicological toxicity of the studied area. The species utilized for toxicity tests responded differently to the investigated samples, showing different sensitivity.

However, a difference in sediment toxicity is registered in different studied areas depending on the sedimentary phases. Indeed, the El Jadida site recorded the maximum effect of embryo-larval malformation in the pore water phase. For the whole sediment, the Sidi Abderrahmane site recorded the maximum effect, while for the algal growth inhibition bioassay, the Bouregreg site showed the most pronounced effect.

Keywords: Ecotoxicology, Bioassays, Sediment toxicity, North Atlantic Coast, test battery.

PROBIOTICS AS PHARMACEUTICALS AGENTS IN GUT HEALTH AND IMMUNITY

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ABSTRACT

Probiotics, defined as live microorganisms that confer health benefits when consumed in adequate amounts, are emerging as a vital link between food science and pharmacy. Increasing evidence highlights their therapeutic role in maintaining gut microbiota balance, enhancing immune function, and preventing gastrointestinal disorders such as irritable bowel syndrome, ulcerative colitis, and antibiotic-associated diarrhea. Probiotics exert beneficial effects through mechanisms such as modulation of intestinal flora, production of antimicrobial peptides, and regulation of host immune responses. From a pharmaceutical perspective, the development of probiotic-based formulations, including capsules, powders, and synbiotic combinations, offers novel approaches to preventive and therapeutic healthcare. Current research also explores advanced delivery systems such as microencapsulation and nanocarriers to improve stability and targeted release. However, safety evaluation, strain-specific efficacy, and regulatory frameworks remain significant challenges. Probiotics represent a promising field in the integration of food studies and pharmacy, bridging nutrition-based interventions with therapeutic applications.

Keywords: Probiotics, Gut Health, Immunity.

**ELEMENTAL PROFILING OF ARGAN KERNEL, LEAVES, AND SHELLS FROM
EASTERN MOROCCO BY NEUTRON ACTIVATION ANALYSIS AND K_o-
STANDARDIZATION**

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ABSTRACT

The nutritional, cosmetic, and pharmaceutical value of the argan tree (*Argania spinosa*), a Moroccan endemic species, depends on a precise understanding of its elemental composition. This work addresses the gap in data for kernels, leaves, and shells from the Oujda region. Samples were collected, prepared, and analyzed by neutron activation analysis using the k_o-standardization method at the TRIGA Mark II reactor (CNESTEN, Morocco). Certified reference materials (IAEA-336) assured quality control. The methodology included both short and long irradiations for accurate quantification of major and trace elements using high-resolution gamma spectrometry, with statistical validation (Z-scores, En values) to ensure reliability. Results revealed significant concentrations of calcium, potassium, and chlorine in leaves and kernels and offer a new comparative baseline for elemental profiles of argan from North Africa. This study provides crucial data for the traceability, food safety, and value-added utilization of argan in the agri-food and cosmetic sectors.

**MICROALGAE AS FUNCTIONAL FOOD INGREDIENTS: NUTRITIONAL POTENTIAL
AND APPLICATIONS OF *CHLORELLA VULGARIS* AND *SPIRULINA PLATENSIS***

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ABSTRACT

Introduction: The search for sustainable food sources has become a priority due to population growth and environmental challenges. Microalgae, such as *Chlorella vulgaris* and *Spirulina platensis*, are rich in proteins, pigments, polysaccharides, and micronutrients. Their incorporation into traditional foods (bread, biscuits, beverages) is gaining attention for their nutritional and functional potential. **Materials and Methods** A literature review was conducted using scientific databases (ScienceDirect, PubMed, Springer) to gather data on the biochemical composition of microalgae and their food applications. Nutritional values were compared with conventional sources (soy, milk, meat). Theoretical simulations of food fortification were performed (e.g., additional protein intake when spirulina is added to bakery products). **Results and Discussion:** Bibliographic data highlight that spirulina contains 55–70% protein with a balanced essential amino acid profile and the antioxidant pigment phycocyanin. Chlorella provides dietary fibers, β -glucans, chlorophyll, and lutein. Incorporating microalgae into foods significantly enhances nutritional value (up to +20% protein in fortified bread) and offers bioactive compounds beneficial to health. However, some limitations remain, including specific taste, production costs, and chlorella's cell wall digestibility. Advances in processing technologies (fractionation, microencapsulation) may improve sensory acceptance and industrial application. **Conclusion:** Microalgae represent promising functional food ingredients, combining high nutritional value with sustainability. Their potential is confirmed by various applications such as fortification, natural colorants, and dietary supplements. Overcoming current barriers through technological innovations will further support their role as strategic resources to meet future food and nutritional challenges.

Keywords: Microalgae; Functional foods; Nutritional value; Spirulina and Chlorella

**MYCOTOXINS AND NEW POSSIBILITIES FOR MYCOTOXIN BIODEGRADATION
USING PROBIOTICS**

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ABSTRACT

Mycotoxins are toxic secondary metabolites produced by microscopic mold fungi. They can contaminate agricultural products both in the field and during storage, posing a serious threat to human and animal health. There are hundreds of known mycotoxins, but several key species are the most common and pose the greatest danger. They are conveniently classified based on the fungi that produce them and their primary toxic effects. Concerns about food safety and the environment are leading to a reduction in the use of various chemicals and the development of sustainable agriculture. In this regard, biological control of phytopathogenic fungi affecting plants, vegetables and fruits, and food can increase the availability, safety, and quality of food, which is one of the important tasks of food security. Dried fruits of Uzbekistan are a valuable source of dietary fiber, a number of vitamins and mineral elements in the diet of the population. Due to the high sugar content, fruits are particularly susceptible to fungal invasion and accumulation of mycotoxins during vegetation, drying and storage. In this regard, research has begun on the microflora of dried fruits (raisins, plums, dates, apricots), the identification of phytopathogenic fungi, producers of mycotoxins, and screening for the antagonistic activity of lactic acid bacteria against phytopathogenic fungi. Since the use of lactic acid bacteria (LAB) for the biodegradation of mycotoxins is one of the most promising and environmentally friendly areas in the fight against these pollutants. Lactic acid bacteria are the object of research, since many strains of the LAB have the status of "Generally Recognized Safe", that is, they are safe for humans and animals. This is a key advantage over chemical detoxification methods. Biodegradation (biodegradation) of mycotoxins is the process of breaking down toxic mycotoxin molecules with the help of living organisms (bacteria, yeast, fungi) or their enzymes to non—toxic or less toxic compounds. Lactic acid biodestructor bacteria are specific strains of lactobacilli that have the ability to neutralize mycotoxins. In addition, LAB are already widely used in the food industry (yoghurts, cheeses, sauerkraut) and in agriculture (silage). Their versatility should be noted: they not only potentially destroy mycotoxins, but also improve the intestinal microbiota, fight pathogens and prolong the shelf life of products. Unlike physical (sorbents) and chemical methods, biodegradation using LAB is a natural and environmentally friendly process that does not leave harmful residues. Some probiotics are able to modify the structure of aflatoxin AFB1, ochratoxin A, converting it into less toxic compounds. For example: *Bacillus subtilis* and *B. licheniformis* produce enzymes (e.g., laccases) that break down aflatoxin and ochratoxin into safe metabolites. The *Lactobacillus plantarum* strain and *L. reuteri* hydrolyze the toxin, reducing its activity. To reduce the decrease in bioavailability and body protection of LAB, probiotics minimize the negative effects of mycotoxin on the body by reducing absorption into the intestine. In addition, LAB protect the liver of animals. *Lactobacillus rhamnosus* and *L. brevis* strains reduce oxidative stress and liver damage caused by mycotoxin. Probiotics have an immunosuppressive effect on AFB1 aflatoxin, enhancing the immune system response. To date, Bacell-M probiotic complexes based on *Bacillus subtilis* are used in animal husbandry for detoxification of feed and LAB can be used as functional products to reduce the risk of aflatoxicosis in humans. Conclusions. Thus, lactic acid bacteria and

probiotics are promising, safe tools for neutralizing mycotoxins, especially in combination with physico-chemical methods. Their use helps to reduce economic losses and increase the safety of the food chain. Effective biodestructor bacteria can be used in an integrated mycotoxin management system. Our further research will focus on studying specific strains of LAB that have antagonistic activity against toxigenic fungi and their biodestructive ability of various mycotoxins for use in the food and feed industry.

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FUNCTIONAL FOODS AND NUTRACEUTICALS IN CHRONIC DISEASE MANAGEMENT

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ABSTRACT

The increasing global burden of chronic diseases such as diabetes, cardiovascular disorders, obesity, and cancer has highlighted the urgent need for preventive and complementary healthcare strategies. Functional foods and nutraceuticals, derived from dietary sources, are gaining recognition as effective agents that extend beyond basic nutrition to provide therapeutic benefits. These include bioactive compounds such as flavonoids, polyphenols, omega-3 fatty acids, dietary fibers, and probiotics, which exhibit pharmacological properties like antioxidant, anti-inflammatory, hypolipidemic, and immunomodulatory effects. Within pharmacy practice, nutraceuticals are increasingly explored as adjuncts to conventional therapy, offering the potential to reduce drug dependency, minimize side effects, and improve patient outcomes. Pharmaceutical research has advanced the development of innovative formulations such as nano-encapsulated bioactives, functional beverages, and fortified supplements to enhance bioavailability and targeted delivery. Additionally, personalized nutrition-based interventions, supported by pharmacogenomics, are opening new avenues for disease prevention and wellness promotion. However, challenges remain regarding clinical validation, standardization of active ingredients, quality control, and regulatory frameworks, which limit their wider therapeutic adoption. Consumer awareness and professional education are also critical for the safe and effective use of functional foods. Overall, the integration of food science with pharmaceutical research provides a promising approach to chronic disease management, preventive healthcare, and the development of sustainable, patient-centered therapeutic options.

Keywords: Functional Foods, Nutraceuticals, Chronic Diseases.

**THE IMPACT OF EXTRACTION SOLVENT ON THE PHYTOCHEMICAL COMPOSITION
AND IN VITRO ANTACID ACTIVITY OF POMEGRANATE LEAVES**

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ABSTRACT

Pomegranate is regarded as an aromatic and medicinal plant, a reservoir of natural compounds with beneficial effects. It has been determined that certain compounds present in leaf extracts, including phenolic compounds, exhibit notable biological activities. Moreover, pomegranate (*Punica granatum* L.) leaves have been demonstrated to possess salutary properties for human health, attributable to their elevated concentration of phenolic compounds, particularly quercitrin.

In this study, the objective is to examine the impact of *Punica granatum* leaf extracts on gastric acidity. This investigation utilizes three distinct methodologies and involves the assessment of the chemical analysis of these extracts.

A series of qualitative phytochemical tests were carried out on aqueous and hydroalcoholic extracts of pomegranate leaves. The results of these tests revealed the presence of a variety of phytochemicals, including tannins, saponins, coumarins, and flavonoids, in the extracts.

The most elevated yield was documented in the aqueous extract of pomegranate leaves, exhibiting a substantial rate of 21.8%. The investigation revealed that the crude extracts of pomegranate leaves exhibited a substantial capacity to neutralize gastric acidity. The hydroalcoholic extract demonstrated the most notable neutralizing potential, with concentrations of 10 and 50 mg/ml exhibiting concentrations of 0.19 ± 0.1 and 0.24 ± 0.1 mmol H⁺ respectively.

The findings of this study suggest that pomegranate leaf extracts have the potential to serve as a natural substitute for conventional antacid medications. This antacid efficacy may be attributable to the presence of bioactive compounds, such as flavonoids, within the extracts.

Keywords: *Punica granatum*, gastro-protective activity, flavonoids, phenolic compounds.

ANATOMICAL FEATURES OF LONG BONES AND THEIR FUNCTIONS

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ABSTRACT

Long bones are specialized structural components of the human skeletal system that play a crucial role in support, movement, and protection. They are characterized by a cylindrical shaft, known as the diaphysis, and two expanded ends called epiphyses. The diaphysis is composed mainly of compact bone, which provides mechanical strength, while the epiphyses contain cancellous (spongy) bone with red bone marrow responsible for hematopoiesis. The metaphysis, located between the diaphysis and epiphysis, includes the epiphyseal plate or line, which is essential for longitudinal growth during development. The periosteum, a vascularized connective tissue covering the external surface, supports bone nourishment and repair, whereas the endosteum lines the medullary cavity and participates in bone remodeling. The medullary cavity, present within the diaphysis, contains yellow marrow that serves as an energy reserve in adults. Articular cartilage covering the epiphyses ensures smooth joint movements and reduces friction. Functionally, long bones act as levers in locomotion, provide attachment sites for muscles, protect internal organs, store minerals such as calcium and phosphorus, and house bone marrow for blood cell production. Clinical significance arises when fractures or metabolic disorders compromise these functions. Understanding the anatomical features of long bones is therefore fundamental in anatomy, physiology, orthopedics, and clinical practice.

Keywords: Long bones, diaphysis, epiphysis, metaphysis, periosteum, bone marrow, compact bone, cancellous bone, hematopoiesis, locomotion.

GINGER AS A FUNCTIONAL FOOD INGREDIENT IN DAILY DIETS

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ABSTRACT

Ginger (*Zingiber officinale*), a widely consumed spice and medicinal root, has garnered significant attention for its potential as a functional food ingredient in daily diets. Rich in bioactive compounds such as gingerol, shogaol, paradol, and zingerone, ginger exhibits diverse pharmacological properties including antioxidant, anti-inflammatory, antimicrobial, and digestive-stimulant activities. These attributes make it an ideal candidate for integration into functional foods aimed at promoting general wellness and preventing chronic diseases. Traditionally used in both culinary and medicinal systems, ginger is now incorporated into a variety of health-oriented products such as teas, smoothies, baked goods, snacks, supplements, and fortified beverages. Current scientific evidence supports the role of ginger in alleviating gastrointestinal discomfort, reducing oxidative stress, regulating blood glucose, and aiding in weight management. Additionally, its natural ability to enhance flavor while offering health benefits allows food industries to develop products that are both nutritious and palatable. The increasing consumer demand for natural, plant-based, and minimally processed ingredients further boosts the popularity of ginger-infused foods. Despite its advantages, factors such as optimal dosage, bioavailability, and potential interactions with medications must be considered when formulating ginger-based functional products. In conclusion, ginger holds immense promise as a safe, accessible, and effective functional food component. Its incorporation into daily dietary habits can offer a holistic approach to health maintenance and disease prevention, aligning with modern nutrition trends focused on plant-based wellness.

Keywords: Ginger, Functional food, Daily diet, Bioactive compounds, Antioxidant, Digestive health, Plant-based nutrition, Nutraceuticals.

**MODULATION OF MILK FATTY ACIDS IN LACTATING GOATS THROUGH
PILIOSTIGMA THONNINGII ESSENTIAL OIL SUPPLEMENTATION**

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ABSTRACT

Plant essential oils are volatile aromatic compounds with recognized antimicrobial properties capable of modulating ruminal fermentation when included in ruminant diets. Such modifications can influence both milk yield and composition, particularly fatty acid profiles. This study evaluated the impact of *Piliostigma thonningii* essential oil (PEO) supplementation on milk fatty acids in lactating West African Dwarf goats. Twenty-eight does, seven days postpartum, were assigned to three dietary treatments in a completely randomized block design over a 90-day period: (1) control diet comprising concentrate mixture and elephant grass (40:60 DM basis), (2) control + 2 mL/head/day PEO, and (3) control + 4 mL/head/day PEO. Supplementation with PEO significantly enhanced the proportion of unsaturated fatty acids, particularly oleic acid (C18:1n9c) and conjugated linoleic acid (CLA). Furthermore, the 4 mL PEO treatment increased omega-3 (C18:3n3) and omega-6 (C18:3n6) fatty acids compared with other groups. In conclusion, dietary inclusion of PEO improved the nutritional quality of goat milk by enriching health-promoting fatty acids, notably CLA and omega-3, underscoring its potential as a natural phytogetic additive for enhancing dairy goat production and human health benefits.

Keywords: *Piliostigma thonningii* essential oil, milk fatty acids, conjugated linoleic acid (CLA), omega-3 fatty acids, West African Dwarf goats, phytogetic feed additives

JEL Classification: L66 (Food; Beverages; Cosmetics; Tobacco), Q16 (R&D; Agricultural Technology; Biofuels), Q18 (Agricultural Policy; Food Policy), Q19 (Other Agricultural and Natural Resource Economics), O13 (Economic Development: Agriculture; Natural Resources)

**COMPARATIVE ANALYSIS OF FLOOD DAMAGES TO AGRICULTURAL SECTOR
USING GEO- SPATIAL TECHNOLOGIES. A CASE STUDY FROM DG KHAN AND
RAJANPUR DISTRICTS**

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ABSTRACT

The paper investigates the reasons, scope, and damage caused by the flood brought on by the district of Dera Ghazi Khan (DGK) and Rajanpur East marginal embankment falling apart. The Dera Ghazi Khan and Rajanpur districts in south Punjab, Pakistan, saw frequent rainfall in the months of July- August 2022, which had a detrimental impact on both people's lives and their possessions. The southern section of Punjab is bounded on the west by the Suleman Range, which stretches 360 kilometers from Ramak (upper side of Taunsa) to Kashmore (start of Sindh), covering the districts of DG Khan and Rajanpur, and on the east by the River Indus. Rainfall in the Suleman Range during the monsoon season (July to September).

Flash floods known as Hill Torrents (local name "Rodh") occur in areas larger than 24500 square kilometers characterized by a large concentration of eroded debris. These Hill Torrents have a total of 200 numbers, which 13 are significant. These Hill Torrents are recognized after crossing through the piedmont area (Fan area) named "Pachad area" with a breadth of 30 to 40 kilometers, comprising around 34500 square kilometers (9400 square kilometers). It destroys irrigated areas, crops, buildings, and public / private infrastructures (most recently in 2008, 2010, 2012, and 2013), generating billions of rupee losses. On the other hand, a large amount of cultivable rain-fed piedmont (Pachad) land, covering around 500,000 acres, does not get vital irrigation water. Hill Torrents, which are often linked with unpredictable flood flows, have kept D.G. Khan and Rajanpur Districts' Hill Torrent fan areas socio-economically poor. From the 1929 Hill Torrent floods until the present, a variety of studies and proposals have been offered to control / manage the Hill Torrent floods.

This paper shows the comparative analysis of flood damages on Agriculture sector in the comparison of rainfall flood year 2010 to the rainfall flood year 2022 occurred in South Punjab, Pakistan. To pursue this research, we used primary data collected from field observations, Global Positioning Systems (GPS), secondary data obtained through government departments as well as online open source databases. Moreover, in order to compare the pre and post flooding land use and land cover, Remote Sensing (RS) Landsat- 8 ETM data were obtained from USGS online database imageries were used as an input for supervised classification process. We used Hydrograph analysis was used to investigate the spatiotemporal variation in river discharge and flood limitations for barrages.

The results indicate that an unusual rainfall in the upper Indus Basin in July caused a significant discharge in the center Indus Basin. In this result, it exceeded the flood limits at different regions of south Punjab, Pakistan, which resulted in the breaching of East Marginal embankment. Modified Normalized Difference in Water Index (MNDWI) was used to extract inundation, and different classes of land cover were identified using a supervised picture classification technique. According to the analysis, a significant rainfall occurrence in the last week of July 2010 in the upper catchment areas of Indus River generated the food. The River Indus experienced its largest discharge in the results.

**ANTIDIABETIC ACTIVITY OF CLADANTHUS ARABICUS PHYTOCONSTITUENTS
EXPLORED VIA COMPUTATIONAL DRUG DISCOVERY**

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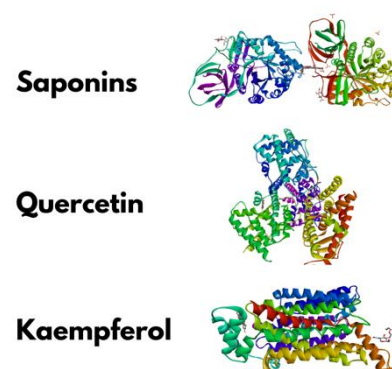
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ABSTRACT

The present study investigates the antidiabetic potential of phytochemicals derived from *Cladanthus arabicus* through molecular docking analyses using AutoDock Vina. The objective was to evaluate the binding affinity and interaction dynamics of major bioactive compounds saponins, quercetin, and kaempferol with key human proteins implicated in diabetes pathophysiology, including β -glucosidase, NR4A1 nuclear receptor, and GLUT4. Compounds were selected based on their prevalence in *A. officinalis* and known or suspected antidiabetic mechanisms. Protein structures were retrieved from the Protein Data Bank (PDB codes: 1OGS for β -glucosidase, 2QW4 for NR4A1, 7WSM for GLUT4), and ligand structures were sourced from PubChem[1]. Docking simulations were conducted with a focus on binding energy, root-mean-square deviation (RMSD), and ligand-protein conformational stability. Among the compounds tested, saponins demonstrated the strongest binding affinity to β -glucosidase with a ΔG of -13.2 kcal/mol, suggesting potent inhibitory activity that may delay carbohydrate digestion and absorption. Quercetin and kaempferol exhibited moderate to strong affinities with their respective targets, reflecting mechanisms such as GLUT4 activation, inhibition of intestinal glucose absorption, and enhanced insulin sensitivity[2].

inhibits α -glucosidase and DPP-IV; kaempferol activates AMPK and enhances GLUT4-mediated uptake. The observed binding affinities and predicted interactions reinforce the therapeutic relevance of *A. officinalis* phytochemicals in diabetes management. This study lays the groundwork for future in vivo studies and clinical trials. The findings underscore the promise of *Cladanthus arabicus* as a source of natural compounds for the development of plant-based antidiabetic therapeutics.

Compound	Target Protein	PDB Code	Best Affinity (kcal/mol)	Key Effect
Saponins	β -glucosidase	1OGS	-13.2	Enhanced β -cell function
Quercetin	NR4A1 ligand domain	2QW4	-9.7	Insulin secretion & glucose uptake
Kaempferol	GLUT4 transporter	7WSM	-8.9	Promotes GLUT4



				translocation & uptake
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Table 1: Binding Affinities and Targets

Figure 1 : Docked Complexes of Key Antidiabetic Compounds

Keywords: Cladanthus arabicus, Molecular Docking, Antidiabetic Activity, Phytochemicals, Protein–Ligand Interactions

**UNPACKING THE PARADOX: SUPPLY CHAIN DYNAMICS AND POLICY
INTERVENTIONS DRIVING THE UNEXPECTED DECLINE IN FOOD PRICES IN
NIGERIA'S STAPLE CROP MARKETS DURING THE 2024-2025 HARVEST SEASON**

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ABSTRACT

Food price volatility has long been a defining challenge in Nigeria, where structural bottlenecks, macroeconomic instability, and recurrent policy reversals often converge to drive costs upward. Against this backdrop, the 2024–2025 harvest season presented an unexpected paradox: instead of the anticipated surge in staple food prices under high inflation and currency depreciation, markets recorded a notable decline across several key crops. This study explores the underlying drivers of this anomaly by combining field-based primary data with qualitative thematic analysis using NVivo. Drawing on interviews and focus group discussions with farmers, traders, aggregators, policymakers, and development actors across Nigeria, the paper unpacks how supply chain adaptations and targeted policy interventions interacted to shape this counterintuitive outcome. Findings reveal that a confluence of factors including government tax waivers on selected imports, subsidized input programs, logistical improvements in aggregation and storage, and shifts in trader behaviour away from speculative hoarding jointly expanded effective supply and compressed market margins. Importantly, actors' expectations of credible government intervention amplified these effects by altering risk perceptions and incentivizing earlier market participation. By situating these dynamics within broader debates on food system resilience and price stabilization, the study contributes new evidence on how behavioral and policy synergies can moderate food price pressures even in inflationary environments. The paper concludes with policy lessons for Nigeria and other developing economies facing the dual challenge of safeguarding food security and stabilizing markets under macroeconomic uncertainty.

Keywords: Nigeria, staple crops, food prices, supply chain dynamics, policy intervention, NVivo, qualitative analysis.

**QUANTITATIVE AND QUALITATIVE SCREENING OF ORGANOCHLORINE
PESTICIDE RESIDUES IN SOME AVAILABLE FRUITS SOLD IN KAURA NAMODA
ZAMFARA STATE**

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ABSTRACT

In this study, organochlorine pesticide residues were analyzed from the selected fruits sold in Kaura Namoda, Zamfara state. Five common fruits, namely Banana, watermelon, guava, pineapple, and orange, were purchased from the central market. QuEChERS and GC-MS were used for the extraction and analysis, respectively. Twelve organochlorine standards were used, and the result shows that only Endosulfan I, with an average concentration of 0.0023 mg/kg, was determined in all the samples, while alpha lindines were found in the pineapple and watermelon with an average concentration of 0.0045mg/kg. Heptachlor, Aldrin, and DDE were not detected in the fruit samples. All the pesticides detected in the fruit sample are below the recommended maximum residual limit MRL of the WHO, except Endosulfan I, which is higher than the WHO-recommended MRL. Therefore, continued monitoring of pesticide residues will provide information for the consumers on the level of fruit contamination.

Keyword: Organochlorine, Residues, Fruit, Kaura Namoda

THE IMPORTANCE OF BALANCED DIET FOR STUDENTS' ACADEMIC PERFORMANCE

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ABSTRACT

Good nutrition is one of the most important but often overlooked factors that shape students' success at school. A balanced diet does not only influence physical growth; it also affects how students think, concentrate, and perform in their studies. In today's fast-changing world, many young learners replace home-cooked meals with fast food or skip meals altogether because of busy schedules. These habits may save time in the short run, but they often lead to low energy, poor concentration, and reduced academic achievement.

This paper discusses the close connection between diet and learning, with a particular focus on high school students. Drawing on existing research as well as observations and survey data collected in Uzbekistan, the study highlights how students who eat balanced meals—rich in fruits, vegetables, proteins, and whole grains—are more likely to stay focused in class, participate actively, and achieve higher grades. By contrast, students with irregular or unhealthy eating patterns often struggle with fatigue, lack of motivation, and weaker academic performance.

The findings emphasize that good nutrition should be viewed as part of the learning process itself. Families and schools both have a role to play in encouraging healthy habits through awareness programs, balanced meal planning, and accessible food options. Supporting students with proper nutrition is not only an investment in their health but also in their future academic and personal success.

