IFIS 2024

INTERNATIONAL FOOD INNOVATION AND SUSTAINABILITY CONGRESS











ABSTRACT BOOK

IFIS

INTERNATIONAL FOOD INNOVATION AND SUSTAINABILITY CONGRESS

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Şerife ÇİMEN, *Yildiz Technical University, Türkiye*

PREFACE

Today, there are stunning statistical data on sustainability. Approximately 878,954,456 people worldwide are malnourished, around 13,000 people die daily due to hunger, and 763,658,986 people cannot access safe drinking water (worldometer.info). Despite these data, approximately 35 % of the food produced worldwide is wasted. These wasted foods cause environmental, economic and sociocultural problems. The World Overshoot Day, which was 24 December in 1971, now falls on 2 August. This means that we are currently consuming 1.7 times more than we should consume normally. Therefore, the concept of sustainability has been among the most important issues worldwide in recent years.

Due to the importance of this issue, as Yıldız Technical University Food Engineering Department, we have organised the "International Food Innovation and Sustainability (IFIS)" congress at Yıldız Technical University Davutpaşa Congress Center between 16-18 May 2024. In the opening speeches of the congress, the importance of innovative approaches and sustainability concepts applied and potential approaches to be applied in the food industry in terms of academic, industrial, environmental and social perspectives were emphasised by academic and sectoral