Keywords: balanced diet, nutrition, academic performance, students, learning outcomes, education

**POLYPHENOLS IN FRUITS AND VEGETABLES AND THEIR ANTIOXIDANT
CHEMISTRY: A REVIEW**

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ABSTRACT

Polyphenols are a large and diverse group of phytochemicals abundantly present in fruits and vegetables, where they influence color, taste, and resistance to stress. They have attracted increasing scientific attention due to their potent antioxidant activities and protective roles against oxidative stress related disorders. Structurally defined by multiple hydroxyl groups, polyphenols act through free radical scavenging, metal chelation, regeneration of endogenous antioxidants, and modulation of oxidative enzyme systems. This review aims to provide a comprehensive synthesis of current knowledge on the occurrence, chemistry, and health relevance of polyphenols in fruits and vegetables. A systematic survey of peer-reviewed literature from databases such as *PubMed*, *Scopus*, and *ScienceDirect* was conducted, focusing on studies describing polyphenol classification, distribution, antioxidant mechanisms, and bioavailability. Findings indicate that grapes, apples, and berries are rich in anthocyanins, catechins, and phenolic acids, while vegetables such as onions, broccoli, and spinach contain flavonoids and phenolic acids with high antioxidant potential. These compounds contribute to cardioprotective, anticancer, neuroprotective, and antidiabetic effects demonstrated in experimental and clinical studies. In conclusion, polyphenols represent vital dietary antioxidants with broad health benefits. Despite challenges of low stability and bioavailability, advances in analytical methods and delivery technologies highlight their potential in functional foods and nutraceutical applications.

Keywords: Polyphenols, Fruits, Vegetables, Antioxidant chemistry, Dietary phytochemicals, Human health

**APPLICATION OF MACHINE LEARNING IN PREDICTING FOOD QUALITY AND
SHELF LIFE**

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ABSTRACT

Food quality and safety are very important for human health and the food industry. Traditional laboratory methods for testing food freshness and shelf life are often slow, expensive, and require expert knowledge. In recent years, machine learning techniques have shown strong potential to solve these challenges. Machine learning models can analyze large amounts of data such as temperature, humidity, pH, and chemical composition to predict the quality and remaining shelf life of food products. This study discusses how machine learning can be applied to monitor food quality more effectively. The advantages include faster prediction, lower cost, and better decision-making for both producers and consumers. The integration of digital technology with food research can improve food safety standards and reduce food waste in society.

Keywords: Machine Learning, Food Quality, Shelf Life, Food Safety, Digital Technology

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ABSTRACT

Food fortification is a cost-effective and sustainable public health strategy aimed at preventing micronutrient deficiencies, which remain a major global health concern. Iron, iodine, and vitamin D are among the most commonly fortified nutrients due to their widespread deficiencies and significant health implications. Iron fortification of staples such as flour and rice helps combat anaemia, especially in women and children. Iodised salt has been a highly successful intervention in reducing goitre and other iodine deficiency disorders worldwide. Vitamin D fortification of milk and edible oils addresses rickets, osteoporosis, and other bone-related health issues, particularly in populations with limited sun exposure. These interventions not only improve nutritional status but also reduce the burden of non-communicable and deficiency-related diseases, enhancing productivity and quality of life. Despite proven benefits, challenges such as bioavailability, population coverage, regulatory frameworks, and public awareness remain. Strengthening fortification programs through effective monitoring, education, and integration with broader nutrition policies can play a vital role in achieving global health targets and ensuring a healthier future.

Keywords:: Food fortification, Micronutrient deficiency, Iron, Iodine, Vitamin D, Anaemia, Goitre, Rickets, Public health nutrition, Nutritional intervention, Iodised salt, Fortified foods, Malnutrition prevention.

**FOOD AND NUTRITION IN SPANISH AS A FOREIGN LANGUAGE (ELE) TEXTBOOKS:
A CONTENT ANALYSIS OF B1 AND B2 LEVEL MATERIALS**

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ABSTRACT

This study examines how food and nutrition topics are represented and pedagogically treated in Spanish as a Foreign Language (ELE) textbooks designed for intermediate learners at the B1 and B2 levels of the Common European Framework of Reference for Languages (CEFR). Food represents a fundamental aspect of human culture and daily communication, making it an ideal vehicle for integrated language instruction that combines practical language skills with cultural understanding. Through systematic content analysis of contemporary ELE materials, this research investigates the types of food-related content present, the pedagogical approaches employed, and the cultural dimensions emphasized in intermediate-level instruction.

The study is grounded in sociocultural theory, which posits that language learning involves not merely acquiring linguistic forms but developing the ability to participate in culturally meaningful practices (Lantolf & Thorne, 2006). Food represents a practice domain where language and culture intersect naturally, providing affordances for authentic communication while transmitting cultural knowledge. The research addresses four primary questions: What types of food-related content appear in B1 and B2 ELE textbooks? How do textbooks integrate linguistic, cultural, and communicative dimensions? What pedagogical approaches are employed? How do materials differ between the two proficiency levels?

**ENHANCED PHOTOCATALYTIC REMOVAL OF TOXIC DYES USING A NOVEL
TRIPLE MOLYBDATE**

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ABSTRACT

The triple molybdate of silver, aluminum and cobalt nanoparticles was synthesized via a solid-state method. X-ray diffraction analysis (XRD) was used to confirm the phase purity. Fourier-transform infrared (FTIR) and Raman spectroscopies were identified as characteristics of bond vibrations. The morphology study using Scanning Electron Microscopy (SEM) revealed the presence of agglomerate in the prepared nanoparticles. The Brunauer–Emmett–Teller (BET) was employed to determine the surface area and pore radius. Vibrational spectroscopy based on IR and Raman techniques provided insights into active phonon vibration modes in MoO_4 . The ultraviolet-visible (UV-Vis) spectroscopy showed that the considered molybdate present a large bond gap of about 3 eV, favorable to interesting photocatalytic activity. A novel molybdate nanoparticles were prepared and tested for the degradation of two toxic azo dyes Acid Black and Acid Yellow under solar light. Remarkably, the considered catalyst showed a super photocatalytic activity reaching over 69% and 93% degradation for AB-52 and AY-23 dyes, respectively. Thus, the heterogeneous catalyst demonstrated excellent photocatalytic performance for degrading hazardous pollutants, environmental remediation and remained reusable in cyclic tests.

**GASTRONOMY TOURISM: A MULTISENSORY JOURNEY THROUGH CULTURE,
IDENTITY, AND SUSTAINABLE DEVELOPMENT**

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ABSTRACT

Gastronomy tourism, also known as culinary or food tourism, has emerged as a dynamic and multidimensional sector within the broader tourism industry, blending travel with local culinary experiences. This review paper explores the evolution, scope, and significance of gastronomy tourism, highlighting its role in promoting cultural heritage, regional identity, and sustainable development. Drawing on an extensive analysis of academic literature, policy reports, and global case studies, the paper synthesizes current knowledge and identifies key trends and challenges in the field. The review underscores how food acts as a powerful medium for storytelling, cultural exchange, and place-making, offering tourists authentic experiences while supporting local economies and small-scale producers. It also examines the impact of globalization, social media, and changing consumer preferences on the development of food-related tourism products and services. Furthermore, the paper explores sustainability dimensions, including the promotion of local ingredients, reduction of food waste, and support for traditional culinary practices. This review identifies several gaps in current research, such as the need for more empirical studies in emerging destinations and a deeper understanding of the socio-economic impacts on host communities. The paper concludes by suggesting directions for future research and policy-making, emphasizing the importance of collaboration between stakeholders to ensure gastronomy tourism contributes positively to destination development.

Keywords: Gastronomy tourism, Culinary heritage, Sustainable tourism, Cultural identity, Food experience

**EVALUATION OF DECONTAMINATION PROTOCOLS FOR MYCOBACTERIUM SPP.
ISOLATION FROM MULTIPLE ANIMAL SPECIES**

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ABSTRACT

To identify an optimal decontamination protocol for isolating Nontuberculous Mycobacteria (NTM) from animal fecal samples, a critical step in surveillance studies. Methods: Fecal samples from various animal species were processed using three decontamination methods: 5% oxalic acid, modified Petroff's method (NaOH), and sulfuric acid. Decontaminated samples were cultured on Löwenstein-Jensen medium and assessed for contamination and mycobacterial growth

Results: While overall contamination was low, the modified Petroff's method was significantly less effective, resulting in a high percentage of contaminated cultures. Both the 5% oxalic acid and sulfuric acid methods effectively controlled contamination and facilitated superior recovery of Mycobacterium species.

Conclusion: Acid-based decontamination, specifically with oxalic or sulfuric acid, is more effective than NaOH-based methods for isolating NTM from fecal samples. These protocols are recommended to enhance detection accuracy in studies of wildlife and domestic animals.

Keys words: Mycobacterium, fecal sample, LJ, Algeria

**SUSTAINABLE VALORIZATION OF ACID WHEY PROTEINS: AN INTEGRATED
APPROACH FOR THE MOROCCAN DAIRY SECTOR**

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ABSTRACT

The dairy sector in Morocco occupies a key position in the agri-food field, transforming billions of liters of milk into yogurt, cheese, and various fermented foods. Yet this processing produces large amounts of acid whey, a by-product still poorly exploited and generating environmental, regulatory, and economic difficulties. Acid whey has an acidic pH (4–5) and a strong organic load, with proteins offering important nutritional and functional potential. Conventional biological treatments remain inadequate, causing disposal challenges and missed chances for valorization.

This doctoral project seeks to establish a sustainable and integrated framework for concentrating and valorizing food proteins derived from acid whey. By targeting this abundant and nutrient rich stream, the work aims to convert a problematic effluent into a resource of high value, while proposing methods suited to the needs of Moroccan dairy SMEs.

Our investigation examines and refines diverse concentration and purification processes, including ultrafiltration, selective precipitation, and chromatography, to obtain reliable and high-quality protein fractions. These proteins demonstrate real promise as functional ingredients, thanks to their nutritional, emulsifying, and gelling attributes. They can support the design of innovative foods such as fortified drinks, protein enriched supplements, and substitute products.

The research ultimately intends to deliver innovative, affordable, and eco-friendly solutions, promoting sustainable acid whey management while advancing food security and strengthening the circular economy of the dairy industry.

Keywords: Dairy industry, Acid whey, Proteins, Concentration, Food valorization.

**GESTATIONAL DIABETES, AWARENESS LEVELS OF EFFECTS AMONG MOTHERS &
IMPLICATIONS OF LIFESTYLE INTERVENTION VS PHARMACOLOGICAL
TREATMENT EFFECTIVENESS**

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ABSTRACT

Gestational Diabetes Mellitus (GDM) is a common pregnancy-related disorder marked by glucose intolerance, posing significant risks such as maternal hypertension, preeclampsia, cesarean delivery, and future development of type 2 diabetes. A descriptive cross-sectional study on pregnant women indicated that lifestyle interventions, including diet and physical activity, provided better glycemic control and fewer neonatal complications compared to drug therapy. The survey showed that while most participants had basic education and moderate awareness of GDM management, knowledge of potential complications remained limited, and only a small number were receiving treatment, with oral medication more frequently used than insulin. These findings emphasize the importance of early lifestyle modifications and pharmacist-led education to improve maternal-fetal outcomes and reduce long-term metabolic risks in resource-limited settings.

Keywords: Gestational diabetes, maternal health, lifestyle intervention, , pregnancy outcomes, type 2 diabetes risk.

**EXPLORING ACTINOBACTERIA FROM ALGERIAN DESERT SOILS FOR THEIR
ANTIMICROBIAL ACTIVITY AGAINST PHYTOPATHOGENIC MICROORGANISMS**

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ABSTRACT

Throughout their life cycle, plants and pathogens interact with a wide variety of organisms; these interactions can affect plant health in a positive and/or negative way (Corbaz, 1990; Nakkeeran et al., 2005). It is estimated that nearly 50% of the world's agricultural production is lost before or after harvest. Biological control is one of the promising methods, it consists of the use of antagonistic microorganisms.

Among the latter, actinomycetes are the best candidate to be applied in the form of a living cell. They are known for their production of bioactive metabolites, their ability to colonize the rhizosphere and plant roots, their ability to control phytopathogenic microorganisms and to form spores adapted to the formation of stable products. However, these are important traits for the success of biological control (Xiao et al., 2002; Bressan, 2003).

The objective of this work is the screening of actinomycete strains isolated from Algerian Saharan soil, which inhibits some phytopathogens (bacteria and fungi).

The isolation of Actinomycetes is done on Vitamin-B chitin media after pretreatment with CaCo₃.

The antimicrobial activity of Actinomycetes against these pathogens is done by the cross-striated method on ISP2 and YGB medium. incubation at 30°C for 24 hours for bacteria and up to 3 days for fungi (Aouiche et al 2013).

80 strains of actinobacteria were tested and 45 strains showed antiphytopathogenic activity or less against a fungus or bacteria, and the inhibition diameter reached up to 30 mm for some strains of actinomycetes.

This number of actinomycete isolates is much higher than other work carried out on the screening of actinobacteria against pathogenic bacteria (Aouiche et al., 2012, Toumatia et al., 2014).

Work is still being carried out to determine the pH kinetics, biomass and antiphytopathogenic activities of the actinomycete isolates obtained.

Keywords: Actinobacteria; Screening; inhibition; phytopathogenes.

**ZEBRAFISH AS A NUTRITIONAL GENOMICS MODEL: CASE STUDY ON FOOD-
DERIVED BIOACTIVE PEPTIDES AND ANTI-DIABETIC POTENTIAL**

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ABSTRACT

The Zebrafish (*Danio rerio*) serves as a validated model in nutritional genomics for evaluating food-derived bioactive peptides against Type 2 Diabetes Mellitus (T2DM). In glucose-induced diabetic zebrafish, administration of *Enhalus acoroides* peptide extract at 5 mg/L for 20 days resulted in a 38% reduction in fasting blood glucose compared to untreated controls. Metformin at 3.3 mg/L induced a comparable 41% decrease. Treated zebrafish showed a 22% reduction in body weight gain and a 30% decrease in total serum triglycerides, while HDL levels increased by 18%. Gene expression analysis revealed a 2.5-fold upregulation of GLP-1 and a 1.8-fold downregulation of PPAR γ and 2.1-fold downregulation of SREBP-1c. Gut microbiota profiling indicated restoration of microbial diversity, with the Shannon index increasing from 2.1 in diabetic controls to 3.6 in peptide-treated groups. Additionally, β -conglycinin-derived peptides at 10 μ g/mL demonstrated 45% inhibition of α -glucosidase activity, resulting in a 33% reduction in postprandial glucose in zebrafish larvae. These interventions also reduced maltase activity by 28%, indicating improved carbohydrate metabolism. Collectively, these results validate zebrafish as a high-throughput model for quantifying anti-diabetic effects of bioactive peptides, demonstrating measurable improvements in glycemic control, lipid metabolism, gene expression, and gut microbiota. The data provide strong evidence for the therapeutic potential of both marine- and plant-derived peptides in the development of functional foods targeting metabolic disorders.

Keywords: Zebrafish, Bioactive peptides, Diabetes Mellitus, Glycemic control, Lipid metabolism, Gut microbiota

**IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) TO
HEALTH INFORMATION MANAGEMENT STUDENTS: A CASE STUDY OF SANI
ZANGON DAURA SCHOOL OF HEALTH TECHNOLOGY DAURA, KATSINA STATE,
NIGERIA**

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ABSTRACT

The research aim to investigate the impact of Information and Communication Technology (ICT) facilities to students of health information management at Sani Zangon Daura, School of Health Technology Daura (SZDSHTD) .Simple random sampling technique was adopted for the study from a sample of size of 93 students with a population of 300 students using Slovin's formula. a research questionnaire for students with title (QSTIOICTTLDHC) were objectively used to investigate the impact and availability of ICT facilities , utilization of the facilities , extent to which students utilizes these facilities , and also uncover the problems that limit full utilization of these facilities . Statistical mean was used to analyze the data obtained from the respondents. It was discovered that there is shortage of ICT tools in their school computer laboratory, and also utilization of these facilities is below standard to aid teaching and learning. It was recommended among others that the college should seek government intervention to expand and renovate ICT laboratory to accommodate high number of students, and also the college should provide efficient solar power supply to avoid uninterrupted power supply, finally the college should put more effort in training and retraining of ICT to teaching staffs to improve teaching and learning.

KEYWORDS: Utilization, ICT, Health, Student, Department, SZDSHTD, Katsina

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ABSTRACT

Humanitarian contexts, ensuring access to safe, nutritious, good quality and culturally appropriate food in the right quantity at the right time and place during an emergency or a protracted crisis is an enormous challenge. to increase given uncertainties such as climate change, global political and economic instability and emerging pandemics like COVID-19 the role of food science and technology in humanitarian response is not well understood and is seldom considered in humanitarian circles.. The implementation of emergency programs and projects tends to induce dependency on aid, rather than strengthening local food systems and ensuring resilience .There needs to be a move beyond rehabilitating and increasing agricultural production to addressing the whole food system .Yogurt is a widely consumed dairy product that is obtained through the fermentation of lactic acid bacteria.. Metabolites of lactic acid bacteria, such as carbonyl compounds, non volatile or volatile acids, and exopolysaccharides. Yogurt can be produced in various forms, including solid, fluid, and soft-drinking types, depending on the manufacturing method employed. In addition, the raw materials, sterilization, homogenization, fermentation, and other conditions in each manufacturing method greatly affect yogurt's physical properties .Food-borne diseases caused by microbial contamination have always been a matter of great concern to human beings detection technologies presents more or less drawbacks, such as complicated operation. Isothermal amplification technology is one of the alternative approach containing the above mentioned advantages accuracy, low sensitivity, long-time detection .Food irradiation is over 100 years old, with the original patent for X-ray treatment of foods being issued in early 1905, 20 years after there discovery by W. C. Roentgen in 1885. Since then, food irradiation technology has become one of the most extensively studied food processing technologies in the history of mankind. Garlic is a common herb consumed worldwide as functional food and traditional remedy for the prevention of infectious diseases since ancient time.. A series of novel coronavirus events were detected in the process of food cold chain packaging and transportation, making the application of molecular diagnosis in food processing .Singapore is a good case study of a small city-state that is trying to increase its own self-production of food using technology.

Keywords: Food policies, Nano materials, humanitarian food aid , resilience ,food safety.

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NUTRITION, LIFESTYLE, AND A PRACTICAL BALANCED DIET PLAN FOR ADULTS AGED 40–49

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ABSTRACT

Adults in their early-to-mid 40s face a transitional health window: metabolic rate begins to shift, risk of noncommunicable diseases (NCDs) (hypertension, hyperlipidemia, type-2 diabetes, coronary disease) rises, and lifestyle stressors often increase. This article synthesizes global and national dietary guidance to provide actionable, evidence-based nutrition and lifestyle recommendations for persons aged ~40–49, and offers a culturally-sensitive, practical 7-day balanced diet chart suitable for a 43-year-old Pakistani professional. Recommendations emphasize whole foods, plant-forward patterns (Mediterranean/DASH), limited saturated fat and processed foods, regular physical activity, and routine screening. The guidance draws on WHO healthy-diet principles, American Heart Association (AHA) cardiovascular dietary guidance, Pakistan’s national dietary guidelines, and recent evidence on Mediterranean-style patterns and middle-age health outcomes. Practical sample menus are provided with estimated caloric guidance for a moderately active 43-year-old male; adaptations for different energy needs and clinical conditions are discussed.

**FOOD WASTE REDUCTION THROUGH SMART IoT AND DEEP LEARNING-BASED
MONITORING SYSTEMS**

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ABSTRACT

Food waste is one of the most pressing global challenges, with significant economic, environmental, and social implications. Traditional methods of managing and monitoring food waste often fail to address the dynamic nature of supply chains, storage, and consumer behavior. Recent developments in intelligent technologies, especially the combination of the Internet of Things (IoT) and deep learning, offer creative prospects to reduce food waste and enhance resource efficiency. This book explores the design, development, and implementation of smart IoT-enabled systems coupled with deep learning models to predict, monitor, and reduce food waste across households, retail, restaurants, and large-scale supply chains. The work emphasizes the role of IoT devices such as sensors for temperature, humidity, and weight, as well as image-based detection systems—in capturing real-time food quality and storage data. Deep learning models, including Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), are employed for spoilage detection, shelf-life prediction, and time-series analysis of perishable goods. The suggested framework illustrates how data-inspired intelligence can produce prompt alerts, aid in decision-making, and enhance the efficiency of food distribution. Research and experiments indicate that the combination of IoT and AI aids in minimizing food waste, enhancing sustainability, and contributing to the achievement of the United Nations Sustainable Development Goals. The book also looks at challenges like making these systems work on a large scale, keeping costs low, protecting personal data, and using new tech like blockchain and edge computing. By combining theoretical foundations, practical applications, and future research directions, this book provides researchers, practitioners, policymakers, and industry leaders with a comprehensive understanding of how smart IoT and deep learning-based systems can transform food waste management. The insights presented aim to drive sustainable practices, foster technological innovation, and support the global movement toward smarter and greener food ecosystems.

KEYWORDS:

Food Waste Management, Internet of Things (IoT), Deep Learning, Sustainability, Smart Monitoring Systems

**IDENTIFICATION, CHARACTERIZATION AND POPULATION DETERMINATION OF
INDIGENOUS CHICKEN STRAINS IN ETHIOPIA**

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ABSTRACT

The study was conducted to identify different strains of indigenous chickens in Southern Ethiopia based on morphometric traits. Phenotypic data were collected from a total of 610 (64 male and 546 female) adult indigenous chickens. Quantitative traits measured were body weight, body length, breast circumference, wingspan, shank length, shank circumference, comb length, wattle length and beak length, the qualitative parameters were comb type, ear lobe color, eye color, feather morphology, feather distribution, plumage pattern, plumage color, spurs, skin color, shank color and shank feather. General Linear Model (GLM) procedure of SAS 9.4 was applied to analyze a data. Number of hens and chicks were significantly ($p<0.05$) higher in Wolaita compared to the other studied zones. However, the number of cockerels is significantly ($p<0.05$) higher in Hadiya zone followed by Wolaita zone. Variation of the study locations significantly influence ($p<0.05$) the body weight, body length, breast circumference, shank length, wing span and comb length. More than 60% of the chickens were observed with single comb type followed by double comb type (36.9%). Among the five observed plumage colour types (white, black, blue, red and wheaten) on indigenous chicken ecotypes; red (55.4%) colored chickens were dominants followed by wheaten (20.5%). Based on this study, the chicken ecotypes across the studied zones did not show the clear cut differentiations and the one that has been called the Wolaita chickens theoretically is not exactly different from the other chicken ecotypes of the studied zones. Most of the studied chicken possessed the single comb. So, by having such kind of the chicken populations in some southern parts of Ethiopia, the conclusion could be there might be the blood of exotic chicken populations' dissemination. Still the indigenous chicken ecotypes in Southern region require the molecular characterization to be sure on the phenotypic characterization information.

Key words: Characterization; Identification; Indigenous chicken strains; Southern Ethiopia

**HARVESTS AND HARDSHIPS: PROTECTION-PRODUCTIVITY PARADOX REALITIES
OF NIGERIA'S RICE AND MAIZE PRODUCTION UNDER BUHARINOMICS**

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ABSTRACT

This study provides a comprehensive analysis of the impact of Buharinomics—the agricultural policy regime under President Buhari (2015–2023)—on Nigeria's rice and maize sectors. Using a mixed-methods approach that integrates quantitative time-series data with qualitative policy analysis, the research evaluates trends in production, trade, productivity, and credit allocation. The findings reveal that while the policy successfully achieved its primary goal of import substitution (reducing rice imports by over 99%), it produced divergent outcomes across commodities. Maize production grew through productivity gains (98.85% of growth from yield increases), whereas rice production expanded mainly through area cultivation (180.75% of growth), masking a significant yield decline. The study also identifies substantial macroeconomic constraints, as high inflation and currency depreciation eroded the real value of agricultural credit and inputs. The paper concludes that while short-term protectionist measures can boost domestic production, sustainable agricultural transformation requires a shift toward productivity-focused policies, improved credit effectiveness, and greater macroeconomic stability. These findings offer critical insights for designing more effective and sustainable agricultural policies in Nigeria and other developing economies.

Keywords: Agriculture; Development; Growth Policy; Reform; Trade

**NUTRITIONAL, THERAPEUTICAL POTENTIAL AND FUNCTIONAL UTILIZATION OF
MANGO PEELS**

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ABSTRACT

Mangoes, known as the king of fruits, are grown and consumed globally. While the pulp is utilized, the peels and seeds are often discarded in large quantities. Increased utilization leads to more waste production, contributing to the environmental issues like; When mango peels decompose in landfills, they release **methane gas**, a powerful greenhouse gas that contributes to climate change. If not properly disposed of, they can also cause **soil and water pollution**, especially in areas where mango processing is done at a large scale. However, mango peels are rich in nutrients and bioactive compounds with significant health and industrial potential. Instead of throwing them away, they can be reused in sustainable ways. Mango Peels are the rich source of Dietary fiber; which aid digestion and gut health, Vitamins & Minerals; essential for metabolic functions, Phytochemicals; offer antioxidant benefits, Amino Acids & Carbohydrates; contributing to energy and cellular repair. Mango peels possess notable therapeutic potential due to their rich content of antioxidants, which help neutralize free radicals and may lower the risk of chronic diseases like cancer and heart conditions. Their antimicrobial properties make them effective against certain bacteria and fungi, offering benefits in food preservation. The fiber and polyphenols in mango peels support gut health by promoting beneficial microbiota and aiding digestion. Additionally, their bioactive compounds exhibit anti-inflammatory effects, helping to reduce oxidative stress in the body. Mango peels offer diverse functional applications across industries. In the food sector, they serve as natural additives in bakery, dairy, and beverage products due to their emulsifying and bulking properties. Their rich bioactive profile makes them valuable for developing low-cost nutraceuticals and health supplements. Additionally, mango peel extracts show promise in eco-friendly wastewater treatment, while their organic content supports sustainable agriculture as compost and fertilizer. Mango peels are no longer just a by-product -they're a functional ingredient with wide-ranging applications in health, food, and sustainability.

**QBD DRIVEN DESIGN AND EVALUATION OF KALONJI OIL-BASED NOVEL
NANOSTRUCTURED LIPID COMPOSITE GEL FOR TRANSDERMAL DRUG DELIVERY
IN OSTEOPOROSIS**

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ABSTRACT

Osteoporosis is systemic skeletal disorder defined as low bone mineral density caused by altered bone microstructure, ultimately predisposing patients to low-impact, fragility fractures. A novel drug formulation for osteoporosis treatment may offer reduced side effects, presenting a new therapeutic option for patients. This study aims to present an approach for developing a nano-formulation of Ib-3276, a Bruton's tyrosine kinase inhibitor targeting osteoporosis. Ib-3276 is classified as a BCS class II drug, characterised by low solubility and high permeability. The oral bioavailability is 2.9 percent. Systemic side effects include infection, anaemia, neutropenia, thrombocytopenia etc. The selection of NLC as a nanocarrier is predicated on its ability to facilitate site-specific drug delivery. NLCs provide an increased drug loading capacity, mitigate drug ejection, facilitate dose reduction, and enhance efficacy. Present study was aimed to develop the NLC using glyceryl mono and di-stearate as solid lipid and kalonji oil as liquid lipid. The formulation was subjected to optimisation using Central Composite design. The size, poly dispersity index (PDI), zeta potential and entrapment efficiency (E.E.) of the developed NLC were 162.8 ± 8.66 nm, 0.223 ± 0.005 , -31.3 mV ± 4.706 and $72.4 \pm 5.52\%$ respectively. Further, FTIR, DSC and XRD analysis of the NLC confirmed the encapsulation of drugs. Transmission electron microscopy (TEM) displayed the globular structure of NLC. The *in-vitro* drug release study showed a 2.5- fold enhanced drug release from NLC as compared to free drug. DPPH radical scavenging activity of the NLC showed the formulation has antioxidant effect due to presence of kalonji oil as excipient (liquid lipid) which would enhance the action of the formulation. Further, drug permeation study using STRAT-M as well as rat skin will be performed followed by cell lines study and pharmacokinetics and pharmacodynamics studies. Consequently, the targeted approach would improve the therapeutic efficacy of the drug and minimize potential side effects linked to systemic administration.

Keywords: Osteoporosis, Bruton's tyrosine kinase inhibitor, Kalonji oil, Central composite rotatable design, Nanostructured lipid carrier

**SEAFOOD SAFETY IN THE MEDITERRANEAN: IMPACTS OF POLLUTION AND
STRATEGIES FOR SUSTAINABLE MANAGEMENT**

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ABSTRACT

The Mediterranean Sea is a vital source of seafood, supporting the nutrition, economy, and culture of millions of people. However, this resource is increasingly threatened by pollution from heavy metals, microplastics, hydrocarbons, agricultural runoff, and untreated urban effluents. These contaminants accumulate in marine organisms and seafood species, posing risks to both ecosystem health and human consumers. Pollution not only reduces seafood quality and safety but also undermines fish stocks and aquaculture productivity, threatening long-term food security in the region.

This work addresses the impact of pollution on Mediterranean seafood, highlighting evidence of contaminant bioaccumulation in key commercial species. It also emphasizes the importance of biomonitoring and the application of biomarkers as effective tools for assessing seafood quality and ecological health. Promoting sustainable management strategies and reinforcing regional cooperation are crucial steps to preserve the integrity of Mediterranean seafood resources and ensure safe consumption for future generations.

Keywords : Mediterranean Sea; seafood safety; pollution; bioaccumulation; biomarkers; marine conservation; food security.

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NUTRACEUTICALS BRIDGING NUTRITION AND MEDICINE

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ABSTRACT

Nutraceutical refers to products derived from processed foods, supplements, specialty foods, and food items that serve as nutrients in a balanced diet. Over the last century, global lifestyles have evolved due to rising incomes, reduced physical activity, and a growing preference for unhealthy food choices. Nutraceuticals have gained immense popularity due to their safety, nutritional benefits, and therapeutic properties. They are utilized in both the treatment and prevention of a range of diseases, such as heart disease, cancer, diabetes, Alzheimer's disease, stroke, Parkinson's disease, and obesity. A better understanding of the shift from treatment to prevention has resulted in a heightened demand for nutraceuticals. This has ushered in a new era in medicine and health, transforming the food and pharmaceutical sectors into areas of significant research interest.

Keywords: Nutraceutical; Balanced Foods; Parkinson's Disease; Obesity; Antioxidants

EVALUATING THE PROTECTIVE ROLE OF *LACTOBACILLUS ACIDOPHILUS* AGAINST AFLATOXIN B1-INDUCED GROWTH IMPAIRMENT IN COCKERELS

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ABSTRACT

This study examines the impact of *Lactobacillus acidophilus* probiotics on the growth performance of cockerels fed a diet containing Aflatoxin B1. A total of 120 nine-week-old cockerels were divided into four treatment groups. The treatments were as follows: T1 received 1 ml of *Lactobacillus acidophilus* per bird per day in water; T2 received 35 µg of Aflatoxin per kg of feed along with 1 ml of *Lactobacillus acidophilus* in water; T3 received 35 µg of Aflatoxin per kg of feed; and T4 served as a control with no Aflatoxin. Each treatment was replicated four times with ten birds per replicate. Data were analyzed using One Way Analysis of Variance (ANOVA). Significant differences ($P < 0.05$) were observed in final weight; feed intake, and daily feed intake during the first phase, with T1 showing the highest final weight (1233.33 g) and T4 the highest feed intake (1044.44 g). T2 had the best FCR value (3.00). Overall, the findings suggest that *Lactobacillus acidophilus* may effectively counteract the negative effects of Aflatoxin B1 on the growth performance of cockerels. Based on the study's findings, it is recommended that farmers can incorporate probiotics into the diet of cockerels to counteract the adverse effects of aflatoxin B1 in contaminated feed. However, further research should be conducted to explore the optimal strains and dosages of probiotics for maximizing growth performance in poultry.

Keywords: Aflatoxin B1, Cockerel chickens, *Lactobacillus acidophilus*, Protective role.

**EXPLORING THE BIOACTIVE COMPONENTS AND PHARMACOLOGICAL BENEFITS
OF A NORTHERN MOROCCAN TRADITIONAL HERB**

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ABSTRACT

Ruta montana L., a medicinal herb in Moroccan folk medicine, has been used to treat infections, hyperglycemia, spasms, and fever. This study uses GC-MS to examine the bioactive constituents of RMEO and analyzes its antibacterial, antioxidant, and antidiabetic actions *in vitro* and using molecular docking approaches.

GC-MS identified 2-undecanone as the main compound of the essential oil. RMEO inhibited α -amylase ($IC_{50} = 0.365 \pm 0.11$ mg/mL) and α -glucosidase ($IC_{50} = 0.311$ mg/mL), had significant antioxidant potential (FRAP $EC_{50} = 188.61 \pm 1.12$ μ g/mL; beta-carotene $IC_{50} = 149.21 \pm 1.12$ μ g/mL), and had potent antibacterial effects, particularly against *Micrococcus luteus* and *Staphylococcus aureus* (20.05 ± 0.98 and 18.11 ± 1.11 mm).

It demonstrated modest efficacy against *Candida albicans* (13.05 ± 0.5 mm), with MIC/MBC values ranging from 0.25 to 8% (v/v). Molecular docking and ADME tests confirmed these findings. Overall, DVEO exhibits remarkable antioxidant, antibacterial, anticandidal, and antidiabetic effects, indicating a potential for natural therapeutic uses.

Keywords: volatile oil, *Ruta montana*, GC-MS, antibacterial, antiradical.

**KINETIC MODELING FOR QUALITY AND SAFETY CONTROL IN ARTISANAL
CHEESE: A PERSPECTIVE FOR CAMEMBERT-TYPE CHEESE PRODUCTION IN
ALGERIA**

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ABSTRACT

The artisanal cheese sector in Algeria holds significant economic and cultural potential, yet faces considerable challenges in standardizing quality and ensuring safety, particularly for complex varieties like Camembert-type cheese. The dynamic biochemical changes during ripening make consistent production difficult without robust scientific tools for prediction and control. This perspective article explores kinetic modeling as a transformative trend to bridge this gap, demonstrating its application through a simulated case study of Algerian Camembert-type cheese. We show how integrated models for pH, texture, and pathogen inactivation can be developed, with results successfully capturing critical ripening transitions: a logistic function for pH deacidification ($R^2 > 0.99$), an exponential decay for firmness loss ($R^2 = 0.985$), and a modified Gompertz model for *Listeria monocytogenes* inactivation ($R^2 = 0.974$). The interdependence of these models, with pH as a master variable, underscores the power of an integrated systems approach. We conclude that the adoption of kinetic modeling represents a pivotal advancement for the future of artisanal cheesemaking, providing a tangible roadmap to digitally optimize processes, proactively ensure safety, and standardize quality without compromising traditional character, thereby enhancing the competitiveness of Algerian artisanal cheeses in both local and international markets.

Key words: Kinetic models , Food quality, Food safety, Artisanal Cheese standardisation

**MOLECULAR DOCKING EVALUATION AND ANTICOCIDIAL BIOACTIVITY OF THE
ANTICOCIDIAL POTENTIAL OF POLYPHENOLS EXTRACTED FROM OLEA
EUROPAEA L. KERNELS IN BROILER CHICKENS**

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ABSTRACT

The present investigation evaluates the antiparasitic potential of olive seed ethanoic extract (*Olea europaea* L. var. Chemal) through in vitro assays and complementary in silico analyses against *Eimeria tenella*. Eight bioactive compounds identified in the seed matrix were investigated for their molecular interactions with three *Eimeria tenella* target receptors via molecular docking including Calcium-Dependent Protein Kinase from *Eimeria tenella* (PDB ID:4YSM), Extracellular solute-binding protein family1 (PDB ID: 5IXP and Hexokinase from *Eimeria tenella* (PDB ID: 6KSR). The in vitro results revealed that ethanoic extract of olive pits, at an optimal concentration of 9.89 mg/g, significantly reduced the development of *Eimeria* oo-cysts, causing damage to their surface integrity and cell fragmentation after 24 hours of incubation. Among the eight bioactive molecules studied, 4 exhibited high binding affinities (-7.0 kcal/mol to -9.6 kcal/mol) for major parasitic targets. Three compounds demonstrated a notable multi-target profile. In this regard, 2,3 dihydroamentoflavone interacted with the three proteins; isorhamnetin, oleuropein and 3-p-coumaroylquinic acid all had affinity against two targets. This multitarget interaction pattern demonstrates Chemlal olive pit chemicals' ability to affect multiple antiparasitic pathways simultaneously. This integrated experimental and computational approach highlights the value of olive seed derivatives in developing alternative antiparasitic strategies.

Keywords: Anticoccidial activity; *Olea europaea* L.; *Eimeria* spp.; Molecular docking; Bioactive compounds; Multi-target interaction.

**EVALUATION OF AUTO MECHANIC WORKSHOP ACTIVITIES ON CROP
PRODUCTION IN SELECTED MECHANIC WORKSHOPS IN FEDERAL CAPITAL
TERRITORY, ABUJA, NIGERIA**

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ABSTRACT

The study assessed the impact of roadside mechanic workshop activities on vegetation in selected Municipal Area Councils in Abuja. Soil samples were collected from fifteen auto-mechanic workshop and agricultural land which serves as control; at depths of 0-10cm and 10-30cm. Standard methods were adopted both for field and laboratory analysis. Vegetation density was estimated using the Quadrat method. In Gwagwalada, the mean SCI for the Mechanical Workshop is 2.6% with a standard deviation of ± 2.5 while the control in Gwagwalada recorded a mean SCI of 80.60% with a standard deviation of $\pm 13.83\%$. The SCI result and that of the control in Gwagwalada are significantly different at the 0.05% level of significance. In Kuje, the SCI results are similar with the control having a mean SCI 79%, with a standard deviation of ± 8.60 while the Mechanical Workshop is 6% with a standard deviation of ± 5.83 , both significantly different at 0.05% level of significance. Automechanic workshop staff should be educated on the importance of environmental protection and the potential impacts of the workshop on vegetation and adopt environmentally friendly practices, such as proper waste disposal, regular maintenance of equipment, and use of eco-friendly cleaning products.

KEYWORD: Auto mechanic workshop, vegetation, Surface cover Index, soil, Area councils

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ABSTRACT

Food fortification is one of the most effective, low-cost, and sustainable public health strategies to prevent micronutrient deficiencies on a population scale. By enriching staple foods such as salt, flour, milk, and rice with essential vitamins and minerals, governments and health organizations aim to combat nutritional disorders including anemia, rickets, goiter, and neural tube defects. Pharmacists, as medication experts and accessible healthcare providers, are uniquely positioned to contribute to the planning, implementation, and evaluation of food fortification programs. Their knowledge of pharmacology, toxicology, and drug–nutrient interactions equips them to ensure that fortification is both safe and effective across different population groups. Pharmacists also play a vital role in public education, counseling communities on the benefits of fortified foods while addressing misconceptions and monitoring for potential risks of over-supplementation or interactions with prescribed therapies. Furthermore, pharmacists can support policymakers by contributing evidence-based recommendations and participating in quality control to guarantee the stability and bioavailability of fortified nutrients. In an era where non-communicable diseases and malnutrition coexist, the pharmacist's role extends beyond dispensing medicines to actively promoting preventive healthcare through nutrition. Integrating pharmacy practice into food fortification initiatives can strengthen public health outcomes and advance global efforts against hidden hunger.

Keywords: Pharmacist, Food Fortification, Public Health, Micronutrient Deficiency, Nutrition, Preventive Healthcare

**WATER SECURITY FOR FOOD SECURITY: THE SEAWATER DESALINATION
STRATEGY IN ALGERIA AS A PILLAR OF RESILIENCE**

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ABSTRACT

Algeria is confronting a severe water crisis, with per capita availability below 600 m³/year far under the water poverty line and climate projections indicating a potential 20% decrease in rainfall by 2050. In response, the nation has embarked on an ambitious strategic pivot towards large-scale seawater desalination to secure its water future.

This presentation will outline Algeria's multi-billion dollar national desalination program, a cornerstone of its long-term water security strategy. The government has allocated approximately \$5.4 billion to this initiative, including a recent \$3 billion investment dedicated to its second phase. The core objective is to dramatically increase the share of desalinated water in the national drinking water supply, from 18% currently to 42% upon the completion of ongoing projects, with a medium-term goal of reaching 60% by 2030.

The methodology involves a phased infrastructure rollout. The first phase, which includes five major plants in Oran, Tipasa, Boumerdes, Bejaia, and El Tarf with a capacity of 300,000 m³/day each, is nearing completion. A second phase (2025-2030) will launch new plants in wilayas including Tlemcen, Mostaganem, and Tizi Ouzou. A key feature is the program's reliance on 100% national expertise for construction, reinforcing sovereignty over critical water infrastructure.

Technologically, Algeria has standardized Reverse Osmosis (RO) due to its efficiency and declining production costs.

Key results and discussion points will address the project's broader implications. While the program will boost total production capacity to 3.76 million m³/day, it also faces challenges, including high energy consumption and the environmental impact of brine discharge. The presentation will conclude by exploring Algeria's efforts to mitigate these issues through plans for renewable energy integration, positioning desalination as a sustainable, albeit complex, solution to the nation's water crisis.

Key words: Seawater Desalination; Water Security; Water Scarcity; Reverse Osmosis; Climate Resilience.

**METAPHORS OF PLENTY: A STYLISTIC STUDY OF FOOD SECURITY RHETORIC IN
PRESIDENT TINUBU'S 2025 INDEPENDENCE DAY**

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ABSTRACT

The 2025 Independence Day address by President Bola Ahmed Tinubu underscores the theme of *food security* and *abundance strategies* as fundamental to Nigeria's developmental trajectory. This study examines how metaphors are stylistically employed in the speech to frame the vision of "food for all" and to construct persuasive narratives of agricultural reform. Relying on the stylistic tradition of metaphor analysis, the research identifies conceptual metaphors that underpin the discourse of plenty, scarcity, and sustenance, and explores their rhetorical effects in shaping public perception. From the lenses of Lakoff and Johnson's Conceptual Metaphor Theory (CMT) alongside stylistic tools such as lexical patterning, foregrounding, and cohesion analysis, the study unveils how food-related metaphors are not merely decorative, but serve ideological and persuasive functions. The data, comprising the official text of the 2025 Independence Day speech, are subjected to qualitative stylistic analysis to explicate recurrent metaphorical mappings between agriculture, national survival, and prosperity for food in abundance. Findings suggest that metaphors of growth, nourishment, and harvest dominate the rhetorical construction of food security, projecting abundance as both a developmental necessity and a patriotic duty. The study argues that such metaphors function to naturalise political promises, reinforce collective responsibility, and evoke hope in a period of socio-economic strain. Finally, the research demonstrates the power of metaphor as a discursive tool in political communication, particularly in relation to national policy discourses on food security.

Keywords: Development, Ideology, National Policy, Persuasion

WHEY UTILISATION AND SUSTAINABLE FOOD INNOVATION: FROM DAIRY BY-PRODUCT TO HIGH-VALUE INGREDIENT

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ABSTRACT

Whey represents approximately 85 to 90% of the initial volume of milk used for cheese production. Long considered a simple waste product with high polluting potential due to its high organic load, it now constitutes a strategic resource for the food industry. Its composition, rich in proteins of high biological value (β -lactoglobulin, α -lactalbumin, lactoferrin, immunoglobulins), lactose, minerals (calcium, phosphorus, magnesium) and water-soluble vitamins, makes it a functional ingredient of choice. Recent advances in membrane filtration and biotransformation processes have enabled the development of various applications. On the nutritional level, whey proteins are used in food supplements, dietetic products (sports nutrition, infant nutrition, medical nutrition) as well as technological agents (foaming agents, emulsifiers, gelling agents). Beyond its uses, whey recovery addresses a dual challenge: reducing the environmental impact of its disposal and generating added economic and nutritional value. In a context where sustainability has become an imperative for the food industry, whey perfectly illustrates the transition from a restrictive by-product to an innovative and sustainable ingredient.

Keywords: Whey, recovery, sustainability, food innovation.

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

LEVERAGING COMPUTER VISION IN FOOD QUALITY CONTROL: ADVANCEMENTS, CHALLENGES, AND FUTURE PROSPECTS

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ABSTRACT

The assurance of high food quality and safety represents a critical concern within the complexities of the global food supply chain. Traditional methods of quality control primarily rely on human evaluation and destructive testing, which are often limited by subjectivity, inconsistency, and inefficiency. In contrast, recent advancements in computer vision technology have introduced non-destructive, automated techniques that can significantly improve the accuracy and speed of food quality assessment. This paper systematically explores current applications of computer vision in food quality control, outlines cutting-edge innovations, and discusses the enduring challenges in implementation. Additionally, it highlights the integration of machine learning and deep learning with computer vision to unlock new potentials in predictive analysis and real-time inspection. The paper concludes by identifying key future prospects and research directions, emphasizing the transformative impact on stakeholders across the food supply chain.

Keywords: Computer vision, food quality control, machine learning, image processing, deep learning, non-destructive testing, automation

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

SUSTAINABLE FOOD SYSTEMS: CHALLENGES, INNOVATIONS, AND PATHWAYS FOR GLOBAL FOOD SECURITY

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ABSTRACT

Sustainable food systems are critical to ensuring food security, environmental health, and social equity in the face of growing global challenges such as climate change, population growth, and resource depletion. This paper explores the concept of sustainable food systems, focusing on their environmental, economic, and social dimensions. Key challenges—including greenhouse gas emissions from agriculture, biodiversity loss, and food waste—are analyzed alongside innovative solutions such as regenerative agriculture, circular food economies, vertical farming, and plant-based diets. The role of policy, technology, and consumer behavior in transforming food systems is also discussed. By synthesizing current research and global initiatives, the paper outlines pathways to achieving a resilient and equitable food future..

Key words: Sustainable food systems, Food security, Food waste, Circular economy, Vertical farming, Plant-based diets.

DETECTION AND ANTIBIOGRAM OF MULTIDRUG RESISTANT *STAPHYLOCOCCUS AUREUS* IN FROZEN CHICKEN SOLD IN OYO STATE, NIGERIA

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ABSTRACT

Contamination of food with pathogenic and potentially pathogenic microorganisms is particularly widespread in low- and middle-income countries (LMICs) like Nigeria, where food safety and hygiene practices are often inadequate. The health risks posed by *S. aureus* are pronounced in environments where food production, handling, and consumption occur under unhygienic conditions. This study was designed to detect the presence of *Staphylococcus aureus* in frozen chicken samples collected from vendors across four local government areas in Ibadan, Oyo State, and to evaluate their antibiotic susceptibility profiles. A total of 250 samples were collected, inoculated, and cultured at 37°C for bacterial growth. Thirty-three *S. aureus* isolates were identified, and their antibiotic susceptibility profiles were determined. The isolates showed the least resistance to fluoroquinolones, specifically levofloxacin and ciprofloxacin (3.03% for both), followed by erythromycin, gentamicin, and ofloxacin (12.12%). Higher resistance was observed for ceftriaxone-sulbactam (69.7%), cefotaxime (87.88%), cefuroxime (90.91%), and amoxicillin-clavulanate (93.94%). The highest resistance was recorded against cefixime and imipenem (100%). Alarming, 32 of the 33 isolates were classified as multidrug-resistant (MDR). The multidrug resistance observed in the isolates shows that antibiotic resistance is still prevalent in food animals. Effective monitoring and surveillance programmes, especially of Food Borne Diseases (FBD) and food-related antimicrobial resistance (AMR) in the human population are recommended for monitoring the safety of the food supply chain

Keywords: Multidrug Resistant *S. aureus*, Frozen Chicken, Antibioqram, Nigeria

DUAL ROLE OF DIETARY TRYPTOPHAN IN MEMORY REGULATION

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ABSTRACT

Tryptophan, an essential amino acid obtained through diet, serves as a critical precursor for two competing metabolic pathways with profound implications for brain function and memory. The majority of dietary tryptophan is metabolized through the kynurenine pathway, while a smaller fraction is converted into serotonin. This study investigates the impact of tryptophan metabolism on synaptic plasticity, neurogenesis, and memory consolidation using a combined biochemical and behavioral approach. We treated male Albino Wistar rats with different doses of tryptophan for 4 weeks followed by weekly assessment of memory performance through Morris Water Maze (MWM) and Novel Object Recognition (NOR) tests. High-performance liquid chromatography (HPLC) was used to quantify serotonin and metabolites in hippocampus, while kynurenine in plasma samples. Our findings reveal that low dose of tryptophan improved learning and memory in rats while high dose significantly impaired spatial and recognition memory, correlating with reduced serotonin and increased kynurenic acid levels. Conversely, tryptophan supplementation at high dose was also accompanied by increased Interleukin-6 (IL-6) expression in brain. These results highlight the dual role of tryptophan in memory regulation—through serotonergic signalling and kynurenine pathway modulation—providing potential therapeutic targets for memory-related disorders such as Alzheimer's and Parkinson's-related dementia.

Key words: tryptophan, memory regulation, serotonin, kynurenine pathway, neuroinflammation, cognitive function

**NUTRACEUTICAL VALUE OF POMEGRANATE (*PUNICA GRANATUM L.*): INSIGHTS
INTO LOCAL VARIETIES FROM ARID ENVIRONMENTS**

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ABSTRACT

The pomegranate (*Punica granatum L.*) holds a privileged position among Mediterranean fruit species due to its dual nutritional and medicinal value. Its fruits, which are rich in polyphenols, flavonoids, hydrolyzable tannins, and anthocyanins, are well known for their antioxidant, anti-inflammatory, and cardioprotective properties (Lansky & Newman, 2007; Viuda-Martos et al., 2010). These bioactive compounds confer a high nutraceutical potential to pomegranate, widely investigated for the prevention of chronic diseases, including cardiovascular disorders, certain cancers, and diabetes (Jurenka, 2008; Ismail et al., 2012).

In arid and semi-arid regions, local pomegranate varieties represent a crucial agro-biological heritage. Adapted to drought and high climatic variability, these cultivars often display enhanced biochemical richness, reflected in higher concentrations of secondary metabolites such as punicalagins and ellagic acid (Elfalleh et al., 2011). Traditionally selected by local communities, these rustic genotypes combine ecological resilience with therapeutic interest, and play a central role in dietary and medicinal practices (Ouzid et al., 2018; Medjeber & Saadoun, 2021).

Valorizing these local genetic resources through scientific research and innovative approaches appears strategic for linking agrobiodiversity conservation with nutraceutical development. By integrating ethnobotanical knowledge with modern biochemical assessments, arid-land pomegranates emerge as key resources for human health and as leverage for adaptation to climate change.

Keywords : Pomegranate · *Punica granatum* · Local varieties · Arid environments · Polyphenols · Antioxidants · Nutraceutical value · Agrobiodiversity

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4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

BEYOND NUTRITION: FOOD AS MEDICINE

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ABSTRACT

The concept of *food as medicine* has gained increasing scientific and clinical relevance, bridging the gap between nutrition and therapeutics. Beyond providing essential nutrients, food components such as bioactive compounds, phytochemicals, probiotics, and functional ingredients play a pivotal role in preventing, managing, and even reversing chronic diseases. Emerging evidence highlights the role of dietary patterns in modulating inflammation, oxidative stress, gut microbiota, and metabolic pathways, underscoring food's potential as a non-pharmacological intervention. This approach aligns with the growing demand for integrative and sustainable healthcare strategies. The present work explores the evolving paradigm of food beyond nutrition, emphasizing its therapeutic applications in areas such as cardiovascular health, diabetes management, mental well-being, and immune resilience. By repositioning food as a cornerstone of preventive medicine, this framework encourages interdisciplinary research, innovative product development, and policy strategies aimed at promoting public health through diet-based interventions.

Keywords: Functional foods, nutraceuticals, preventive health, bioactive compounds, food as medicine

**PHYTOCHEMICAL, HAEMATOLOGICAL AND ANTI-TRYPANOSOMAL POTENTIAL
OF *CARICA PAPAYA* LEAF IN RATS INFECTED WITH *TRYPANOSOMA BRUCEI BRUCEI***

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ABSTRACT

Background: Trypanosomiasis remains one of the most significant parasitic diseases affecting humans and livestock in sub-Saharan Africa. Conventional trypanocides are limited by toxicity, cost, and emerging parasite resistance. Medicinal plants such as *Carica papaya* (pawpaw) represent a promising alternative due to their ethnomedicinal applications. Objective: This study evaluated the phytochemical composition, haematological parameters, and in vivo anti-trypanosomal activity of ethanolic leaf extracts of *Carica papaya* in albino rats experimentally infected with *Trypanosoma brucei brucei*. Methods: Ethanol extraction of pawpaw leaves was performed. Acute oral toxicity was determined in rats. Infected rats were treated with different extract doses (100, 200, and 300 mg/kg body weight). Standard drug (berenil) and untreated controls were included. Body weight and haematological indices were monitored, and phytochemical constituents were screened. Results: Phytochemical analysis revealed the presence of tannins, saponins, phenols, cardiac glycosides, flavonoids, and alkaloids. Acute toxicity tests indicated low toxicity (LD₅₀ > 1,500 mg/kg). Rats treated with *C. papaya* extract showed dose-dependent improvement in red blood cell count, haemoglobin concentration, and packed cell volume compared to the negative control. Although the extract did not completely clear parasitemia, it significantly suppressed parasite replication and extended survival. Berenil-treated rats and normal controls exhibited greater weight gain, while extract-treated groups showed moderate weight loss. Conclusion: Ethanol leaf extract of *C. papaya* demonstrated promising anti-trypanosomal and haematoprotective effects, likely due to its bioactive phytochemicals. Though not curative, the extract may serve as an adjunct to conventional trypanocides to enhance therapeutic outcomes. Further studies on isolation of active compounds and mechanistic pathways are recommended.

Keywords: *Carica papaya*, trypanosomiasis, phytochemicals, haematology

IMPACT OF CLIMATE CHANGE ON FOOD AVAILABILITY AND RURAL LIVELIHOODS: A RAJASTHAN PERSPECTIVE

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ABSTRACT

Rajasthan, one of the driest states in India, has long been vulnerable to climatic extremes. In recent decades, the effects of climate change—erratic rainfall, frequent droughts, rising temperatures, and declining groundwater levels—have intensified, directly threatening food production and rural livelihoods. Agriculture in Rajasthan is largely rain-fed, and smallholder farmers, who form the backbone of the rural economy, face increasing uncertainty in crop yields and food availability.

These climatic shifts are not only reducing agricultural productivity but also deepening poverty and food insecurity in rural households. Families often resort to seasonal migration, child labor, or low-paying alternative work to cope with declining farm incomes. Women, who play a central role in household food management, are disproportionately affected, bearing the burden of water collection, food preparation, and ensuring family nutrition in times of scarcity.

This paper focuses on the impact of climate variability on food systems and rural livelihoods in Rajasthan. Using secondary research and field-based insights, it highlights how climate change is reshaping the state's agrarian communities and their coping strategies. The discussion also explores policy and community-based solutions, such as climate-resilient agriculture, watershed management, and social safety nets, as pathways to reduce vulnerability. The study concludes that urgent, context-specific interventions are essential to protect food security and rural life in Rajasthan under the growing threat of climate change.

Keywords: Climate Change, Food Security, Rural Livelihoods, Rajasthan Agriculture, Drought and Migration

**COMPARATIVE ANALYSIS OF PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES
OF HORSERADISH (*ARMORACIA RUSTICANA*) LEAVES AND ROOTS – IMPLICATIONS
FOR FOOD APPLICATIONS**

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ABSTRACT

Horseradish (*Armoracia rusticana*) is a widely used aromatic plant with nutritional and functional potential beyond its culinary role. This study aimed to comparatively evaluate the physicochemical and functional properties of horseradish leaves and roots, with the objective of assessing their suitability for diverse food applications.

Physicochemical analyses included moisture content, ash, pH, titratable acidity, water activity, color parameters, macronutrient composition (proteins, lipids, carbohydrates by difference, fibers), energy value, and mineral content. Functional properties assessed were water and oil holding capacities, gelling ability, swelling capacity, emulsifying capacity and stability, foaming capacity and stability, and bulk density.

The results showed significant differences between leaves and roots. Horseradish leaves exhibited a significantly higher fat content — approximately three times greater than that of the roots — as well as higher ash levels. Conversely, the roots showed lower water activity, indicating potentially better microbial stability during storage. In terms of functional behavior, the leaves demonstrated superior overall performance, with enhanced water and oil holding capacities, better emulsifying and foaming abilities, and greater stability across the functions compared to the roots.

These findings suggest that horseradish leaves offer superior functional advantages and may be valorized as natural emulsifiers, foaming agents, or texture enhancers in food formulations. The comprehensive characterization highlights the potential for full-plant utilization of horseradish in functional food development and sustainable ingredient innovation.

Keywords: horseradish, root, leaves, functional properties, physicochemical analysis

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Scientific Conference Participations

1. Şuiian Bianca, Amariei Sonia, *Research on New Biodegradable Packaging for Food Industry*, International World Energy Conference-III, **Turkey**, 4-5 December 2023.
2. Şuiian Bianca, Amariei Sonia, *Bibliometric Study On Biodegradable Active Food Packaging: Trends, Challenges And Future Directions*, 91th International scientific conference of young scientists and students "Youth scientific achievements to the 21st century nutrition problem solution", **Ukraine**, 7-11 April 2025.
3. Şuiian Bianca, Amariei Sonia, Petraru Ancuța, Avrămia Ionuț, *Evaluation Of Bioactive Compounds From Horseradish Root (Armoracia Rusticana) And Their Antioxidant Potential*, 8th International Food, Agriculture and Veterinary Sciences Congress, **Turkey**, 29-31 May 2025.
4. Şuiian Bianca, Amariei Sonia, *Development of Bioactive Food Packaging Materials with Antiallergenic Potential*, Workshop – Doctoral Days, Ştefan cel Mare University of Suceava, **Romania**, 17-22 June 2025.
5. Şuiian Bianca, Amariei Sonia, Petraru Ancuța, *The Potential Anti-Allergenic Effect Of Horseradish In The Development Of Bioactive Packaging*, 7th International Cappadocia Scientific Research Congress, **Turkey**, 2-4 August 2025.

THE FOODS OF PREGNANT LADIES IN PAKISTAN

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ABSTRACT

This study explores the dietary practices and cultural beliefs surrounding food consumption among pregnant women in Pakistan. Pregnant women in Pakistan often categorize foods as “hot,” “cold,” or “hard,” influencing their dietary choices throughout pregnancy. Early pregnancy commonly involves consuming “cold” foods such as yogurt, lentils, and vegetables to balance the body and reduce morning sickness, while the later trimesters favor “hot” foods like animal proteins and fats to support childbirth. However, socio-cultural beliefs and family influences, especially from mothers-in-law and traditional birth attendants, sometimes restrict nutrient-rich foods, particularly protein sources. Economic constraints also limit access to diverse and nutritious foods including meats, fruits, and vegetables, resulting in reliance on staple carbohydrates such as lentils and bread. Despite nutritional needs increasing during pregnancy, misconceptions and affordability barriers often hinder optimal dietary intake. Addressing these cultural and economic challenges through education and support during antenatal care is critical for improving maternal and fetal health outcomes in Pakistan.

Key words :-pregnant women, hot,cold,hard foods ,nutritional needs.

BIOACTIVE COMPOUNDS IN GOAT MILK: POTENTIAL APPLICATIONS IN HUMAN NUTRITION

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ABSTRACT

Ensuring food safety in fresh produce remains challenging, as conventional methods like washing or peeling are often insufficient to eliminate pesticide residues, particularly systemic compounds. Among emerging decontamination technologies, ozonation and ultrasound have gained particular attention due to their effectiveness, eco-friendliness, and scalability. Ozone, a strong oxidizing agent, can degrade a wide range of pesticide molecules on the surface of fruits and vegetables without leaving harmful residues, as it naturally decomposes into oxygen. Ultrasound, on the other hand, enhances the removal process through cavitation, generating localized microbubbles and turbulence that disrupt pesticide residues and increase the penetration of cleaning solutions. When applied in combination, ozone and ultrasound demonstrate synergistic effects, achieving higher degradation rates while reducing treatment time and energy demand. Beyond their efficiency, these methods are attractive for their sustainability: they reduce the reliance on chemical detergents, lower water consumption, and preserve the sensory and nutritional qualities of produce. Despite promising results, challenges remain regarding standardization of operating parameters, cost-effectiveness in large-scale applications, and regulatory acceptance. Nevertheless, ozonation and ultrasound represent key innovations that could reshape post-harvest treatment practices and contribute to safer and more sustainable food systems.

Keywords: ozonation, ultrasound, pesticide residues, fresh produce, sustainable food safety.

**EFFECT OF INSECURITY ON FOOD SECURITY: THE MODERATING ROLE OF
FARMERS' RESILIENCE IN MARIGA LOCAL GOVERNMENT AREA OF NIGER
STATE, NIGERIA**

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ABSTRACT

This study examines the effect of insecurity on food security. While previous research has reported conflicting findings regarding this relationship, the present study introduced farmers' resilience as a moderating factor. A survey research design was employed, with data collected from 384 farmers in the Shiroro Local Government Area. Using Partial Least Squares Structural Equation Modeling (Smart PLS4), the results revealed that insecurity has a significant negative impact on food security. However, farmers' resilience was found to significantly moderate this relationship, shifting the effect from negative to positive. Based on these findings, it is recommended that the government and relevant stakeholders strengthen security measures in farming communities to safeguard farmers, farmlands, and food supply chains, thereby reducing the adverse effects of insecurity on food security. Furthermore, policies and programs should be developed to enhance farmers' resilience through capacity building, access to resources, adoption of improved farming techniques, and provision of social support systems, as these measures can help mitigate the impact of insecurity and promote sustainable food security.

Keywords: Insecurity, Food Security, and farmers' resilience

**OZONATION AND ULTRASOUND AS SUSTAINABLE EMERGING TECHNOLOGIES FOR
PESTICIDE REMOVAL FROM FRESH PRODUCE**

**MEGHLAUI Zoubeida, MECHIAH Fahima, INOURI Ahlam, BENHOULA Mohammed,
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ABSTRACT

Ensuring food safety in fresh produce remains challenging, as conventional methods like washing or peeling are often insufficient to eliminate pesticide residues, particularly systemic compounds. Among emerging decontamination technologies, ozonation and ultrasound have gained particular attention due to their effectiveness, eco-friendliness, and scalability. Ozone, a strong oxidizing agent, can degrade a wide range of pesticide molecules on the surface of fruits and vegetables without leaving harmful residues, as it naturally decomposes into oxygen. Ultrasound, on the other hand, enhances the removal process through cavitation, generating localized microbubbles and turbulence that disrupt pesticide residues and increase the penetration of cleaning solutions. When applied in combination, ozone and ultrasound demonstrate synergistic effects, achieving higher degradation rates while reducing treatment time and energy demand. Beyond their efficiency, these methods are attractive for their sustainability: they reduce the reliance on chemical detergents, lower water consumption, and preserve the sensory and nutritional qualities of produce. Despite promising results, challenges remain regarding standardization of operating parameters, cost-effectiveness in large-scale applications, and regulatory acceptance. Nevertheless, ozonation and ultrasound represent key innovations that could reshape post-harvest treatment practices and contribute to safer and more sustainable food systems.

Keywords: ozonation, ultrasound, pesticide residues, fresh produce, sustainable food safety.

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ABSTRACT

The purpose of this paper is to analyse why aesthetic food arrangement has a positive effect on our perception. Visual imagery has a deep role in our perception of taste. First of all, the human brain tastes food using the visual sense, even before we take a first bite from it. One effect of us looking at food that is arranged in a visually pleasing, aesthetic way is that we find that food tastier and healthier than the same food, with the same ingredients, arranged in a common way. Here we can speak about the expectation bias, and about the placebo effect, as our expectations of food to taste better once it looks good leads to food actually tasting better. We also identify the halo effect, as a beautiful plate leads to our belief that the food on it is healthier and even more expensive than it actually is. We can think here of the example of fine dining, where food is associated with a very high value of the dish. Color, shape, composition, and symmetry activate the visual cortex, which in turn activates our expectations about the taste of the respective food. Examples of aesthetic food arrangements can be found across cultures. E.g. Japanese kaiseki, which focuses on seasonality and minimalism, French haute cuisine, which focuses on balance and symmetry, and Modernist plating, which presents us with a challenge to symmetry and relies on artistic flair. Psychology and cultural awareness make up the methodological framework.

Keywords: Visual sense, health, halo effect, expectation bias.

SOCIOECONOMIC VARIABLES INFLUENCING FOOD SAFETY KNOWLEDGE AND PRACTICES BAMBARA (OKPA) PUDDING VENDORS IN NSUKKA AGRICULTURAL ZONE, ENUGU STATE, NIGERIA

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ABSTRACT

The study was designed to determine the socioeconomic variables that influence food safety knowledge and Practices of Bambara (okpa) pudding vendors in Nsukka agricultural zone. The Population for the study comprised all okpa pudding vendors in Nsukka agricultural zone. Multi stage sampling procedure was used to select a sample size of 72 respondents. The data for the study was collected using interview schedule. This was administered using android application, Kobo collect. Frequency, mean score, percentage and chi-square analytical tools were used in the analysis of data. The major findings showed that the majority (84.7%) of the respondents have high food safety knowledge. Also the majority (66.7%) of the respondents practice food safety occasionally. The chi square result shows that at $p \leq 0.05$, there was no significant association between knowledge level and level of food safety practices of the respondents. $X^2(1, N=72) df = 1.341, P = 0.247$. also the chi-square result showed that at $P > 0.05$, there is no significant association between age of respondent and frequency of food safety practice $X^2(325.052), df=312, P = 0.294$, monthly income of respondent and frequency of food safety practice $X^2(214.858), df=184, P = 0.059$, level of education of the respondent and frequency of food safety practice $X^2(22.900), df=24, P = 0.526$. Also the chi-square result showed that at $P \leq 0.05$, there was no significant association between knowledge level and age of the respondents. $X^2(4, N=72) df = 3.149, P = 0.533$ and there was no significant association between knowledge level and number of social organization of the respondents. $X^2(3, N=72) df = 0.985, P = 0.805$. The study concluded that food safety knowledge level of okpa vendors does not influence their practice of food safety and socioeconomic variables does not influence the food safety knowledge level and practice. The study recommended that Government and agencies should organize sensitization campaigns and workshops to sustain the levels of food safety knowledge observed and to improve the food safety knowledge of the few that had low level of food safety knowledge.

Keywords: Food Safety Knowledge, Bambara Pudding Vendor

**EDIBLE HERBS AS FUNCTIONAL INGREDIENTS: BIOACTIVE COMPOUNDS SHAPING
FOOD QUALITY AND HEALTH**

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ABSTRACT

Edible herbs are becoming more and more significant to functional foods since they are full of bioactive chemicals that affect both the quality of food and human health. These plants, which include typical culinary herbs like basil, rosemary, and turmeric, as well as less common ones like bitter leaf and neem, have phytochemicals including polyphenols, flavonoids, alkaloids, terpenoids, and essential oils. These components work together to defend against illnesses, kill pathogens, and reduce inflammation. Herbal bioactives have a dual function in food systems: they lengthen shelf life by reducing lipid oxidation and microbial proliferation, while concurrently improving sensory attributes such as flavour, colour, and texture. In addition to preserving food, accumulating data from in vitro, in vivo, and clinical investigations reveals their efficacy in decreasing the risks of chronic diseases, including cardiovascular disorders, diabetes, and particular cancers. The worldwide desire for natural replacements for synthetic chemicals has speed up research into how to integrate herbs to functional foods, nutraceuticals, and dietary supplements. Nonetheless, many challenges continue, especially concerning the bioavailability, stability, and standardization of herbal bioactives under varied processing and storage situations. Conflicting results in clinical research underline the intricacy of turning laboratory data into trustworthy human health outcomes. This review consolidates known information regarding the phytochemical composition, technological applications, and health advantages of edible herbs, categorizing them as promising multifunctional components at the convergence of food science and medicine. By merging food quality and health perspectives, this paper addresses existing knowledge gaps and proposes future research alternatives, including better delivery systems and synergistic investigations of multi-herb formulations. Such findings may motivate the development of novel, evidence-based functional foods that fit with consumer goals for safe, natural, and health-promoting diets.

Keywords: Edible herbs, Functional foods, Bioactive compounds, Antioxidants, Antimicrobial activity, Chronic disease prevention, Food preservation

**IMPROVING DATE PALM FRUIT QUALITY THROUGH BIOCHAR AND COMPOST
APPLICATION IN OASIS ECOSYSTEMS**

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ABSTRACT

In the Algerian Sahara, the date palm is vital to oasis ecosystems. This study examines the effects of compost and biochar derived from date palm waste on the quality of ‘Deglet Nour’ dates. The experiment was conducted at the ITDAS “El-Hadjeb, Biskra” station on 36 date palms over 10 years old. Fertilization treatments included biochar combined with manure and chemical fertilizers, biochar with compost and fertilizers, and biochar alone with either manure or compost. Quality parameters measured at the Tmar ripening stage were moisture content, titratable acidity, and total soluble solids (TSS). Results showed that the biochar-manure-fertilizer treatment reduced titratable acidity (0.06 meq/100g) compared to the control (0.287 meq/100g). The highest moisture content (15%) was observed with biochar-manure treatment, while the mineral fertilizer treatment had the lowest moisture content (9.5%). The highest TSS concentration (7.5%) was recorded in the biochar-manure-fertilizer treatment. These findings suggest that combining biochar with manure and chemical fertilizers enhances date quality and offers a sustainable fertilization approach for oasis agriculture.

Keywords: Algeria, Biochar, Compost, Date Fruit, Fertilization, Quality.

ARBUTUS (ARBUTUSUNEDO L.): ECONOMIC AND FOOD IMPACTS

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ABSTRACT

Wild edible plants, such as the strawberry tree (*Arbutus unedo* L.), play a role in community nutrition and health. Belonging to the Ericaceae family, arbutus grows on forest edges and rocky slopes, and is widespread in the Mediterranean region and North Africa. In Morocco, it is known as “Sasnou” and is used in traditional medicine for its therapeutic properties. Its various parts (leaves, roots, fruit) can have socio-economic uses.

The strawberry tree (*Arbutus unedo* L.) is still an under-exploited plant in Morocco, although recent research has highlighted its many economic and dietary benefits. Many studies agree that this plant is an important source of nutrients, such as fiber, protein, carbohydrates and minerals, making it a healthy alternative for the diet. In particular, it is rich in phytonutrients, such as polyphenols, recognized for their antioxidant, urinary antiseptic, anti-inflammatory, anti-diarrheal, anti-hypertensive and anti-diabetic properties (thanks in particular to the exploitation of the roots). However, knowledge of the ecological conditions favorable to arbutus cultivation remains limited. Some studies suggest that the plant's geographical distribution is correlated with specific climatic conditions, but others have failed to draw clear conclusions about the exact factors influencing its growth. This uncertainty highlights the need for further research into the ecological conditions and development programs for this species, to ensure food security and the sound management of natural resources.

In conclusion, the strawberry tree (*Arbutus unedo*) has significant nutritional and economic potential, but. Research is essential to identify the optimal ecological conditions and make the most of its phytonutritional properties.

Keywords: Arbutus (*Arbutus unedo* L.) ; biogeographical distribution ; potential socio-economic uses ; nutritional value.

**THE IMPORTANCE OF MICROBIAL BIOPREPARATIONS IN IMPROVING MEAT
QUALITY OF SMALL RUMINANTS: A REVIEW**

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ABSTRACT

The incorporation of probiotics as dietary additives has been linked to several positive outcomes, including enhanced carcass weight, improved color, tenderness, flavor, muscle fiber characteristics, water retention capacity, and a healthier fatty acid composition in meat. Accordingly, this review highlights the role of probiotics in improving meat quality in small ruminants. While many advantages have been reported, the results across studies remain inconsistent, and the underlying mechanisms of action are not yet fully clarified. Such discrepancies may stem from variations in probiotic strains, dosages, duration of supplementation, nutritional regimes, animal breed, age, and overall health status. This review offers an integrated perspective on the application of probiotics in small ruminant production and their influence on meat quality.

Keywords. cellulytic bacteria, probiotics, meat quality; small ruminants, include rumen microbiota, sheep

PRODUCTION OF RAW STARCH HYDROLYZING α -AMYLASE BY *BACILLIS SUBTILIS* SUBSP. *SUBTILIS* AND ITS APPLICABILITY IN IMPROVING FOOD NUTRITION

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ABSTRACT

Microbial amylases are important enzymes used in starch hydrolysis in food and fermentation industries. This study describes the suitability of *Bacillus subtilis* subsp. *subtilis* for economical production of amylase in solid state fermentation (SSF) using wheat bran (110 U/g substrate). High amylase production (2000U/g substrate) was attained at pH 6.0 and 30°C after 72 h with the supplementation of starch and sodium nitrate to the SSF medium. The enzyme was concentrated using lyophilization followed by dialysis. Amylase showed optimal activity at pH 7.0 and 60°C. The rate of starch hydrolysis increased with increase in reaction time that stabilized after 30 min. Enzyme resulted in efficient hydrolysis of processed and raw starches (cereal flours) in a time dependent manner. End products include glucose, maltose and oligomers in processed and raw starches as confirmed by thin layer chromatography. Therefore, the bacterial amylase is economical, thermostable and neutral having potential in improving food nutrition by saccharification of raw and processed starch. The important findings of this study will be presented.

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

FOOD SAFETY REGULATIONS AND CONSUMER AWARENESS

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ABSTRACT

Food safety is a critical component of public health that ensures the protection of consumers from foodborne diseases, contamination, and adulteration. With globalization and the expansion of food supply chains, the role of food safety regulations has become increasingly important in maintaining quality standards from production to consumption. Effective regulations, such as the Hazard Analysis and Critical Control Points (HACCP), Food Safety and Standards Authority of India (FSSAI) guidelines, and Codex Alimentarius standards, provide a framework for controlling hazards and ensuring safe practices. However, the effectiveness of these regulations depends largely on consumer awareness and participation. Educated consumers are more likely to read food labels, demand compliance, and report unsafe practices, thereby encouraging industries to adhere to regulatory norms. In many developing countries, limited awareness leads to weak enforcement and higher risks of foodborne illnesses. Public health campaigns, digital platforms, and community-based interventions play a crucial role in bridging this gap. The integration of regulatory frameworks with consumer education creates a sustainable system where both industry and consumers contribute to food safety. Therefore, enhancing consumer awareness alongside strengthening regulations is essential to safeguard health, promote trust, and ensure sustainable development in the food sector.

Keywords: Food Safety, Regulations, Consumer Awareness, Foodborne Diseases, HACCP, FSSAI, Codex Alimentarius, Food Supply Chain, Labeling, Adulteration, Public Health, Risk Management, Compliance, Sustainability.

**PERSONALIZED NUTRITION AND GENOMICS – A NEW FRONTIER IN DIETARY
HEALTH**

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ABSTRACT

Advances in genomics and data science are transforming the way we understand human nutrition, giving rise to the field of personalized nutrition—a tailored approach to diet that considers an individual's genetic makeup, microbiome, lifestyle, and metabolic profile. Moving beyond general dietary guidelines, personalized nutrition aims to optimize health outcomes, prevent chronic diseases, and improve overall well-being through interventions that are uniquely suited to each individual.

This session explores the current scientific developments and applications of nutrigenomics, including how specific genetic variations influence nutrient metabolism, food intolerances, disease susceptibility, and dietary response. It will also address emerging technologies such as DNA-based diet plans, gut microbiome analysis, and wearable health trackers that feed into precision nutrition platforms. Additionally, the presentation will critically examine the ethical, social, and economic implications of these technologies, including issues of accessibility, data privacy, and the potential for widening health disparities.

Drawing on interdisciplinary research from nutrition science, genetics, and bioethics, this session aims to assess the promise and limitations of personalized nutrition. It will also discuss how this emerging field can be integrated into public health strategies and clinical practice, while ensuring equitable access and responsible implementation.

Keywords:

- Personalized nutrition
- Nutrigenomics
- Precision health
- Microbiome and diet
- Genetic variation

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

FROM FOOD SECURITY TO FOOD SOVEREIGNTY: REFRAMING THE RIGHT TO FOOD IN INTERNATIONAL HUMAN RIGHTS LAW

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ABSTRACT

The right to food has long been articulated within international human rights discourse as an essential component of the right to an adequate standard of living under various instruments such as the International Covenant on Economic, Social and Cultural Rights (ICESCR), Universal Declaration of Human Rights (UDHR), 1948, Convention on the Rights of the Child (CRC), 1989, FAO's Right to Food Guidelines (2004) etc. However, the prevailing focus on *food security*—ensuring availability, accessibility, and adequacy—has been critiqued for its state-centric, quantitative, and market-driven orientation, which often sidelines issues of equity, sustainability, and community agency. In response, the emerging paradigm of *food sovereignty* seeks to reframe the right to food by emphasizing peoples' rights to define their own food systems, protect traditional agricultural practices, and prioritize ecological and cultural sustainability over purely economic efficiency. This paper critically examines the evolution of the right to food in international human rights law, tracing its normative development from the 1948 Universal Declaration of Human Rights to contemporary debates at the Food and Agriculture Organization (FAO), the UN Committee on World Food Security, and the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP). By examining the limitations of the food security framework in addressing structural inequalities—such as land dispossession, corporate concentration in global food chains, and the marginalization of indigenous and smallholder farmers—this study argues that food sovereignty offers a more holistic and future-oriented legal vision. It situates food sovereignty within broader movements for environmental justice, climate resilience, and the realization of sustainable development goals, while also exploring its contested relationship with trade liberalization regimes under the World Trade Organization (WTO) and intellectual property rights under the TRIPS Agreement. The paper contends that reframing the right to food through a sovereignty lens requires a reconceptualization of international legal obligations, moving beyond minimum subsistence guarantees to affirming collective rights to land, seeds, and biodiversity. It further highlights the need for stronger accountability mechanisms to bridge the gap between normative recognition and practical enforcement at both global and domestic levels. Ultimately, this research underscores that the future of the right to food lies not merely in securing calories for survival but in empowering communities to exercise control over their food systems in a manner consistent with human dignity, cultural identity, and ecological sustainability.

Keywords: Right to Food; Food Security; Food Sovereignty; International Human Rights Law; Sustainable Development.

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

NANOTECHNOLOGY APPLICATIONS IN FOOD PRESERVATION AND SAFETY

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ABSTRACT

Nanotechnology is increasingly being explored in the food sector as a powerful tool to enhance preservation and safety. The incorporation of nanomaterials into food packaging has led to the development of active and intelligent systems that extend shelf life, inhibit microbial growth, and monitor product freshness in real time. Nano-encapsulation of antioxidants, antimicrobials, and other bioactive compounds not only improves their stability but also allows controlled release, ensuring better nutritional quality and functionality. In terms of food safety, nanosensors have shown great potential in rapidly detecting pathogens, toxins, and chemical contaminants with high accuracy, reducing the risks of foodborne illnesses. These advancements help reduce the use of chemical preservatives and support sustainable preservation methods. Despite these benefits, concerns regarding toxicity, environmental impact, and the lack of standardized regulations remain significant challenges for the large-scale application of nanotechnology in the food industry. Addressing these issues is crucial for ensuring consumer trust and safety. Overall, nanotechnology presents a promising frontier in food science, with the potential to revolutionize preservation strategies, improve safety standards, and contribute to sustainable and healthier food systems.

Keywords: Nanotechnology, Food preservation, Food safety, Nanosensors, Packaging

**EXPLORING THE INTERSECTION OF FOOD STUDIES AND PHARMACY: THE
IMPACT OF DIETARY INTAKE ON DRUG EFFICACY AND SAFETY**

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ABSTRACT

The interaction between food and pharmaceuticals is a growing area of interdisciplinary concern, merging the fields of food studies and pharmacy. Dietary components can significantly alter the pharmacokinetics and pharmacodynamics of medications, affecting their absorption, metabolism, distribution, and excretion. These interactions may enhance or diminish drug efficacy, or increase the risk of adverse effects. For example, grapefruit juice can inhibit cytochrome P450 enzymes, leading to increased blood concentrations of certain medications, while high-calcium foods may interfere with the absorption of antibiotics such as tetracyclines. This abstract explores how common dietary habits and specific nutrients influence drug behaviour in the body, highlighting the importance of nutritional awareness in pharmaceutical care. By examining current research and clinical guidelines, this study emphasizes the need for closer collaboration between dietetics and pharmacy professionals to optimize treatment outcomes and ensure patient safety. Understanding food–drug interactions is essential for advancing personalized medicine and improving health education.

Keywords: Food-drug interactions, pharmacokinetics, pharmacodynamics, cytochrome P450, nutrition-drug interaction, personalized medicine, pharmaceutical care, patient safety.

ICONFOOD'25

4th INTERNATIONAL CONGRESS on FOOD RESEARCHES

REGULATORY ASPECTS OF FUNCTIONAL FOODS AND NUTRACEUTICALS

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ABSTRACT

In recent years, the line between food and medicine has gotten harder to see, especially because of the growing popularity of functional foods and nutraceuticals. These products are often sold as natural and healthy alternatives to regular medicines and are especially popular with younger people. This group of people tends to prefer natural ways to stay healthy, is more skeptical of traditional drugs, and often follows health trends that come from social media. Even though these products are used a lot, they are not always well-regulated. Their health claims can be unclear, and there isn't much solid science to back them up. Unlike medicines, they usually don't go through strict testing and aren't checked as carefully by government agencies. This creates problems when it comes to safety, how well they work, proper dosages, and possible interactions with other medicines. Pharmacists are now playing a bigger role in helping people choose wisely in this area, offering advice based on real evidence and pushing for better rules and oversight. This study looks at the rules that govern these products, how people choose them, and how pharmacists are adapting to this changing area of health, especially as it affects the choices of today's younger generation.

KEYWORDS: Functional foods, Nutraceuticals, Dietary supplements, Social media influence, Gen Z health choices.

**FACTORS INFLUENCING WILLINGNESS TO PAY MORE FOR ORGANIC FOOD: A
CROSS-COUNTRY ANALYSIS**

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ABSTRACT

This study explores the key factors influencing individuals' willingness to pay for organic food, particularly natural milk and olive oil. Motivated by the perception that organic food is healthier than conventional alternatives, the research involved a two-phase online survey conducted between January 2022 and August 2024. A total of 233 valid responses were collected from participants in Albania, Algeria, Georgia, and Türkiye.

Using SPSS software (Version 26), the data were analysed through descriptive statistics, cross-tabulation, and Chi-square tests to assess the relationship between demographic factors and willingness to pay for organic products. The findings revealed that nationality and age group significantly impact willingness to pay, while gender and educational level do not show a statistically significant influence.

The study suggests that targeted strategies focusing on specific age groups (especially Generations X and Z) and national contexts could improve organic food marketing and adoption. Future research is encouraged to include broader demographic samples and additional countries to strengthen the generalizability of the findings.

Keywords: Consumer behaviour, Organic food, Chi-square test, Willingness to pay, Green consumerism.

**ECONOMIC BURDEN OF FOODBORNE DISEASES: A MEDICAL LABORATORY
APPROACH TO DETECTION AND PREVENTION**

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ABSTRACT

Foodborne diseases remain a major global challenge, affecting millions of people each year and creating both health and economic burdens. Contamination of food with pathogenic bacteria, fungi, parasites, and chemical residues not only leads to acute illness but also contributes to long-term complications, loss of productivity, and increased healthcare costs. The present study focuses on understanding the economic implications of foodborne illnesses while highlighting the role of medical laboratory techniques in early detection and prevention. Standard diagnostic approaches such as microbial culture, serological testing, and molecular assays provide reliable methods for identifying causative agents of contamination. Laboratory-based surveillance ensures timely intervention, which reduces the scale of outbreaks and minimizes hospital admissions. Economically, early detection through laboratory diagnostics can lower treatment expenses, decrease workforce absenteeism, and safeguard the food industry from losses due to recalls and trade restrictions. Preventive laboratory testing further reduces the strain on healthcare systems by enabling safer food distribution chains. This paper emphasizes that integrating affordable, rapid, and accurate diagnostic tools into food safety frameworks is essential for reducing both the health risks and the financial costs associated with foodborne diseases. Strengthening laboratory capacities and linking them with national food safety policies can contribute to sustainable public health outcomes and economic resilience.

Keywords: Food borne diseases, Medical laboratory, Food safety, Economic burden, Prevention

**POMEGRANATE (*Punica granatum* L.) PEEL AND ARIL EXTRACTS AS NATURAL LIPID-
LOWERING AGENTS: EVIDENCE FROM A RAT MODEL**

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ABSTRACT

Introduction and Purpose: *Punica granatum* L. is claimed to provide several health benefits. Some studies have reported a relationship between pomegranate consumption and the prevention of oxidative stress, diabetes, inflammation, cancer, and the development of cardiovascular disease. This study aims to evaluate the antioxidant and hypolipidemic properties of phenolic-rich extracts from pomegranate peels (PPPE) and arils (PAPE) collected in the central area of Morocco (plans of Tadla, Beni Mellal, Morocco).

Materials and Methods: We analyzed the antioxidant activity, total phenolic content, and flavonoids of the different secondary metabolites of pomegranate, as well as its phytochemical screening. The hypolipidemic activity was studied in a rat model that was injected intraperitoneally with Triton WR-1339. The animals were grouped as follows: a normolipidemic control group, a hyperlipidemic group, a simvastatin (reference) group, and a phenolic extract-treated group. After 24 hours of treatment, serum lipid profiles were investigated using commercially available kits.

Results: The total phenolic and flavonoid content were 283.86 ± 17.89 and 166.90 ± 18.10 mg GAE/g dw and 185.37 ± 3.05 and 57.43 ± 0.41 mg QE/g dw, respectively, for the peels and arils. The antioxidant activity was evaluated using DPPH and hydrogen peroxide scavenging assays, and the ferric reducing antioxidant power (FRAP). The IC₅₀ value for DPPH and FRAP inhibition activity was highest for the peel extract compared to the aril extract. Similarly, peel extract exhibited a more potent antioxidant effect than aril extract in terms of its capacity to scavenge hydrogen peroxide radicals. Administering the peel and aril extract significantly ($p < 0.001$) reduced the serum levels of total cholesterol (TC), triglycerides (TG), low-density lipoprotein (LDL), and very-low-density lipoprotein (VLDL), as well as the atherogenic index (AI). However, the concentration of high-density lipoprotein (HDL) was

significantly higher ($p < 0.001$) in the treated groups than in the hyperlipidemic control rats induced by Triton WR-1339 after 24 hours of treatment.

Discussion and Conclusion: These results reflect the protective effects that pomegranates can provide against metabolic disorders such as atherosclerosis and cardiovascular disease. Due to these properties, studies can be extended to explore their potential applications in food preservation and as health supplements and nutraceuticals.

Key Words: Antioxidant activities, flavonoids, hypolipidemic activity, polyphenols, *Punica granatum* L.

**TURNING WASTE INTO NUTRITION: SINGLE CELL PROTEIN PRODUCTION BY
*CELLULOSIMICROBIUM CELLULANS***

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ABSTRACT

Introduction and purpose: The growing need for protein sources that are sustainable has led microbial biomass or single-cell protein (SCP) into the limelight as an alternative option. Agro-industrial lignocellulosic residues, like soybean meal and wheat straw, are abundant and inexpensive substrates for microbial protein. The current research was focused on assessing the capacity of *Cellulosimicrobium cellulans*, which is a cellulolytic bacterium, to produce SCP from pretreated lignocellulosic materials as a fermentation substrate.

Materials and Methods: The experiment was performed with *Cellulosimicrobium cellulans* inoculated in glucose (1%), yeast extract (1%), soybean meal (2%), and wheat straw (4%) fermentation medium supplemented with essential mineral salts. Wheat straw and soybean meal were treated with 2% NaOH and autoclaved at 121°C 15psi for 1 hour. The fermentation was performed in shaking incubators at 37°C for 72 hours. Following fermentation, the broth was centrifuged and filtered at 6000 rpm for 5 minutes. The obtained pellet was harvested as SCP. Bacterial cultures during the process were maintained on nutrient agar and broth media.

Results: Fermentation resulted in apparent biomass formation as microbial pellets, confirming SCP production. Pretreatment of lignocellulosic waste had a dramatic effect on substrate digestibility and microbial growth. While protein quantification was not included in the study, pellet recovery was evidence of successful SCP biosynthesis employing agricultural residues as the carbon source.

Discussion and Conclusion: The current research highlights the viability of *Cellulosimicrobium cellulans* for transforming cellulosic waste into single-cell protein. This is a sustainable and cost-effective process for protein production, which is highly significant in light of food and feed security worldwide. The results corroborate the viability of pretreated lignocellulosic waste as a substrate for microbial fermentation system in SCP production.

Key Words: Single-Cell Protein, *Cellulosimicrobium cellulans*, lignocellulosic waste, fermentation, sustainability.

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ABSTRACT

Food safety is a growing public health concern as dietary patterns, globalization of the food trade, and industrial processing increase the risk of contamination, adulteration, and exposure to toxic substances. Pharmacy practice, traditionally centered on medicines, now plays a vital role in addressing food-related toxicological challenges due to the direct implications on health and therapeutic outcomes. Pharmacists are uniquely positioned to identify, monitor, and manage food safety concerns by bridging knowledge between toxicology, nutrition, and pharmacotherapy. Foodborne toxins may arise from biological sources, such as microbial pathogens and mycotoxins, or from chemical contaminants including pesticides, heavy metals, and adulterants. Chronic exposure to such agents contributes to cancer, organ damage, reproductive disorders, and altered drug metabolism. For instance, excessive pesticide residues in fruits or mercury in fish can interact with prescribed medications, complicating patient therapy. Pharmacists can contribute to food toxicology through patient education, pharmacovigilance, and research into the mechanisms of toxicity and safe dietary practices. Moreover, the emergence of functional foods and nutraceuticals has blurred the boundary between diet and drugs, demanding a greater understanding of food–drug interactions. Counseling patients about avoiding high-risk combinations, such as grapefruit juice with statins or dairy products with certain antibiotics, enhances therapeutic safety. In addition, pharmacists play a role in ensuring food supplements adhere to regulatory standards, thereby reducing the risks of adulteration and misleading claims. By integrating food safety principles into daily practice, pharmacists can expand their contribution to preventive healthcare, reducing the burden of foodborne illnesses and toxic exposures. Strengthening collaboration between pharmacy professionals, food scientists, and public health agencies is essential to build a safer food environment. Ultimately, food safety and toxicology represent a vital frontier in pharmacy practice, aligning with its mission to protect and promote health.

Keywords:

Food safety, Toxicology, Pharmacy practice, Food–drug interactions, Contaminants, Public health, Nutraceuticals, Functional foods, Adulteration, Pharmacovigilance, Patient safety, Preventive healthcare.

UDC: 619:616.006.447-097.3:636.22.2:578

**FOODBORNE CLOSTRIDIAL INFECTIONS: RISK ASSESSMENT AND CONTROL IN
ANIMAL-ORIGIN PRODUCTS**

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ABSTRACT

Introduction. Foodborne clostridial infections, mainly caused by *Clostridium perfringens*, *Clostridium botulinum*, and *Clostridium difficile*, represent a serious threat to food safety and public health. Among these, *C. perfringens* is one of the most frequent causes of foodborne outbreaks worldwide, primarily associated with meat and dairy products of animal origin. The persistence of clostridial spores in food-processing environments and their resistance to heat and disinfectants complicate risk management strategies.

Materials and Methods. This study was carried out as a literature-based review focusing on foodborne clostridial infections in animal-origin products. The following methodological steps were applied: Data Sources: Scientific articles and reviews published between 2010–2024 were retrieved from PubMed, Scopus, Web of Science, and Google Scholar. In addition, official reports from the World Health Organization (WHO) and Food and Agriculture Organization (FAO) were included. 2. Inclusion Criteria: Publications addressing the prevalence, pathogenicity, diagnostic methods, and preventive strategies for *Clostridium perfringens*, *Clostridium botulinum*, and *Clostridium difficile* in meat, dairy, and other animal-origin products. 3. Analysis: Extracted data were summarized and compared to identify trends in epidemiology, modern diagnostic approaches (PCR, NGS), and effective preventive measures (probiotics, natural antimicrobials, hygiene protocols, packaging technologies).

Results. The review of recent studies demonstrates that *Clostridium perfringens* is the most common clostridial pathogen associated with foodborne outbreaks, particularly linked to meat and dairy products of animal origin. Epidemiological data indicate that improper refrigeration, insufficient cooking, and cross-contamination are the main contributing factors to outbreaks. Advances in molecular diagnostic methods, including PCR, multiplex PCR, and next-generation sequencing, have significantly improved the speed and accuracy of detecting toxigenic *Clostridium* strains in food samples. These methods allow not only rapid identification but also genetic characterization of virulence factors, enhancing outbreak investigations. Preventive strategies evaluated in recent literature highlight the effectiveness of strict temperature control, improved hygienic processing, and the application of novel approaches such as natural antimicrobials, essential oils, probiotics, and modified-atmosphere packaging.

Conclusion. Clostridial foodborne infections remain a significant global concern due to their persistence in the food chain and their ability to cause severe health outcomes. The results of this review underline the importance of continuous risk assessment in animal-origin products, where improper handling and processing are the leading causes of contamination. Future efforts should focus on integrating innovative technologies with traditional hygiene measures to ensure food safety and protect public health.

Keywords: *Clostridium perfringens*, foodborne infections, animal-origin products, food safety, risk assessment, control measures

**EPIDEMIOLOGICAL STUDY OF DETERMINANTS OF LOW BIRTH WEIGHT IN
YEMEN**

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ABSTRACT

Background: Low birth weight (LBW) is a critical driver of neonatal morbidity, mortality, and long-term health risks. In Yemen, conflict, food insecurity, and health system collapse since 2015 have intensified LBW prevalence. Estimates from 2015–2025 show consistently high rates, often exceeding 35% in hospitals and above global averages, maternal undernutrition, anemia, poor antenatal care, and adolescent pregnancy are key determinants requiring urgent intervention.

Methods : This study is a secondary-data synthesis combining UNICEF-WHO estimates, SMART surveys, and Yemeni facility studies (2015–2025). Key sources included global LBW estimates, nutrition reports, and hospital-based epidemiologic studies. LBW was defined as birth weight <2500 g. A year-by-year LBW prevalence series (2015–2025) was built using reported data, modeled trends, and cautious extrapolations. Only aggregated, publicly available data were used, ensuring no ethical concerns with individual data.

Results: National household data on LBW in Yemen are sparse, with the 2013 DHS as the main baseline. SMART surveys in 2018 focused more on child malnutrition, leaving birthweight data incomplete. Hospital studies (Taiz, Sana'a, tertiary centers) report LBW rates of 35–39%, higher than national estimates. Modeled national LBW prevalence rose from 24% in 2015 to ~28.5% in 2025, with values after 2020 extrapolated. These modeled figures reflect the impact of conflict, food insecurity, and weak health systems. Subnational hospital data show referral bias but highlight hotspots with extremely high LBW burdens. Maternal under-nutrition and poor dietary intake are leading contributors to LBW in Yemen. Maternal anemia is strongly linked to LBW, with adjusted odds ratios around 1.5–2.0. Inadequate ANC, adolescent pregnancy, rural poverty, and displacement further increase risk. Overall, conflict-driven food insecurity and service disruption remain the strongest contextual drivers.

Conclusion: Yemen continues to face high LBW prevalence, mainly due to maternal under-nutrition, anemia, poor ANC, and conflict-related food insecurity. National estimates place LBW in the upper-

20% range, while hospitals report even higher localized burdens. Improving maternal nutrition, strengthening ANC, and enhancing birthweight surveillance are urgent priorities.

Key word: Epidemiological -LBW - Health-Yemen

APPLICATION OF BACTERIOPHAGE IN FOOD SAFETY

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ABSTRACT

In recent years, there has been a growing interest in natural antimicrobial agents, prompted by shifts in consumer views on the use of chemical preservatives for food safety. Bacteriophages are viruses that target bacteria and are utilized in the food industry as a biological control mechanism to diminish or eradicate pathogenic microorganisms in food products. They are classified as natural antimicrobials, and their effectiveness in managing bacterial infections within the agricultural and food sectors has resulted in the creation of several phage products. The proliferation of bacterial resistance to commercially accessible antimicrobial treatments is a significant global issue. Phage treatment may serve as a suitable substitute for chemical preservatives. Considering the prevalent emergence of bacterial resistance to antimicrobial agents, the application of bacteriophages may represent a superior strategy for preventing the growth of pathogenic bacteria and offer opportunities for the development of new antimicrobial agents to diminish the incidence of bacterial infections.

Keywords: Bacteriophage, Antimicrobial agent, pathogens, Natural preservative.

**PROCESS OPTIMIZATION OF GAMMA IRRADIATION ON ACRIDITY CONTENT OF
NIGERIA XANTHOSOMA SAGITTIFOLIUM SPECIES**

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ABSTRACT

Nigeria *Xanthosoma sagittifolium* specie (NXs 001) is a cocoyam variety cultivated for its corms and referred to locally as Edeocha. Its high acidity content hinders their utilization as components of food formulation. The cocoyam was exposed to gamma radiation at doses of 20Gy, 40Gy, 80Gy, 120Gy and 150Gy and stored for 28 weeks to investigate how the radiation doses affected its acidity factor. Response Surface Methodology (RSM) was used to study the impact of radiation dose and storage time on the acidity content and to predict the optimization conditions. Statistical analysis was conducted to determine the primary and interaction effects of dose rates and storage time on acidity content. The main effects and interactions sensitive analysis results showed a substantial impact on the acidity content at dosages over 80Gy. The prediction model indicated that the optimization dose and storage time to achieve a 50% reduction in the acidity content were 70Gy and 13weeks, respectively. The study's findings demonstrated that RSM was a great technique for modelling and prediction studies.

TRADITIONAL FOOD BASED MEDICINE TO TREAT THYROID DYSFUNCTION

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ABSTRACT

Thyroid hormones are essential for normal growth and development in children. Nutritional factors are closely related to thyroid dysfunction due to deviation from normal physiology of the gland. Iodine, a main constituent of thyroid hormones (T3 and T4), deficiency is one of the commonest causes of hypothyroidism in children and adults, worldwide. Other micronutrients, such as Cruciferous vegetables, Pearl Millet, Soy products and Cassava, were also attributed to cause thyroid dysfunction. Environmental factors, namely, contamination of water with goitrogens could also contribute to the aetiology of goitre in some endemic areas. Dietary advice and avoidance of excessive use of goitrogens in diet are part of guidance on nutritional safety that needs to be established, especially in the areas of endemicity. In this study the receptor molecule docked with phytochemical compounds to inhibit the dysfunction of the thyroid to find the high binding energy to treat the diseased state to normal condition.

Keywords: Cruciferous vegetables, Goitrogens, Iodine, Micronutrients, Millet, Soy, Thyroid

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HERBAL NUTRACEUTICALS AND THEIR ROLE IN PREVENTIVE PHARMACY

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ABSTRACT

The integration of herbal bioactives into food-based products has created a new dimension in preventive healthcare and pharmacy. Herbal nutraceuticals, derived from plant sources such as turmeric (curcumin), green tea (catechins), garlic (allicin), and ginseng (ginsenosides), provide therapeutic benefits in addition to their nutritional value. These compounds have been scientifically validated for their antioxidant, anti-inflammatory, antimicrobial, and chemopreventive properties, making them promising agents for the management of lifestyle-related diseases including hypertension, type 2 diabetes, obesity, and certain cancers. In the pharmaceutical field, research has advanced the formulation of herbal nutraceuticals into capsules, functional drinks, and nano-delivery systems, thereby improving stability, absorption, and targeted action. Unlike synthetic drugs, these products offer fewer side effects, better patient compliance, and sustainable long-term benefits, which align with the principles of preventive pharmacy. However, concerns remain regarding standardization of plant extracts, variability in bioactive content, and the need for rigorous clinical trials to establish efficacy and safety. Regulatory challenges also limit their integration into mainstream pharmaceutical practice. Despite these limitations, herbal nutraceuticals represent a vital intersection of food science and pharmacy, offering a cost-effective and natural approach to enhance public health and reduce the burden of chronic diseases.

Keywords: Herbal Nutraceuticals, Preventive Pharmacy, Chronic Diseases, Phytochemicals

**LIGHT SCATTERING IN DYNAMICS AND RHEOLOGY OF MIXTURES OSA OF
STARCH-XANTHAN IN SOLUTION FOR FOOD PREPARATIONS**

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ABSTRACT

Octenyl succinic anhydride modified starches have effective emulsifying properties, due to the addition of bifunctional groups that are both hydrophilic and hydrophobic. The surface properties combined with the low price of OSA starch have made it a surfactant of choice in the composition of food emulsions (salad dressing, mayonnaise, or to partially substitute the excessively expensive sodium caseinate proteins in the composition of dairy products (creamy yogurt, cheeses, cheese preparations, etc.). Therefore, it is important to focus on the association of starch OSA with polysaccharides, given their complementary functional property, namely, surface activity and gelation, depending on the physicochemical environment and temperature, mixtures of amphiphilic biopolymers and polysaccharides which are known to develop either synergistic interactions.

The objective of this work is to attempt to clarify the interactions between OSA of Starch (octenyl succinic anhydride modified starches) and xanthan in solution, by determining the physicochemical characteristics of the aqueous mixture (particle size distribution by DLS and turbidity), as well as the rheological properties under variable shear, in oscillatory regime and as a function of temperature.

Keywords: DLS; interactions; OSA starch; rheology; xanthan.

**CONSUMERS' ACCEPTABILITY OF SWEETENED CARDABA BANANA (*Musa acuminata*
x balbasiana) AS SIOPAO FILLING**

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ABSTRACT

This study investigated the sensory attributes and overall acceptability of sweetened “cardaba” banana as a novel siopao filling, with specific focus on taste, aroma, texture, appearance, and general consumer preference. Thirty panelists composed of faculty members from the Teacher Education Program (n=10), Bachelor of Technology and Livelihood Education students (n=10), and administrative staff (n=10) participated in the evaluation. Descriptive statistics, Mean, and Analysis of Variance (ANOVA) were employed, with Tukey’s test utilized to further examine significant differences among treatments.

Findings revealed that Treatment 3 consistently achieved the highest mean scores, being described as “sweet-tasting,” with a “pleasant aroma,” “soft and fluffy” texture, and a “visually appealing white appearance,” all of which contributed to a “very much liked” general acceptability rating. Statistical analysis showed no significant differences among treatments in terms of taste and appearance; however, significant variations were observed in aroma, texture, and overall acceptability. Based on these results, Treatment 3 is recommended for potential production and commercialization as a viable food innovation.

Future research is recommended to highlight the nutritional benefits and functional properties of sweetened “cardaba” banana by determining its physicochemical characteristics, pH level, moisture content, and nutrient composition. Additionally, shelf-life studies should be conducted to assess its stability for long-term storage and consumption. For enhanced marketability, appropriate packaging and labeling are also encouraged to improve consumer perception and acceptance in commercial settings.

**ADVANCES IN SOLID-STATE FERMENTATION FOR BIO-CONVERSION TO PRODUCE
HIGH VALUE-ADDED PRODUCTS**

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ABSTRACT

The increase in population coupled with several socio-infrastructureal decadence in many parts of the rural areas in Nigeria has become a common problem and this is causing severe malnutrition by the day. A good approach ameliorate this challenge for sustainable development is required. Agricultural residues are considered suitable for conversion into profitable products through solid-state fermentation (SSF). About 300g of Sessame seeds and soyabean seed in ration 1:1 (Sample A) was subjected to solid-phase fermentation. Same quantity each of Sessame seeds (Sample B) and soyabean seeds (Sample C) individual was set aside as control. The combination of the seeds, sample A, recorded increased protein value by 35.4% above sesame seeds and 23.5% greater than soyabeans under the same fermentation conditions. Although both crops have high organic content that is used as potential substrates to produce value-added products through SSF, the combination of the two had better value that can be harnessed for children meal in the low-economy rural areas and could further be developed for commercial applications. The applications of SSF developed products in the food industry as flavouring agents, acidifiers, preservatives and flavour enhancers have recorded successes. The sustainability opportunities and future directions of this procedure could increase the economy of the producing areas too.

Keywords: Sesame, SSF, Fermentation, Bio-conversion and Agriculture produce

**NANO-INSECTICIDES: EFFECTS OF BIOSYNTHESIZED SILVER NANOPARTICLES
USING *AZARDIRACHTA INDICA* EXTRACTS ON FIELD INSECT PEST AND
NUTRITIONAL CONTENTS OF ROSELLE CALYCES (*HIBISCUS SABADRIFFA* L.)**

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ABSTRACT

The increasing global demand for sustainable agricultural practices necessitates alternatives to synthetic insecticides which threaten environmental sustainability and human health. This study evaluated the efficacy of green-synthesized silver nanoparticles (AgNPs) derived from neem (*Azadirachta indica*) plant parts used as nano-insecticides and nutritional enhancer in the management of insect pests of roselle. The experiment was a Randomized Complete Block Design with five treatments: nano-neem seed (NS-AgNPs), nano-neem bark (NB-AgNPs), nano-neem leaf (NL-AgNPs), synthetic insecticide (cypermethrin), and untreated control, replicated three times. Tested nano-insecticides demonstrated significant insecticidal effects against *Dysdercus* spp., with NS-AgNPs showing comparable insecticidal efficacy (100% mortality) to cypermethrin. Least yield loss (48%) was observed from roselle plants-treated NS-AgNPs compared to other treated and untreated harvested calyx. Significant mineral and vitamin contents were observed from the harvested calyces. However, NS-AgNPs treated-calyces had highest calcium and potassium contents (6.14 mg/kg) than other calyces from nano-insecticides treated roselle plants while NL-AgNPs treated-calyces had significant iron (1.23 mg/kg) and magnesium (1.57 mg/kg) contents than nano-insecticides harvested calyces. Vitamin analysis indicated that NS-AgNPs significantly enhanced vitamin C content compared to other treated and untreated calyces. This study concludes that green synthesized silver nanoparticles, particularly

from neem seeds, represent a promising environmentally sustainable alternative to conventional insecticides for roselle pest management consequently, enhanced nutritional quality of the harvested calyces.

Key words: Silver nanoparticles, Roselle calyces, Vitamin, Mineral, Nano-insecticides, *Dysdercus* spp

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A SYNOPSIS OF ARTIFICIAL INTELLIGENCE IN THE FOOD SECTOR

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ABSTRACT

Advanced predictive analytics with precise forecasting for agricultural yield and weather forecasts can be powered by AI techniques. Large-scale data analysis can be used to track soil nutrient levels and identify disease or insect infestation indicators, leading to healthier crops. Other ways AI is assisting the food production industry include inventory management, identifying allergies and nutritional components in food, and optimising food delivery routes and schedules.

The foundation of the food sector is its supply chains. Artificial Intelligence in the supply chain helps track products from harvest to distribution channels and manage inventories with greater accuracy. Additionally, the system helps ensure food hygiene setups in various operational circumstances, test products at every level, and improve food standards surveillance.

AI is assisting farmers in proactively identifying plant illnesses and pest infestations. Additionally, the technology aids in the detection of environmental factors such as soil fertility, temperature, humidity, and nutritional qualities. This is called smart farming. Data collected from drones, sensors, and satellites can be analysed by farmers to save time and costs related to field trials, food inspections, and more.

Because AI can more precisely forecast product demand, it has been assisting in the reduction of waste in the retail food industry. One of the most potent aspects of AI technologies in the supply chain is predictive analytics, which helps spot patterns and emerging trends well in advance of their occurrence.

Food firms are becoming more open and compliant thanks to AI. Additionally, it increases the food supply chain's sense of accountability. If the employees on the shop floors are not wearing food safety equipment or abiding by the regulations, AI-enabled cameras can identify safety concerns. Because production is being monitored in real-time, problems with food contamination and other safety concerns are being identified more quickly and efficiently.

Keywords: AI, Food industry, Supply chain

**UNVEILING ADAPTIVE COMPONENTS FOR ENVIRONMENTAL HETEROGENEITY IN
IPOMOEA CARNEA JACQ.**

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ABSTRACT

Environmental heterogeneity is an important factor that affects species richness and provides conditions for adaptation of existing species. Factors affecting the diversity gradient are climatic variation, biotic interactions, territory, ambient vigor, productivity, available water resources and some other factors that direct the historical process by the evaluation of climatic history and phylogeny of niche conversation. Naturally adapted populations of *Ipomoea carnea* Jacq. were collected from various ecological regions of Punjab province to investigate their adaptive components that have been developed under heterogeneous environmental conditions. Multivariate redundancy analysis (RDA) and correlation analysis were done to evaluate the association of soil physiochemical features with different morpho-anatomical and physiological characteristics. *I. carnea* is an invasive species that can rapidly grow, spread and adapt from xerophytic to aquatic habitats. This species showed better growth and biomass production near water bodies. Additionally, it also exhibited some specific anatomical modifications such as aerenchyma formation, sclerification, xylem ray thickness, leaf thickness and large metaxylem area that enable it to survive under harsh environmental conditions. Populations from highly saline habitats showed higher value of osmolytes and ionic contents (K^+ and Ca^{2+}). Furthermore, the populations from highly saline areas also exhibited the maximum uptake of Na^+ content and the lowest uptake of K^+ and Ca^{2+} content. In conclusion, *I. carnea* showed very specific modifications in morpho-anatomical and physiological traits that reveal its ecological success from aquatic to xerophytic habitats.

**EFFECTS OF THREE PHYTOGENIC AQUEOUS BLENDS ON NUTRIENT UTILISATION
EFFICIENCY OF BROILER CHICKEN**

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ABSTRACT

The poultry industry faces increasing demand for natural feed additives that enhance nutrient utilization while reducing reliance on synthetic growth promoters. Phytogenic plants such as garlic (*Allium sativum*), ginger (*Zingiber officinale*), and onion (*Allium cepa*) possess bioactive compounds with antioxidant, and digestive-stimulant properties that may improve feed utilisation efficiency in broiler production. This study was conducted to evaluate the effect of aqueous extracts of garlic, ginger, and onion on the nutrient digestibility of broiler chickens. A total of 120-day-old broilers were allocated into four treatment groups with three replicates each. Treatments consisted of aqueous blend prepared at 20 g, 30 g, and 40 g of each spice per litre of water, administered at 1 ml/litre (T1, T2, and T3), while the control group (T4) received plain water with antibiotics. Faecal samples were collected for proximate composition to determine nutrient excretion and digestibility in the laboratory. The results were subjected to one way analysis of variance. The results revealed significant differences ($p < 0.05$) among treatments in crude-protein, fat, ash, and nitrogen-free extract. Broilers in T1 exhibited the lowest faecal NFE (65.94%) and moderate crude protein excretion (10.46%), indicating superior carbohydrate and protein digestibility. T2 and T3 had higher crude protein excretion, suggesting reduced nitrogen retention, while the control group recorded the highest NFE (73.39%) and lowest protein utilization. Although T1 showed higher fat excretion, its overall balance in nutrient utilization was superior. It was concluded that moderate inclusion of aqueous extracts of garlic, ginger, and onion at 40g/L is optimal for improving nutrient digestibility in broilers. The study recommends the adoption of phytogenic extracts in poultry production to enhance feed efficiency, reduce nutrient losses, and support sustainable, residue-free poultry farming.

KEYWORDS: feed, garlic, ginger, onion, water

**ANNUAL VARIATIONS IN THE PHYSICOCHEMICAL AND NUTRITIONAL PROFILES
OF CHIA SEEDS (*SALVIA HISPANICA* L.) CULTIVATED UNDER MEDITERRANEAN
CLIMATE CONDITIONS IN NORTHERN MOROCCO**

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ABSTRACT

Chia (*Salvia hispanica* L.) seeds are valued for their rich nutritional and bioactive profiles. This study evaluated inter-annual variability in physicochemical, nutritional, and mineral composition of chia seeds grown in Northern Morocco during four consecutive harvests (2022–2025). A completely randomized design with three replications per year was used. Standard AOAC methods analyzed moisture, protein, lipids, fiber, total sugars, polyphenols, antioxidant activity, and minerals (K, P, Na, Ca, Mg, Cu, Mn, Zn, Fe). Results showed highly significant effects ($p < 0.001$) of harvest year on all parameters. Notably, lipid content varied from 4.3% to 22.2%, protein ranged from 16.5% to 24.6%, and polyphenols from 26.3 to 55.4 $\mu\text{g GAE/mL}$. The 2023 harvest had the highest sugar content (58.17 mg/L), phenolics (55.39 $\mu\text{g GAE/mL}$), and antioxidant activity (54.04% inhibition). In contrast, the 2024 harvest showed the highest ash (9.01%) and zinc (38.19 ppm) but lowest fat (4.29%), while 2025 was richest in iron (91.60 ppm). These findings demonstrate that environmental and agronomic factors strongly influence seed quality. Understanding this is critical for optimizing cultivation and valorizing Moroccan chia as a functional food.

Keywords: *Salvia hispanica*, chia seeds, physicochemical, nutritional profiles, annual variations, mediterranean climate, Morocco

**EFFECT OF VITAMIN D SUPPLEMENTATION ON SYMPTOMS AND CLINICAL
OUTCOMES IN ADULTS WITH DIFFERENT BASELINE VITAMIN D LEVELS: A
RANDOMIZED STUDY**

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ABSTRACT

Vitamin D and calcium insufficiency is common among Moroccan people and represents a risk factor for osteoporosis and therefore fractures. Some recent data suggest that the use of moderate daily doses of vitamin D rather than high doses administered intermittently would be preferred.

We evaluated, from a randomized double-blind placebo-controlled study, the effects of daily administering of 600 IU of vitamin D3 for three months in 32 people, 16 people of normal weight and average age of 42 years and 16 obese people of average age of 48 years and having a normal concentration of vitamin D or presenting an insufficiency defined by serum concentrations of 25(OH)D ≤ 12 ng/ml.

The mean patient age was 44 ± 7 years, their median daily dietary intakes of calcium and vitamin D in the placebo (n = 8) and supplemented (n = 95) groups were 671 mg and 61.8 IU, respectively. and 697 mg and 66.8 IU. The median concentrations of 25(OH)D were 7.0 ng/ml in both groups, those of PTH were 48 and 49 pg/ml, respectively. The median increase in 25(OH)D is 22.0 ng/ml vs 4 ng/ml ($p < 0.0001$) and the median decrease in PTHi is 17 pg/ml vs 5 pg/ml ($p < 0.0001$) under supplementation and placebo respectively.

Supplementation in vitamin can increase the level of vitamin D in individuals with deficiency in Vitamin D. Larger-scale and longer-term multicenter studies are needed to evaluate the clinical effects of such supplementation.

Key words: vitamin D deficiency, vitamin D supplementation, weight status, Morocco.

**ASSOCIATION BETWEEN VITAMIN D STATUS, CHOLESTEROL LEVEL AND OBESITY
IN MOROCCAN POPULATION**

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ABSTRACT

Problem statement

Obesity and vitamin D deficiency have both been identified as major public health problems around the world. Overweight and obesity can cause many complications, including cardiovascular complications, but can also disrupt phosphocalcic metabolism, the objectives was to assess the phosphocalcic profile, the lipid balance as well as the dosage of vitamin D in an obese and overweight population, and to understand if the insufficiency in vitamin D is a cause or consequence of obesity.

Methods

This is a descriptive cross-sectional study. It took place at the Mimosas Kenitra, Medical Analysis Laboratory for 18 months. The population concerned includes subjects Men and women aged between 20 years and 70 years who have BMI (Weight/height²)>25. Sociodemographic characteristics: age, gender, family situation, professional activity and mode of transport were evaluated.

Results

Patients who are morbidly obese present a vitamin D deficiency of 60%, while 30% of obese patients with vitamin D deficiency were normal. The prevalence of vitamin D deficiency among males and females was 45% and 52.4% respectively [$p=0.04$, odds ratio (OR)=0.7, $\chi^2=3.9$]. 9% of patients with severe obesity present have hypercholesterolemia, while 62% of overweight patients have normal cholesterol values.

Conclusion

vitamin D deficiency had a possible relationship with obesity that could be explained by several causes including insufficient sun exposure, lack of exercise, lower vitamin intake, retention of blood vitamin D in adipose tissue.

Key words: Vitamin D, Cholesterol, Calcium, Phosphorus, Obesity, overweight, Morocco.

**BIOCHEMICAL AND MINERAL CHARACTERIZATION OF LENS CULINARIS
VARIETIES: NUTRITIONAL POTENTIAL AND FOOD APPLICATIONS**

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ABSTRACT

This study presents a comprehensive analysis of the biochemical and mineral composition of 16 *Lens culinaris* varieties, with distinct profiling of leaf (f) and seed (g) components. The objective was to evaluate their nutritional potential and functional properties for food applications.

Thirty-two samples were analyzed for proximate composition (dry matter, mineral matter, nitrogen, phosphorus, crude fat, crude cellulose, inorganic impurities), bioactive compounds (sugars, polyphenols), and mineral content (K, P, Na, Cu, Mn, Zn, Fe, Ca, Mg).

Results revealed significant differences between plant parts. Leaves showed higher nutritional density with elevated: Crude fat content (up to 28.12%), Crude cellulose (up to 28.14%),

Iron levels (up to 1960 ppm) and polyphenol concentrations (up to 706.2 mg/ml)

Seeds demonstrated distinct advantages with: Higher sugar content (up to 996.9 mg/ml),

Substantial zinc levels (up to 198.5 ppm), Notable magnesium concentrations (up to 5.19%),

Lower fat content (1.38-3.1%).

The variability in biochemical profiles among varieties highlights their potential for targeted applications. Leaves appear suitable for functional ingredients rich in fiber, polyphenols, and minerals, while seeds offer opportunities as energy sources and micronutrient supplements.

These findings provide valuable insights for:

Developing functional foods and nutritional supplements

Agricultural Product valorisation

Targeted nutrient enrichment strategies

The study underscores the importance of Lens culinaris part selection and variety consideration in optimizing nutritional value for human consumption.

Keywords: Lens culinaris, Plant composition, Nutritional analysis, Functional foods, Bioactive compounds, Mineral content, Food applications

**CULTIVATING HEALTH: EVALUATING THE INFLUENCE OF PERMACULTURE ON
THE NUTRITIONAL PROFILE OF SWEET POTATOES AND ITS IMPLICATIONS FOR
HUMAN HEALTH**

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ABSTRACT

This study evaluates the impact of permaculture on the nutritional quality of sweet potatoes and its implications for human health. In accordance with permaculture principles, sweet potatoes were cultivated without tilling, pesticides, or chemical fertilizers in Oulad Selama (Morocco). After a four-month growth period, nutritional analysis revealed a distinctive profile: a high moisture content (75.03 g/100g) and carbohydrate content (21.59 g/100g), a low lipid content (0.23 g/100g), and a moderate energy value (418 kJ/100g). The protein content (2.48 g/100g) was slightly above average.

These results characterize the permaculture-grown sweet potato as a light, hydrating, and low-calorie food. This research demonstrates that permaculture, beyond its environmental benefits, can produce food with nutritional qualities beneficial to human health, offering a healthy alternative to conventional agricultural production methods.

Keywords: Permaculture, Nutrition, Human Health, Sustainable Agriculture, Sweet Potato, Nutritional Quality.

**BIOTECHNOLOGICAL VALORISATION OF SHRIMP WASTE: PHYSICOCHEMICAL
AND MICROBIAL QUALITY**

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ABSTRACT

Of the hundreds of shrimp species known worldwide, just 20 are significant for commercial and transformation activities. However, the production and consumption of shrimp generate enormous amounts of debris, mostly shells, which harm the environment and public health. To determine the value of the by-products made from shrimp shells, this study assessed their chemical makeup and microbiological condition. Therefore, shrimp waste samples were collected from Kenitra (Northwest Morocco). After laboratory treatments, we measured the physicochemical and microbial parameters of wastes and their fermented by-product, including temperature, pH, minerals, and organic compounds, following standard methods. Microbial analysis addressed the identification of bacteria and fungi species and the pathogenic strains. The obtained results showed that the shrimp co-product was rich in dry matter (24.91%), organic matter (16.76%), chitin 16.57%, ashes (8.15%), and total protein (13.54%). In contrast, fat presented only 2.52%. Minerals were dominated by Calcium (5.57 mg/l), iron (0.92 mg/l), and phosphorus (0.72 mg/l). In total, 9 microbial strains were identified in the fermented samples, including *Escherichia coli* (54.73%), *Proteus mirabilis* (9.47%), *Klebsiella pneumoniae* (8.42%), and *Enterobacter* sp. (7.36%). *Salmonella enteritidis* was absent in by-product samples. Lactic acid bacteria and yeasts were significantly superior in fermented by-products, while FMAT, molds, total coliforms, Faecal coliforms, and *Clostridium sulphur* were significantly superior in non-fermented samples. These results demonstrated the richness of shrimp wastes in minerals and organic compounds and the absence of pathogenic strains. These are proposed to encourage the use of shrimp by-products in agronomic, food, and pharmaceutical applications.

Tests on the application of these biostimulants to silage corn crops were conducted in the laboratory as a factor in fertilization and soil and plant amendment in biostimulant formulations, and the results obtained were very satisfactory.

Keywords: by-products, shrimp waste, composition, fermentation, biotechnological valorization, microbiology.

**DEVELOPMENT OF A FUNCTIONAL HERBAL BEVERAGE FORMULATED WITH
YELLOWFIN TUNA (*THUNNUS ALBACARES*) BONE EXTRACT**

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ABSTRACT

This study aimed to develop a functional herbal beverage by incorporating hydrolysate derived from yellowfin tuna (*Thunnus albacares*) bones. The hydrolysate was produced through protease-assisted hydrolysis at 50 °C for 8 - 24 h, resulting in a protein-rich extract containing bioactive peptides with measurable antioxidant activity. The fish bone hydrolysate was subsequently blended with an extract of *Curcuma aromatica* (yellow zedoary), a medicinal herb recognized for its anti-inflammatory, antimicrobial, and antioxidant properties due to its high flavonoid and essential oil content. A series of formulations were prepared with varying ratios of the two extracts and evaluated for their sensory attributes. Among them, two formulations demonstrated the most favorable overall acceptability scores and were selected as the optimal beverage prototypes. These findings provide a scientific foundation for the development of a health-oriented drink that synergistically combines marine-derived nutrients with herbal bioactive components.

Keywords: Functional herbal beverage, fish bone hydrolysate, yellowfin tuna bone, yellowfin tuna bone extract.

QUALITY PARAMETERS OF FIZZY DRINK MADE FROM RED GRAPE (*Vitis vinifera*)

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ABSTRACT

Fizzy drinks, also known as soft drinks, sodas, or carbonated beverages, are non-alcoholic drinks containing carbon dioxide gas dissolved in water, which creates the characteristic bubbles and fizz when the container is opened. Carbonation, the process of dissolving carbon dioxide gas (CO₂) in a liquid, dates back several centuries and has evolved significantly from its early rudimentary forms to the highly controlled industrial techniques used. The last decade has witnessed a remarkable surge in the demand for natural fruit-based beverages driven by an expanding consumer base that prioritizes health, wellness, and sustainability. This trend aligns with a global movement toward reducing synthetic additives, sugars, and preservatives in processed foods and beverages, favoring products, that promise nutritional benefits and minimal processing which brings about natural extraction of juice, smoothie and natural fizzy drinks but the havoc they caused on consumer health and consumer education awareness and food safety culture can't be overemphasize, that's why this study, is aimed at producing nutritious food that are safe from a natural flavored fizzy drink made from red grape where the pH, brix and CO₂ was investigated. Six different sample were prepared FDA (70%g Grape: 20% Sugarcane: 10% Spices) which is the control, FDB (70% Grape:20% Sugarcane:10% Spices:Pineapple), FDC (70% Grape:20% Sugarcane:10% Spices:Orange), FDD (70% Grape:20% Sugarcane:10% Spices:Lemon), FDE (70% Grape:20% Sugarcane:10% Spices:Strawberry), FDF (70% Grape:20% Sugarcane:10% Spices:Beetroot) respectively. The effect shows a significant difference ($P \geq 0.005$) in the result, for pH (6.25-6.38), brix (8.28-20.10) while CO₂ (0.17-0.93) respectively.

Keywords: Fizzy drink, Red grape, Brix, pH, Physicochemical Properties

**INTRODUCING SOME SOLUTIONS FOR THE "UPCYCLING" TREND IN THE F&B
(FOOD AND BEVERAGE) INDUSTRY**

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ABSTRACT

The "upcycling" trend - recycling and upgrading by-products into food products of higher value or quality - is emerging as a sustainable solution in the global F&B industry but is facing many challenges in terms of consumer awareness. This study shows that consumers have the potential to accept upcycled products if they are properly communicated, transparent in the production process and linked to personal values. The study proposes five possible marketing solutions, including green storytelling, lifestyle positioning, creative community collaboration, technology-based supply chain transparency and trial experiences combined with market education. These solutions serve as strategic platforms, supporting businesses to build a consumer market towards sustainable development; and promote the formation of a socially responsible consumer community.

Keywords: upcycling, F&B, food, beverage.

BIOCHEMICAL CHARACTERIZATION AND BIOACTIVITY OF CAROB (*CERATONIA SILIQUA L.*) SEEDS, PULP, AND LEAVES: A NATURAL SOURCE OF ENVIRONMENTAL BIOACTIVE COMPOUNDS

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ABSTRACT

Carob (*Ceratonía siliqua L.*), a widely distributed Mediterranean species, represents a promising source of natural bioactive compounds with potential applications in nutraceutical, food, and environmental fields. This study aimed to characterize and compare the biochemical and biological properties of seeds, pulp, and leaves from six Moroccan carob populations. Analyses focused on total polyphenols, flavonoids, while antioxidant activity was assessed using DPPH and FRAP assays. Antimicrobial activity was evaluated against *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, and *Klebsiella pneumoniae* using disk diffusion and microdilution methods. Significant differences ($p \leq 0.001$) were observed among the different plant parts for all measured parameters. Pulp and leaves exhibited the highest polyphenol and flavonoid contents, whereas seeds showed the strongest antioxidant and antimicrobial activities. These findings highlight the diversity and bioactivity of carob-derived biomolecules, suggesting their potential as natural antioxidants and antimicrobial agents for environmental and food-related applications. Overall, this study emphasizes the valorization of Moroccan carob as a sustainable source of bioactive compounds, supporting its use in functional formulations and eco-friendly applications.

Keywords: Carob, *Ceratonía siliqua L.*, seeds, pulp, leaves, polyphenols, antioxidant activity, antimicrobial activity, bioactive compounds

**METAL–ORGANIC FRAMEWORKS AS EMERGING MATERIALS FOR SUSTAINABLE
WATER TREATMENT AND FOOD SAFETY APPLICATIONS**

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ABSTRACT

Water contamination by emerging pollutants, including pharmaceutical residues, dyes, and agricultural chemicals, has become a critical concern for both environmental and food safety sectors [1]. Recent advances in material science have positioned Metal Organic Frameworks (MOFs) as auspicious materials for water purification applications. Owing to their tunable porosity, large surface area, and chemical versatility, MOFs exhibit exceptional adsorption and catalytic properties for the removal of organic and inorganic pollutants [2]. This work presents an overview of the synthesis, structural features, and performance of MOFs as advanced functional materials for promoting water treatment efficiency. Particular attention is given to MOF-based composites and their integration with photocatalytic and electrochemical systems to enhance the degradation of persistent contaminants. Furthermore, the potential of green and food-safe synthesis routes utilizing bio-based linkers, such as gallic acid, is discussed as a sustainable approach that aligns with circular economy principles. Overall, MOFs offer a powerful platform for developing next-generation treatment systems that ensure cleaner water resources, improved food safety, and sustainable environmental protection.

Keywords: Metal–Organic Frameworks, Water Treatment, Photocatalysis, Environmental Remediation, Food Safety, Green Chemistry

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YUTMA GÜÇLÜĞÜ OLAN BİREYLERDE YETERLİ VE DENGELİ BESLENME
NUTRITION IN INDIVIDUALS WITH SWALLOWING DIFFICULTIES

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ÖZET

Yutma güçlüğü (disfaji), özellikle yaşlı ve nörolojik hastalığı olan bireylerde sık görülen, malnütrisyon, dehidratasyon ve aspirasyon pnömonisi riskini artıran önemli bir sağlık sorunudur. Yeterli ve dengeli beslenme, bireylerin fiziksel ve psikolojik sağlıklarını korumak, büyüme ve gelişmelerini desteklemek için temel bir gerekliliktir. Sağlıklı bir diyet, tüm besin öğelerinin uygun miktarlarda alınımı içerir. Böylece, obezite, diyabet, kardiyovasküler hastalıklar gibi kronik hastalıklar önlenmiş olur. Yetersiz ve dengesiz beslenme, çeşitli sağlık sorunlarına yol açabilir. Enerji, protein, yağ eksikliklerine bağlı zayıflama, halsizlik; vitamin ve mineral eksikliklerine bağlı anemi, bağışıklık sistemi zayıflığı; aşırı enerji alımının da kalp hastalıkları, diyabet riski; dengesiz beslenme ile insülin direnci, hipertansiyon ile karşılaşmaktadır. Yutma güçlüğü olan bireylerde hastalığı oluşturan sebeplere ilaveten yetersiz ve dengesiz beslenme sonucunda bu tabloların oluşması muhtemeldir. Bu hastaların iyileşebilmeleri için yeterli miktarda besin öğelerini almaları diğer hasta bireylere göre daha önem arz etmektedir. Yutma güçlüğünde beslenmenin değerlendirilmesinde Eating Assessment Tool-10 (EAT-10), Gugging Swallowing Screen (GUSS) ve International Dysphagia Diet Standardisation Initiative (IDDSI) tabanlı doku ve kıvam modifikasyonları değerlendirme araçları kullanılmaktadır. Değerlendirmeler sonucunda; besin yoğunlaştırma, oral beslenme destekleri (ONS) ve enteral beslenme gibi programlar seçilmektedir. Bu çalışma, disfajili bireylerde yeterli ve dengeli beslenme sağlanmasına yönelik güncel kanıtları ve uygulamaları vurgulamak amacıyla yapılmıştır. Ayrıca multidisipliner yönetim, izlem protokolleri ve geleceğe yönelik araştırma alanları ele alınmıştır. Klinik uygulamada bireyselleştirilmiş, güvenli ve enerji-protein açısından yeterli beslenme planları öncelikli olmalıdır.

Anahtar Kelimeler: yutma güçlüğü, beslenme, malnütrisyon.

ABSTRACT

Swallowing difficulty (dysphagia) is a significant health problem, particularly common among elderly individuals and those with neurological disorders, increasing the risk of malnutrition, dehydration, and aspiration pneumonia. Adequate and balanced nutrition is essential to maintain individuals' physical and psychological health and to support growth and development. A healthy diet includes the intake of all nutrients in appropriate amounts, thereby preventing chronic diseases such as obesity, diabetes, and cardiovascular disorders. Inadequate and unbalanced nutrition can lead to various health problems:

weakness and weight loss due to energy, protein, and fat deficiencies; anemia and impaired immune function due to vitamin and mineral deficiencies; increased risk of heart disease and diabetes due to excessive energy intake; and insulin resistance or hypertension as a result of unbalanced nutrition. In individuals with swallowing difficulties, in addition to the underlying causes of the disorder, insufficient and imbalanced nutrition can further contribute to these conditions. For these patients, receiving an adequate intake of nutrients is of greater importance compared to other patients for recovery.

In the assessment of nutrition in dysphagia, tools such as the Eating Assessment Tool-10 (EAT-10), Gugging Swallowing Screen (GUSS), and International Dysphagia Diet Standardisation Initiative (IDDSI)-based texture and consistency modification evaluation methods are used. Based on these assessments, programs such as food thickening, oral nutritional supplements (ONS), and enteral nutrition may be chosen.

This study was conducted to highlight current evidence and practices for ensuring adequate and balanced nutrition in individuals with dysphagia. In addition, multidisciplinary management, monitoring protocols, and future research areas are discussed. In clinical practice, individualized, safe, and energy-protein sufficient nutritional plans should be prioritized.

Keywords: dysphagia, nutrition, malnutrition.

**ASSOCIATIONS OF DIETARY PATTERNS, DAIRY INTAKE, AND BODY COMPOSITION
WITH FOREARM BONE MINERAL DENSITY IN PHYSICALLY ACTIVE CAUCASIAN
MEN**

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ABSTRACT

Nutrition rich in protein, calcium, and vitamin D supports bone mineralization, which is essential for skeletal strength in physically active men. Dairy products provide highly bioavailable calcium and complete protein, contributing to bone regeneration and reducing the risk of skeletal injuries. The purpose of the study was to assess the effects of dietary patterns, dairy product consumption, the intake of calcium, protein, vitamin D, and phosphorus, and body composition on forearm bone mineral density in 450 Caucasian men from Poland aged 21.5 years. Forearm bone parameters were measured by densitometry. Dairy product consumption and eating habits were assessed using a 24-hour dietary recall conducted via face-to-face interview and analyzed using the computer program Diet 6.0. Four dietary patterns were analyzed: No. 1. traditional/normal diet; No. 2. lactose-free, gluten-free; No. 3. with high consumption of fruits, vegetables, dairy products, whole grains, poultry, fish, nuts, and legumes; No. 4. high protein. The participants demonstrated a high level of physical activity, engaging regularly in various sports disciplines. Their mean training experience amounted to 6.5 years. A single forearm bone scan was conducted at two regions: distal (dis) and proximal (prox). Body composition was assessed

using bioelectrical impedance analysis (BIA) with a Jawon Medical Scan analyzer. This work was written with the financial support of the Ministry of Education and Science as part of the Research Project (UPB No. 14): “Determinants of bone mineral status in recreational and professional sports of different age groups”. The project is being implemented at the Józef Piłsudski University of Physical Education in Warsaw, Poland, by a multidisciplinary team of researchers. All calculations were performed with STATISTICA software (v. 12.0, StatSoft, USA). The data analysis was based on factor analysis of variance ANOVA and the Bonferroni post hoc test. The effect size was calculated as eta-squared (η^2). Relationships between body composition and type of dietary pattern and BMD (mean distal and proximal) were evaluated using two-way ANOVA. The statistical significance was set at $\alpha < 0.05$ for all analyses. In this study, distal BMD was significantly influenced by fat-free mass and dietary pattern, with a large effect size ($\eta^2 = 0.12$). Proximal BMD was affected by years of sports training (medium effect, $\eta^2 = 0.09$), fat mass (small effect, $\eta^2 = 0.04$), fat-free mass (small effect, $\eta^2 = 0.02$), and daily dairy product consumption (large effect, $\eta^2 = 0.14$). Fat-free mass and adherence to specific dietary patterns play a significant role in determining distal forearm bone mineral density in physically active men. Proximal forearm BMD is influenced by multiple factors, including years of sports training, body composition (fat and fat-free mass), and daily dairy intake, highlighting the combined effect of lifestyle and nutritional factors on bone health.

Keywords: bone mineral density, Caucasian men, dietary pattern, dairy products, fat mass, fat-free mass

YAŞA BAĞLI GÖZ SAĞLIĞINI ETKİLEYEN FONKSİYONEL GIDA BİLEŞİKLERİ
FUNCTIONAL FOOD COMPOUNDS AFFECTING AGE-RELATED EYE HEALTH

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ÖZET

Yaşlanma ile bozulan temel fizyolojik fonksiyonlardan bir tanesi de göz sağlığıdır. Yaşa bağlı makula dejenerasyonu (AMD), diyabetik retinopati (DRP), glokom, katarakt ve kuru göz sendromu gibi oküler hastalıklar, dünya genelinde görme bozukluklarının ve körlüğün en önemli nedenlerinden sayılmaktadır. Yaşlanma, hiperglisemi, aile öyküsü, inflamasyon, kanser oluşumları, yüksek metabolizma hızı ve UV ışığa maruz kalma gibi birçok risk faktörü yaşa bağlı göz hastalıklarını tetikleyici unsurlardır. Bu risk faktörleri ile oksidatif stres kaynağı olarak kabul edilen ve kontrol edilemeyen reaktif oksijen türleri (ROS) oluşur. Oksidatif stres, yaşa bağlı göz hastalıkları (YBGH)'nın en önemli nedenidir. Retinal Ganglion Hücresi (RGC) hasarlarında oksidatif stresin kilit rol oynadığı bilinmektedir. Bu hasarların tedavisinde A, C ve E vitaminleri, koenzim Q, polifenoller, lutein, zeaksantin ve likopen gibi antioksidan özelliği olan fonksiyonel gıda bileşenlerinin potansiyel etkilerinin olduğu düşünülmüştür. Yapılan çalışmalar ile özellikle yüksek antioksidan ve anti-inflamatuar içerikteki gıda ürünlerinin tek tek veya kombinasyonlar halinde tüketiminin oksidatif stresin zararlı etkilerini azalttığı rapor edilmiştir. Yaşa bağlı göz hastalıklarının oluşumunun engellenmesinde ve eğer hastalık oluşmuşsa kontrol altında tutulmasında fonksiyonel gıda bileşenlerinin etkileri araştırılmıştır. Fonksiyonel gıda bileşenleri içeren beslenme takviyeleri ve beslenme düzenlemeleri, yaşa bağlı göz hastalıklarıyla mücadele etme yolunda bir strateji olarak değerlendirilebilir. Ancak bu bileşenlerin istenilen etkileri gösterebilmesi için yeterli ve düzenli kullanılması gerekmektedir.

Bu derlemenin amacı, yaşa bağlı göz hastalıklarından korunmada fonksiyonel gıda bileşenlerinin etkilerinin açıklanmasıdır. Ayrıca bu bileşenlerin etkin kullanımları ile ilgili bilgiler de sunulmuştur.

Anahtar kelimeler: Yaşa Bağlı Göz Hastalıkları, Gıda Bileşikleri, Fonksiyonel Bileşikler

ABSTRACT

One of the fundamental physiological functions that changes with aging is eye health. Ocular diseases such as age-related macular degeneration (AMD), diabetic retinopathy (DRP), glaucoma, cataracts, and dry eye syndrome are considered the leading causes of visual impairment and blindness worldwide. Numerous risk factors, including aging, hyperglycemia, family history, inflammation, cancer, high metabolic rate, and UV light exposure, are triggers for age-related eye diseases. These risk factors lead to the formation of uncontrolled reactive oxygen species (ROS), which are considered sources of oxidative stress. Oxidative stress is the most important cause of age-related eye diseases. Oxidative stress is known to play a key role in retinal ganglion cell (RGC) damage. Antioxidant functional food ingredients such as vitamins A, C, and E, coenzyme Q, polyphenols, lutein, zeaxanthin, and lycopene

have been suggested to have potential effects in the treatment of these damages. Studies have reported that consumption of food products with high antioxidant and anti-inflammatory content, either individually or in combination, reduces the harmful effects of oxidative stress. The effects of functional food ingredients on preventing the development of age-related eye diseases and controlling them if they already occur have been investigated. Nutritional supplements and dietary changes containing functional food ingredients can be considered a strategy for combating age-related eye diseases. However, for these ingredients to have the desired effects, they must be used adequately and regularly.

This study examines current studies investigating the effects of functional food ingredients in combating age-related eye diseases. It also provides information on the effective use of these ingredients.

Keywords: Age Related Eye Diseases, Food Compounds, Functional Compounds

**LİMON OTU UÇUCU YAĞI NANOEMÜLSİYONLARI İÇEREN BEZELYE PROTEİNİ-
ÇEMEN TOHUMU MÜSİLAJ FİLMLERİ: NANOEMÜLSİYON ÜRETİM YÖNTEMLERİ
VE KONSANTRASYONUN ETKİLERİ**

**PEA PROTEIN-FENUGREEK SEED MUCILAGE FILMS INCORPORATING
LEMONGRASS ESSENTIAL OIL NANOEMULSIONS: EFFECTS OF NANOEMULSION
PROCESSING METHODS AND CONCENTRATION**

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ÖZET

Yeni gıda ambalajı biyopolimerlerinin geliştirilmesi, plastik bazlı ambalajların yol açtığı çevresel sorunlara çözüm sunma potansiyeli ve ambalajlara fonksiyonel özellikler kazandırarak gıdaların raf ömrünü artırma olasılığı nedeniyle giderek artan bir ilgi görmektedir. Bu bağlamda, bezelye proteini ve çemen tohumu müsilaajı polimer matrisi kullanılarak, antioksidan özelliklere sahip yeni bir biyobozunur nanokompozit film geliştirilmiştir. Filme, limon otu uçucu yağı nanoemülsiyonları (NE) dahil edilmiştir. Söz konusu nanoemülsiyonlar, iki farklı yöntemle hazırlanmıştır: yüksek hızlı homojenizasyon (HHNE) ve yüksek hızlı homojenizasyonun ardından ultrasonik homojenizasyonunun uygulandığı kombine yöntem (UHNE). Kombine yöntemle (UHNE) elde edilen nanoemülsiyon, ortalama 120.27 nm parçacık boyutu ve 0.19 polidispersite indeksi ile üstün nanoparçacık özellikleri sergilemiştir. Buna karşılık yalnızca yüksek hızlı homojenizasyon (HHNE) ile hazırlanan nanoemülsiyon, 200 nm'nin altında parçacık boyutu ve homojen dağılım göstermiş olsa da nanoparçacık oluşumunda daha düşük verimlilik sağlamıştır.

Limon otu uçucu yağı içeren nanoemülsiyonlar (HHNE ve UHNE), bezelye proteini-çemen tohumu müsilaajı temelli biyopolimer matrisine iki farklı konsantrasyonda (%10 ve %20, v/v) ilave edilmiştir. Filmler; %10-HHNE, %20-HHNE, %10-UHNE, %20-UHNE ve kontrol (%0-NE) olarak kodlanmıştır. Filmlerin kalınlık, nem içeriği, su buharı geçirgenliği, renk ve opaklık, çekme dayanımı (TS), kopma uzaması (EAB), toplam fenolik madde içeriği (TPC) ve antioksidan aktivite (AA) değerleri belirlenmiştir. Biyonanokompozit filmler, kontrol filmine kıyasla anlamlı derecede daha yüksek TPC ve AA değerleri göstermiştir ($p<0.05$). Daha küçük parçacık boyutuna sahip nanoemülsiyonların (UHNE) film çözeltilerine dahil edilmesi, biyolojik aktif özellikleri artırmıştır. En yüksek TPC (3.98 ± 0.21 mg gallik asit/g kuru ağırlık) ve AA (31.52 ± 2.04 inhibisyon) sırasıyla %10-UHNE ve %20-UHNE filmlerinde gözlenmiştir. Nanoemülsiyon üretim yöntemi ve konsantrasyonu, filmlerin renk ve opaklık özelliklerini belirgin düzeyde etkilemiştir ($p<0.05$). Özellikle %20-UHNE filmlerinde daha küçük damlacık boyut dağılımı, ışıklılığın azalmasına ve sarılık değerlerinin artmasına neden olmuştur. Opaklık değerleri %10-HHNE ve %10-UHNE filmlerinde artarken, %20-HHNE ve %20-UHNE filmlerinde önemli bir düşüş kaydedilmiştir. %20 nanoemülsiyon ilavesi, su buharı geçirgenliğini önemli ölçüde artırırken ($p<0.05$), filmlerin çekme dayanımını düşürmüştür ($p<0.05$). Ancak %10 NE içeren filmlerde, uygulanan yöntemden bağımsız olarak TS değerlerinde önemli bir azalma gözlenmemiştir ($p>0.05$). Tüm filmlerde EAB değerleri önemli düzeyde iyileşmiştir. Sonuç olarak, uçucu yağın varlığı nedeniyle filmlerde kullanılacak nanoemülsiyon konsantrasyonu sınırlıdır. Nanokompozit filmler arasında, %10-UHNE filmi en iyi fonksiyonel özellikleri sergilemiştir. Gelecek

çalışmalarda, söz konusu filmlerin yapısal ve antimikrobiyal özelliklerinin daha ayrıntılı biçimde karakterize edilmesi ve farklı gıdalarda uygulanabilirliklerinin araştırılması önerilmektedir.

Anahtar Kelimeler: biyobozunur filmler, bezelye proteini, bitki tohumu musilajı, çemen tohumu musilajı, limon otu uçucu yağı, nanoemülsiyon

ABSTRACT

The development of new food packaging biopolymers is gaining increasing interest due to their potential to address the environmental challenges posed by plastic-based packaging and enhance the shelf life of foods by imparting functional properties to packaging. Therefore, a novel biodegradable nanocomposite film with antioxidant properties was developed using pea protein and fenugreek seed mucilage as the polymer matrix, incorporating lemongrass essential oil nanoemulsions (NEs). These NEs were prepared using two methods: high-speed homogenization (HHNE) and a combined approach involving high-speed homogenization followed by ultrasonic homogenization (UHNE). The NE produced by the combined method (UHNE) demonstrated excellent nanoparticle properties, with a mean particle size of 120.27 nm and a polydispersity index of 0.19. In contrast, the NE obtained via high-speed homogenization (HHNE) exhibited a particle size below 200 nm and homogeneous distribution but was less efficient in nanoparticle formation.

Lemongrass essential oil-loaded nanoemulsions (HHNE and UHNE) were incorporated into a pea protein–fenugreek seed mucilage-based biopolymer matrix at two different concentrations (10% and 20% v/v). The films were coded as 10%-HHNE, 20%-HHNE, 10%-UHNE, 20%-UHNE, and control (0%-NE). The thickness, moisture content, water vapor permeability, color and opacity, tensile strength (TS), elongation at break (EAB), total phenolic content (TPC), and antioxidant activity (AA) of the films were determined. Bionanocomposite films exhibited significantly higher TPC and AA values than the control film ($p < 0.05$). Incorporating NEs with smaller particle sizes (UHNE) into film solutions enhanced bioactive properties. The highest TPC (3.98 ± 0.21 mg gallic acid/g dry weight) and AA ($31.52 \pm 2.04\%$ inhibition) were observed in the 10%-UHNE and 20%-UHNE films, respectively. The nanoemulsion production method and its concentration significantly influenced the color and opacity of the films ($p < 0.05$). The smaller droplet size distribution of the essential oil in the 20%-UHNE films resulted in reduced lightness and increased yellowness values. While opacity values increased in the 10%-HHNE and 10%-UHNE films, a significant decrease was observed in the 20%-HHNE and 20%-UHNE films. The incorporation of 20% nanoemulsion significantly increased water vapor permeability ($p < 0.05$) while reducing the tensile strength of the films ($p < 0.05$). Regardless of the method, films containing 10% NE showed no significant reduction in TS ($p > 0.05$). EAB values improved significantly in all films. Due to the presence of essential oil, the maximum feasible nanoemulsion concentration in the films is limited. Among the nanocomposite films, the 10%-UHNE film exhibited the best functional properties. Future research should focus on a more detailed characterization of the tested films, including their structural and antimicrobial properties, as well as testing their applicability in various foods.

Keywords: biodegradable films, pea protein, plant seed mucilage, fenugreek seed mucilage, lemongrass essential oil, nanoemulsion

**MONITORING OF COLISTIN RESISTANCE IN ESCHERICHIA COLI ISOLATED FROM
RETAIL POULTRY MEAT: PHENOTYPIC AND MOLECULAR FINDINGS**

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ÖZET

Kolistin, çoklu ilaç dirençli Gram-negatif bakterilerin tedavisinde “son seçenek” antibiyotik olarak kullanılmaktadır; ancak hayvancılıkta profilaktik ve terapötik kullanımı, direnç gelişimini hızlandırmıştır. Tavuk etlerinden izole edilen *Escherichia coli* suşlarında kolistin direnci son yıllarda giderek daha fazla bildirilmektedir. Direnç çoğunlukla plazmid aracılı mcr genleri ile ilişkilidir. Bu gen, IncI2, IncX4 veya IncHI2 gibi mobil plazmidlerde taşınarak farklı bakteriler arasında hızla yayılabilir. Türkiye’de yapılan çalışmalarda, perakende tavuk etlerinden izole edilen *E. coli*’lerde kolistin direnci fenotipik olarak %2–5 oranındadır, mcr-1 geninin varlığı ise daha düşük sıklıkta (%0.2–1) bildirilmiştir. Asya’da ise %5–30, Avrupa’da düzenleyici önlemler sonrası <%2 oranlarında rapor edilmiştir. Çalışmamızda 25 farklı satış noktasından temin edilen 100 tavuk eti örneğinden 38 *E.coli* izolatı elde edilmiştir. Kolistin dirençlerinin tespiti için ise broth dilüsyon testi uygulanmış ve 4 *E. coli* izolatında 2g/ml düzeyinde direnç fenotipi gözlemlenmiştir. Bu izolatlardan birinde PCR yöntemiyle mcr-1 geni pozitifliği tespit edilmiştir. Bu çalışma ile ülkemizde kanatlı etlerinde ikinci kez mcr-1 gen varlığı tespit edilmiştir. Bu durum, gıda zinciri yoluyla insanlara direnç genlerinin geçiş riskini artırmakta ve tedavi seçeneklerini sınırlamaktadır. Kolistin direncinin kontrolü için antibiyotik kullanımının kısıtlanması, hijyen uygulamalarının güçlendirilmesi ve fenotipik/genotipik izleme çalışmalarının yaygınlaştırılması önerilmektedir.

Anahtar Kelimeler: Kolistin, mcr-1, *Escherichia coli*, tavuk eti

ABSTRACT

Colistin is used as a "last-line" antibiotic for the treatment of multidrug-resistant Gram-negative bacteria; however, its prophylactic and therapeutic use in livestock farming has accelerated the development of resistance. Colistin resistance in *Escherichia coli* strains isolated from chicken meat has been increasingly reported in recent years. Resistance is often associated with plasmid-mediated mcr genes. This gene, carried on mobile plasmids such as IncI2, IncX4, or IncHI2, can spread rapidly among different bacteria. In studies conducted in Turkey, colistin resistance in *E. coli* isolated from retail chicken meat was phenotypically 2–5%, while the presence of the mcr-1 gene was reported at a lower frequency (0.2–1%). In Asia, it was reported at 5–30% and <2% in Europe following regulatory measures. In our study, 38 *E. coli* isolates were obtained from 100 chicken meat samples obtained from 25 different sales points. Broth dilution testing was used to detect colistin resistance, and a resistance phenotype was observed in four *E. coli* isolates at a level of 2 g/ml. One of these isolates was positive for the mcr-1 gene by PCR. This study marks the second time the presence of the mcr-1 gene has been detected in poultry meat in our country. This increases the risk of transmission of resistance genes to humans through the food chain and limits treatment options. Restricting antibiotic use, strengthening hygiene practices, and expanding phenotypic/genotypic monitoring studies are recommended to control colistin resistance.

Keywords: Colistin, mcr-1, *Escherichia coli*, chicken meat

**KEFIRE FERMENTASYON ÖNCESİ VE SONRASI EKLENEN TARÇININ BAZI GLİSEMI
VE İŞTAH PARAMETRELERİNE ETKİSİ**
**THE EFFECT OF CINNAMON ADDED TO KEFİR BEFORE AND AFTER
FERMENTATION ON SOME GLYCEMIC AND APPETITE PARAMETERS**

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ÖZET

Giriş ve Amaç: Glikoz metabolizmasını uyarak insülin benzeri bir etki oluşturabilen tarçının bu etkileri fermentasyon süreci ile değiştirilebilmektedir. Bu çalışma, tarçının kefirin mayalanma sürecinde fermente edilebilirliğini ve fermente edilen tarçının sağlıklı yetişkinlerde glisemi ve iştah regülasyonuna etkisini incelemek amacıyla yapılmıştır.

Yöntem: 19–50 yaş arası, sağlıklı 34 yetişkin gönüllüye (13 erkek, 21 kadın) en az iki haftalık wash-out periyodu içeren iki farklı müdahale gününde fermente edilmiş ve edilmemiş tarçın eklenmiş kefir, peynirli tost eşliğinde tüketirilmişdir. Test günlerinde 0-30-60-90-120. dakikalarda kan glikozu ölçülmüş, plazma örneklerinde leptin ve ghrelin düzeyleri ELISA yöntemiyle analiz edilmiştir.

Aynı zaman dilimlerinde iştah durumları görsel analog skala (VAS) ile değerlendirilmiş ve günün geri kalanındaki besin tüketimleri kaydedilmiştir.

Bulgular ve Sonuç: Fermente tarçın tüm zaman noktalarında; kadınlarda plazma glikozunu anlamlı şekilde arttırırken ($p<0.05$), erkeklerde fark bulunmamıştır.

Erkeklerde 30. Dakikaya ilişkin VAS skorları incelendiğinde, fermente tarçın doygunluğu arttırıp ($p:0.033$) açlık skorunu azaltırken ($p:0.002$) kadınlarda değişiklik oluşturmamıştır ($p>0.05$). İştah hormonları ve besin tüketimi açısından hem kadınlarda hem de erkeklerde her iki müdahale arasında anlamlı farklılık bulunmamıştır.

Sonuç olarak bu çalışma kefir mayalaması sırasında tarçının kısmi olarak fermente edilebildiği, fermentasyon sürecinin tarçının iştahı azaltıcı etkilerini arttırabildiğini göstermiştir. Bu bulgular tarçının fonksiyonel besin alternatiflerinin geliştirilmesinde kullanılabileceğine dair prelininer düzeyde kanıt oluşturmaktadır.

Anahtar kelimeler: Tarçın, kefir, fermentasyon, plazma glikozu, iştah

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ABSTRACT

Introduction and Objective: Cinnamon, which can induce an insulin-like effect by stimulating glucose metabolism, can be altered by the fermentation process. This study aimed to investigate the fermentability of cinnamon in kefir fermentation and the effects of fermented cinnamon on glycemia and appetite regulation in healthy adults.

Method: Thirty-four healthy adult volunteers (13 men, 21 women) aged 19–50 consumed fermented and unfermented cinnamon-infused kefir, accompanied by cheese toast, on two separate intervention days, each with a minimum two-week washout period.

Blood glucose was measured at 0, 30, 60, 90, and 120 minutes on the test days, and leptin and ghrelin levels in plasma samples were analyzed by ELISA.

Appetite was assessed using a visual analog scale (VAS) at the same time points, and food consumption for the remainder of the day was recorded.

Results and Conclusion: Fermented cinnamon significantly increased plasma glucose in women at all time points ($p < 0.05$), while no difference was found in men.

When examining VAS scores at the 30th minute in men, fermented cinnamon increased satiety ($p: 0.033$) and decreased hunger scores ($p: 0.002$), but did not cause any change in women ($p > 0.05$). No significant differences were found between the two interventions in terms of appetite hormones and food consumption in either women or men. In conclusion, this study demonstrated that cinnamon can be partially fermented during kefir fermentation, and that the fermentation process can enhance the appetite-reducing effects of cinnamon. These findings provide preliminary evidence that cinnamon can be used in the development of functional food alternatives.

Keywords: Cinnamon, Kefir, Fermentation, Blood Sugar, Appetite

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**POLİKİSTİK OVER SENDROMU OLAN KADINLARDA DİYETLE ALINAN İLERİ
GLİKASYON SON ÜRÜNLERİ İLE SEMPTOMLAR VE ANTROPOMETRİK
ÖZELLİKLER ARASINDAKİ İLİŞKİ: VAKIF ÜNİVERSİTESİNDE VAKA-KONTROL
ÇALIŞMASI**

**ADVANCED GLYCATION END PRODUCTS AND THEIR ASSOCIATION WITH
SYMPTOMS AND ANTHROPOMETRIC FEATURES IN WOMEN WITH POLYCYSTIC
OVARY SYNDROME: A CASE-CONTROL STUDY AT A FOUNDATION UNIVERSITY**

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ÖZET

Polikistik over sendromu (PKOS) dünyada prevalansı giderek artan ve kadınların yaşam kalitelerini önemli ölçüde olumsuz etkileyen endokrin bir bozukluktur. PKOS; menstrüasyon düzensizlikleri, androjen fazlalığı ve infertilite gibi sağlık problemlerine yol açabilmektedir. Birçok hastalıkta olduğu gibi beslenmenin PKOS ile ilişkisi oldukça önemlidir. Son yıllarda, PKOS ve diyet ile alınan ileri glikasyon son ürünleri (dAGE) arasında ilişki olduğunu ortaya koyan araştırmalar bulunmaktadır. AGE'ler yüksek sıcaklıkta pişirme ve kızartma gibi gıda işleme yöntemleriyle oluşan bileşiklerdir. Bu bileşikler, reaktif oksijen türleri oluşturarak hücrelerde oksidatif stresin artmasına neden olmaktadır. PKOS'u olan kadınlarda oksidatif stres ve inflamasyon düzeylerinin arttığı ve bu durumun hastalığın klinik semptomlarının ilerlemesine neden olabileceği öne sürülmektedir. Bu araştırma ile dAGE'lerin kadınlarda hastalıkla ilişkili semptomlar, antropometrik özellikler ve yaşam kalitesi üzerindeki etkilerini incelemek amaçlanmıştır. Çalışma İstanbul'da bir vakıf üniversitesinde öğrenim gören, PKOS tanısı

almış vaka grubu (n = 30) ve PKOS tanısı olmayan sağlıklı kontrol grubu (n = 109) olmak üzere toplam 139 katılımcı ile yürütülmüştür. Tüm katılımcılardan antropometrik ölçümler alınmış ve 3 günlük besin tüketim kayıtları kullanılarak diyet kaynaklı dAGE miktarları hesaplanmıştır. PKOS'a özgü Polikistik Over Sendromu Yaşam Kalitesi-50 Ölçeği (PKOSQ-50) yalnızca vaka grubuna uygulanmış ve dAGE miktarları ile hastalık semptomları ve antropometrik ölçümler arasındaki ilişkiler incelenmiştir. Ayrıca tüm katılımcılar SF-12 Yaşam Kalitesi Ölçeği'ni doldurmuş; vaka ve kontrol gruplarının yaşam kaliteleri, dAGE miktarlarına göre incelenmiştir. Çalışma bulgularında PKOS'lu kadınlarda menstrual düzensizlikler (p <0,001) ve obezite göstergeleri (BKİ p <0,001, bel çevresi p = 0,004, bel/kalça oranı p <0,001) kontrol grubuna göre anlamlı olarak daha yüksek bulunmuştur. SF-12 ölçeğinin alt boyutlarından biri olan "fiziksel yaşam kalitesi" (PCS12, p = 0,019) PKOS grubunda düşük iken, "mental sağlık kalitesi" puanları (MCS12, p = 0,977) gruplar arasında farklılık göstermemiştir. Uyku süresi, PKOS'lu kadınlarda daha kısa saptanmıştır (6,8 ± 1,4 saat vs. 7,5 ± 1,1 saat, p = 0,001). Diyetten alınan AGE miktarları (CML p = 0,192, CEL p = 0,433, MGH1 p = 0,802, toplam AGE p = 0,996) PKOS ve kontrol grubu arasında benzer bulunmuştur. PKOSQ-50 ölçeği değerlendirmelerine göre PKOS'lu kadınlarda psikososyal ve duygusal (39,0 [33,8–47,5]), fertilite (31,0 [27,0–33,0]), obezite/menstrual düzensizlikler (29,5 [22,0–35,0]) ve hirsutizm (22,0 [13,0–27,0]) alt boyutlarında orta düzeyde etkilenme olduğu gösterilmiştir. Çalışmamızda kontrol grubu ve PKOS'lu vaka grubu arasında dAGE alımlarına göre anlamlı bir ilişki saptanmazken dAGE seviyelerine göre yapılan sınıflandırmaya göre (düşük ve yüksek AGE), kontrol grubunda yüksek dAGE oluşumu daha yüksek enerji (p = 0,001) ve makro besin ögesi alımı (protein p = 0,001, yağ p = 0,002, karbonhidrat p = 0,019) ile ilişkili olup, mental sağlık puanlarını düşürmüştür (MCS12 p = 0,030). Sonuç olarak bu çalışma, PKOS'lu kadınların menstrual düzensizlik, obezite ve düşük fiziksel yaşam kalitesi açısından sağlıklı kontrollere göre daha olumsuz profillere sahip olduğunu göstermiştir. Diyetten alınan AGE miktarları PKOS'lu grupta yaşam kalitesi ve vücut kompozisyonunu etkilemezken, kontrol grubunda yüksek dAGE alımı enerji tüketimini artırıp mental sağlığı olumsuz etkileyebilmektedir. Bulgular, her ne kadar PKOS'lu grupta dAGE açısından fark olmadığını gösterse de kontrol grubundaki öne çıkan değişkenler kadın sağlığında özellikle enerji dengesi ve dAGE alımının potansiyel etkilerinin önemine dikkat çekmekte ancak konu ile ilgili daha kapsamlı klinik araştırmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Polikistik over sendromu, Semptom, İleri glikasyon son ürünleri, Yaşam kalitesi, Antropometri

ABSTRACT

Polycystic Ovary Syndrome (PCOS) is an endocrine disorder with a rising prevalence worldwide that significantly impacts women's quality of life. PCOS can lead to health problems such as menstrual irregularities, hyperandrogenism, and infertility. As with many other diseases, nutrition plays a crucial role in PCOS. Recent studies have highlighted a potential relationship between PCOS and dietary advanced glycation end products (dAGEs). AGEs are compounds formed during food processing methods such as high-temperature cooking and frying. These compounds increase reactive oxygen species, resulting in elevated oxidative stress within cells. It has been suggested that oxidative stress and inflammation are increased in women with PCOS, which may contribute to the progression of clinical symptoms. This study aimed to investigate the effects of dAGEs on disease-related symptoms, anthropometric characteristics, and quality of life in women. The study was conducted in Istanbul at a foundation university and included a total of 139 participants: a PCOS case group (n = 30) and a healthy control group without PCOS (n = 109). Anthropometric measurements were taken from all participants, and dietary dAGE intake was calculated using 3-day food records. The PCOS-specific Polycystic Ovary Syndrome Questionnaire-50 (PCOSQ-50) was administered only to the case group, and the relationships between dAGE intake, disease symptoms, and anthropometric measurements were examined.

Additionally, all participants completed the SF-12 Quality of Life Scale, and the quality of life of the case and control groups was analyzed according to dAGE intake. The study findings showed that women with PCOS had significantly higher menstrual irregularities ($p < 0.001$) and obesity indicators (BMI $p < 0.001$, waist circumference $p = 0.004$, waist-to-hip ratio $p < 0.001$) compared to the control group. Among the SF-12 subscales, physical quality of life (PCS12, $p = 0.019$) was lower in the PCOS group, whereas mental health scores (MCS12, $p = 0.977$) did not differ between groups. Sleep duration was shorter in women with PCOS (6.8 ± 1.4 hours vs. 7.5 ± 1.1 hours, $p = 0.001$). Dietary AGE intake (CML $p = 0.192$, CEL $p = 0.433$, MGH1 $p = 0.802$, total AGE $p = 0.996$) was similar between the PCOS and control groups. According to PCOSQ-50 evaluations, women with PCOS exhibited moderate impairment in psychosocial and emotional (39.0 [33.8–47.5]), fertility (31.0 [27.0–33.0]), obesity/menstrual irregularity (29.5 [22.0–35.0]), and hirsutism (22.0 [13.0–27.0]) subscales. Although no significant relationship was found between dAGE intake and study groups, categorization based on dAGE levels (low vs. high AGE) revealed that in the control group, high dAGE intake was associated with higher energy ($p = 0.001$) and macronutrient intake (protein $p = 0.001$, fat $p = 0.002$, carbohydrate $p = 0.019$) and negatively affected mental health scores (MCS12 $p = 0.030$). In conclusion, this study demonstrated that women with PCOS had less favorable profiles regarding menstrual irregularities, obesity, and lower physical quality of life compared to healthy controls. While dietary AGE intake did not affect quality of life or body composition in the PCOS group, high dAGE intake in the control group increased energy consumption and adversely affected mental health. Although no differences in dAGEs were observed in women with PCOS, the findings highlight the potential importance of energy balance and dAGE intake for women's health, emphasizing the need for more comprehensive clinical research on this topic.

Keywords: Polycystic Ovary Syndrome, Symptoms, Advanced Glycation End Products, Quality of Life, Anthropometry

**MALTİTOL VE ERİTRİTOL KULLANIMININ ŞEKERİ AZALTILMIŞ BİSKÜVİ
FORMÜLASYONUNA ETKİSİ**
**EFFECT OF MALTITOL AND ERYTHRITOL USE ON REDUCED SUGAR BISCUIT
FORMULATION**

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ÖZET

Günümüzde tüketicilerin sağlıklı beslenmeye yönelik artan talepleri doğrultusunda, bisküvi gibi yaygın tüketilen ürünlerde şeker azaltımı önemli bir araştırma alanı haline gelmiştir. Bu çalışmada, bisküvi formülasyonunda sükröz ve yüksek fruktozlu mısır şurubu (HFCS) miktarları azaltılarak veya HFCS tamamen çıkartılarak, eritritol ve maltitol kullanımının bisküvinin fiziksel, kimyasal ve tekstürel özelliklerine etkisi araştırılmıştır. Bu kapsamda kontrol ve şekeri azaltılmış (sükröz-eritritol ve sükröz-maltitol) bisküvi örnekleri hazırlanmıştır. Bulgular, şeker azaltımının ürünlerin fiziksel ve tekstürel özelliklerini belirgin bir şekilde etkilediğini göstermiştir ($p<0,05$). HFCS içermeyen örneklerde L^* değerinin daha yüksek, a^* değerinin ise daha düşük olduğu bulunmuştur ($p<0,05$). Maltitol ve eritritol içeren formülasyonlarda, HFCS miktarının kademeli olarak azaltılması (0,72-0,36-0,18g HFCS/100 g bisküvi hamuru), bisküvilerin esmerleşme indeksi değerini etkilememiştir ($p>0,05$). Eritritol içeren formülasyonlarda, bisküvilerin yayılma faktörü, maltitollü formülasyonlara göre daha düşük tespit edilmiştir ($p<0,05$). Sertlik ve kırılmalık kontrol örneğinde en yüksek, eritritollü formülasyonlarda ise en düşük değerler elde edilmiştir ($p<0,05$). Nem içeriği ve su aktivitesi (a_w) açısından kontrol ile maltitol içeren (HFCS'siz) örnekler arasında istatistiksel olarak anlamlı bir fark bulunmazken ($p>0,05$), eritritol içeren (HFCS'siz) örnek en yüksek değeri göstermiştir ($p<0,05$). Kül ve protein içeriğinde formülasyonlar arasında önemli bir fark gözlemlenmemiştir ($p>0,05$). Bu çalışmanın sonucunda, şeker azaltmada maltitolün kontrole en yakın fiziksel, kimyasal ve tekstürel özellikleri sergileyerek, ürün özelliklerini korumada en uygun alternatif olduğu belirlenmiştir. Elde edilen sonuçlar, maltitolün endüstriyel ölçekte şeker azaltımına yönelik bisküvi üretiminde uygulanabilir ve güvenli bir çözüm sunduğunu göstermektedir.

Anahtar Kelimeler: HFCS, esmerleşme indeksi, şeker alkolü, yayılma faktörü, kalite özellikleri

ABSTRACT

In line with the increasing consumer demand for healthier diets, sugar reduction in widely consumed products such as biscuits has become an important area of research. In this study, the effects of using erythritol and maltitol on the physical, chemical and textural properties of biscuits were investigated by reducing the amounts of sucrose and high fructose corn syrup (HFCS) or removing HFCS completely in the biscuit formulation. Control and sugar-reduced biscuit samples (sucrose–erythritol and sucrose–maltitol) were prepared. The findings demonstrated that sugar reduction significantly influenced the physical and textural properties of the products ($p < 0.05$). In HFCS-free formulations, higher L^* values and lower a^* values were observed ($p < 0.05$). Gradual reduction of HFCS levels (0.72–0.36–0.18 g HFCS/100 g biscuit dough) in maltitol- and erythritol-containing formulations did not significantly affect the browning index ($p > 0.05$). In erythritol-containing formulations, the spread factor of biscuits was found to be lower compared to those containing maltitol ($p < 0.05$). Hardness and fracturability values were highest in the control sample and lowest in erythritol formulations ($p < 0.05$). Regarding moisture content and water activity (a_w), no significant differences were observed between the control and maltitol-containing HFCS-free samples ($p > 0.05$), whereas the erythritol HFCS-free sample exhibited the highest values ($p < 0.05$). No significant differences were observed among the formulations in terms of ash and protein contents ($p > 0.05$). In conclusion, maltitol was identified as the most suitable alternative for sugar reduction in biscuits, as it exhibited physical, chemical, and textural properties most similar to the control, thereby maintaining overall product quality. The results indicate that maltitol offers a practical and reliable solution for industrial-scale sugar reduction in biscuit production.

Keywords: HFCS, browning index, sugar alcohol, spreading factor, quality characteristics

**PRELIMINARY FINDINGS ON THE EFFECTS OF PSEUDO-CEREAL FLOURS AND
ENZYME ADDITIVES IN GLUTEN-REDUCED WAFER FORMULATIONS**

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ABSTRACT

Wheat flour is the traditional base for wafer production, providing gluten networks that ensure dough elasticity and crispness. However, increasing consumer demand for gluten-free and nutritionally enhanced products has encouraged the use of alternative flours and functional additives. This preliminary study evaluated the effects of pseudo-cereal and legume flours, combined with enzyme applications, on the physical, chemical, and sensory properties of gluten-reduced and gluten-free wafer formulations.

Nine recipes were prepared: one control with 100% wheat, four gluten-reduced formulations (25–75% wheat replaced with buckwheat, corn, chickpea, or lentil), and four gluten-free formulations (100% substitution with combinations of buckwheat, rice, oat, quinoa, chickpea, and lentil). In formulations with $\geq 50\%$ substitution, inulin, xanthan gum, α -amylase, and protease were incorporated to improve dough workability and textural quality. Analyses included moisture, water activity, color (L^* , a^* , b^*), texture (hardness), wet gluten, ash, protein, fiber, and sensory evaluation using a 9-point hedonic scale. The results showed that gluten levels decreased to 5.6–8.4% in reduced-gluten wafers, with RG-4 (wheat–lentil) providing the highest protein content (12.66%) and RG-3 (wheat–chickpea) the highest fiber (20.5%). Sensory scores indicated that buckwheat (RG-1) and corn (RG-2) formulations achieved the most balanced acceptance, while some gluten-free samples exhibited excessive hardness and lower consumer appeal.

These findings suggest that pseudo-cereal and legume flours can enhance nutritional properties while reducing gluten content, although challenges remain in texture and sensory quality at high substitution

levels. This study provides baseline data to guide future multivariate optimization and industrial application of gluten-reduced and gluten-free wafers.

Keywords: wafer, gluten, pseudo-cereal, enzyme, sensory properties, preliminary study

**COMPREHENSIVE BIOACTIVITY AND SAFETY EVALUATION OF ESSENTIAL OILS:
ANTIMICROBIAL, ANTIOXIDANT, AND TOXICOLOGICAL PERSPECTIVES**

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ABSTRACT

Introduction: Antimicrobial resistance poses a serious threat to humans and environmental ecosystems. Alternatives to traditional antimicrobial therapies such as essential oils (EOs) are needed. The aim of the present study was to investigate the chemical composition, antibacterial and antioxidant activities of some commercial EOs.

Methods: In this study, three selected EOs were screened against four bacterial strains identified as resistant to antibiotics: *Staphylococcus aureus*, *Escherichia coli*, *Enterococcus faecalis* and *Klebsiella pneumonia*, as well as two sensitive bacterial strains: *Staphylococcus aureus* and *Escherichia coli*. Isolated bacterial strains were characterized and identified by morphological and biochemical tests. Commercially EOs of *Artemisia vulgaris* L, *Cuminum cyminum*, *Thymus saturejoides*, were evaluated for their antibacterial and antioxidant activities.

Results: From this study, the results obtained reveal that no bacterial strain tested was resistant to any of the studied EOs. the antioxidant results showed a noticeable antioxidant activity in the total antioxidant capacity in all EOs. While, in DPPH method, only *Thymus saturejoides* showed a strong activity.

Conclusion: These antibacterial and antioxidant activities support further research to discover new chemical structures that can inhibit the growth of multidrug-resistant bacteria.

Keywords: Antibiotic resistance; Antibacterial; Antioxidant; Essential oils; Multidrug- resistant bacteria

TEK KULLANIMLIK GIDA AMBALAJLARININ ÇEVRESEL ETKİLERİ
ENVIRONMENTAL IMPACTS OF SINGLE-USE FOOD PACKAGING

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ÖZET

Gıda sektöründe hijyen, pratiklik ve taşıma kolaylığı sağlaması nedeniyle yaygın olarak kullanılan tek kullanımlık ambalajlar, küresel ölçekte ciddi çevresel sorunlara yol açmaktadır. Özellikle plastik, karton, alüminyum ve biyobozunur malzemelerden üretilen ambalajların üretim, kullanım ve bertaraf süreçlerinde ortaya çıkan karbon ayak izi, enerji tüketimi ve atık yönetimi problemleri, bu çalışmanın temel inceleme alanını oluşturmaktadır. Literatür taramaları ve güncel istatistikler, tek kullanımlık ambalajların önemli bir kısmının geri dönüşüm süreçlerine dâhil edilemediğini, büyük oranda düzenli depolama sahalarına yönlendirildiğini veya doğrudan çevreye karışarak ekosistemler üzerinde uzun vadeli tahribat yarattığını göstermektedir. Ayrıca, hızlı tüketim kültürü ve değişen tüketici alışkanlıkları, ambalaj atıklarının miktarını artıran başlıca etkenler arasında yer almaktadır. Bu bağlamda, yalnızca ambalaj atıklarının azaltılması değil, aynı zamanda sürdürülebilir ambalaj alternatiflerinin geliştirilmesi ve döngüsel ekonomi prensiplerinin yaygınlaştırılması gerekmektedir. Çalışma kapsamında elde edilen bulgular, tek kullanımlık ambalajların çevresel etkilerinin azaltılması için politika yapıcılarının etkin düzenlemeler geliştirmesi, gıda endüstrisinin yenilikçi ambalajlama çözümlerine yönelmesi ve tüketicilerin bilinçlendirilmesi gerektiğini ortaya koymaktadır. Sonuç olarak, çevre dostu ambalaj sistemlerinin teşvik edilmesi, hem ekolojik dengeyi korumak hem de sürdürülebilir gıda tedarik zincirleri oluşturmak açısından kritik öneme sahiptir.

Anahtar Kelimeler: tek kullanımlık ambalaj, gıda sektörü, çevresel etki, sürdürülebilirlik, döngüsel ekonomi

ABSTRACT

Single-use packaging, widely used in the food industry for its hygiene, practicality, and ease of transport, causes serious environmental problems on a global scale. The carbon footprint, energy consumption, and waste management problems arising from the production, use, and disposal processes of packaging made from materials such as plastic, cardboard, aluminum, and biodegradable materials form the main focus of this study. Literature reviews and current statistics show that a significant portion of single-use packaging cannot be included in recycling processes, is largely directed to regular storage sites, or directly mixes with the environment, causing long-term damage to ecosystems. Furthermore, the fast-paced consumption culture and changing consumer habits are among the main factors increasing the amount of packaging waste. In this context, it is necessary not only to reduce packaging waste but also to develop sustainable packaging alternatives and promote circular economy principles.

The findings obtained within the scope of the study reveal that policymakers need to develop effective regulations, the food industry needs to turn to innovative packaging solutions, and consumers need to be made aware in order to reduce the environmental impact of single-use packaging. As a result,

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encouraging environmentally friendly packaging systems is
necessary to both protect the ecological balance and ensure sustainability.

Keywords: single-use packaging, food industry, environmental impact, sustainability, circular economy

**CAFFEINE EXPOSURE AND ITS NEUROBEHAVIORAL ALTERATIONS IN ZEBRAFISH
(DANIO RERIO)**

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ABSTRACT

Caffeine is one of the most widely consumed psychoactive substances worldwide, with well-known effects on the central nervous system. The zebrafish (*Danio rerio*) has become a prominent model for investigating neurobehavioral responses due to its genetic and physiological similarity to humans, transparent embryos, and well-characterized neural circuits. This review provides a comprehensive synthesis of studies examining the neurobehavioral effects of caffeine exposure in zebrafish. Reported outcomes include alterations in locomotor activity, changes in anxiety-like behavior, modulation of social interactions, and effects on cognitive performance. These behavioral changes are linked to modifications in neurotransmitter systems, synaptic activity, and neural circuitry function. Evidence indicates that caffeine can exert both stimulatory and inhibitory effects depending on dose, exposure duration, and developmental stage, highlighting the complexity of its action on the nervous system. By

integrating findings from multiple studies, this review emphasizes the zebrafish as a versatile model for understanding the neural mechanisms underlying caffeine-induced behavioral changes. The insights gained from this research contribute to a better understanding of how commonly consumed stimulants influence neurobehavioral processes and may inform translational studies in humans.

Keywords: Caffeine exposure; Zebrafish; Neurobehavior; Neurotoxicity

**ANALYSIS OF NIGERIAN EXPENDITURE AND INFLATION UNDER BUHARINOMICS:
PROMISE OR PRACTISE?**

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ABSTRACT

This study presents a comprehensive analysis of Nigeria's economic expenditure patterns during the administration of President Muhammadu Buhari from 2015 to 2023, a period often referred to as the era of "Buharinomics." Employing a descriptive analysis of secondary data (2014-2023) from the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN), the research dissects the components of Gross Domestic Product (GDP) by expenditure in both nominal and real terms, juxtaposed against detailed inflationary trends. The findings reveal a profound and critical divergence between nominal and real economic indicators. While nominal consumption, investment, and government expenditure showed substantial growth, the real-term analysis, adjusted for inflation, uncovers a period of severe economic stagnation. Key results indicate that real household consumption and government expenditure in 2023 were virtually stagnant compared to 2014 levels, while real investment saw only marginal growth. This stagnation occurred alongside escalating, broad-based inflation, particularly in food and essential commodities, which drastically eroded purchasing power. The study concludes that the policy mix of foreign exchange restrictions, import controls, and debt-financed fiscal expansion, compounded by external shocks, primarily generated inflationary pressure rather than sustainable real economic growth. The outcome was a stagflationary environment characterized by high inflation and stagnant output. The research underscores the imperative for future policy to prioritize macroeconomic stability, market-oriented reforms, and security to unlock productive capacity and foster inclusive growth.

Keywords: CPI, Economy, Growth, Policy, Reform, Nigeria

**COMBINED EFFECTS OF SHADE AND WATER STRESS ON PHYSIOLOGY AND
GROWTH OF TOMATO PLANTS (*SOLANUM LYCOPERSICUM* L)**

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ABSTRACT

The Mediterranean region is predominantly vulnerable to the impact of climate change. One consequence of the globale warming is the increasingly frequent occurrence of drought and high temperatures. This study evaluated the combined effect of shade (high density) and water stress on the growth of two tomato varieties (*Solanum lycopersicum* L.) in greenhouses. Four treatments were applied: two water conditions (Control T0) and continuous stress (T1) and two planting densities conditions (High density (HD) and Low density: (LD)). In this experiment we analyzed different physiological (stem length, leaf number, leaf area, biomass) and biochemical parameters (water content, chlorophyll, sugars, proline, phenolic compounds). Our results showed that shade did not significantly modify several parameters, such as stem thickness, number of leaves, nodes, internode length, as well as leaf and root water content, regardless of water conditions. In M82, shade had no significant effect on stem length, flower number, total sugars and phenolic compounds. On the other hand, it stimulated specific leaf area and Chlorophyll b, but reduced root dry weight and carotenoids under stress and irrigation, increased leaf dry weight under stress, and reduced chlorophyll a under irrigation). Finally, in both varieties, shade inhibited proline synthesis and total protein synthesis under water stress, without any notable effect under irrigation.

Keywords: drought, high density planting, proline, climate change, shade.

MULTIMODAL SENTIMENT ANALYSIS IN FOOD REVIEWS

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ABSTRACT

The growing influence of consumer-generated multimedia content on food choices and agricultural practices has created opportunities for sentiment analysis that extends beyond text-based data. Traditional sentiment analysis relies heavily on textual reviews, often neglecting the rich multimodal cues embedded in images, videos, and audio feedback. In this work, we propose a multimodal sentiment analysis framework that integrates textual reviews, food images, and contextual metadata to assess consumer opinions on food products. By employing deep learning-based fusion techniques, we combine linguistic features with visual attributes such as freshness, portion size, and presentation to capture a more nuanced understanding of consumer sentiment. Experiments on benchmark food review datasets demonstrate that multimodal fusion significantly outperforms unimodal models, highlighting the importance of integrating visual cues in sentiment prediction. The findings provide new insights for food industries, nutrition researchers, and recommendation systems, offering a more holistic approach to analyzing consumer preferences.



İlgili makama;

ICONFOOD'25 4. ULUSLARARASI GIDA ARAřTIRMALARI KONGRESİ 16-18 Ekim 2025 tarihleri arasında Sivas Cumhuriyet Üniversitesi Gıda Çalışmaları Uygulama ve Araştırma Merkezi'nde 26 farklı ülkenin akademisyen/araştırmacılarının katılımıyla gerçekleşmiştir. Kongre kapsamında sunumu yapılan 299 bildirinin 143 adeti Türkiye'den katılımcılar tarafından; 156 bildiri ise 26 ülkeden katılımcılar tarafından sunulmuştur. Kongre 16 Ocak 2020 Akademik Teşvik Ödeneği Yönetmeliğine getirilen *"Tebliğlerin sunulduğu yurt içinde veya yurt dışındaki etkinliğin uluslararası olarak nitelendirilebilmesi için Türkiye dışında en az beş farklı ülkeden sözlü tebliğ sunan konuşmacının katılım sağlaması ve tebliğlerin yarıdan fazlasının Türkiye dışından katılımcılar tarafından sunulması esastır."* değişikliğine uygun düzenlenmiştir.

Bilgilerinize arz edilir,

Saygılarımla,

A handwritten signature in blue ink, reading "Özlem Pelin CAN".

Prof. Dr. Özlem Pelin CAN
Chair of Congress / Kongre Başkanı



T.C.
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İlgi : 22.04.2025 tarihli ve E-30182376-051-550571 sayılı yazınız.

Gıda Çalışmaları Uygulama ve Araştırma Merkezi ile İktisadi Kalkınma ve Sosyal Araştırmalar Enstitüsünün (İKSAD) İşbirliği ile 16-18 Ekim 2025 tarihlerinde yüz yüze ve çevrimiçi olarak gerçekleştirilmesi planlanan 4rd International Congress on Food Researches/ 4. Uluslararası Gıda Araştırmaları Kongresi'nin (ICONFOOD'25) ilgi de kayıtlı yazı ile belirtilen "Düzenleme Kurulu" Rektörlüğümüzce uygun görülmüştür.

Gereğini rica ederim.

Prof. Dr. Hayati ÖZTÜRK
Rektör V.

Ek:

- 1- İş Birliği Protokolü (3 Sayfa)
- 2- Kongre Düzenleme Kurulu (2 Sayfa)

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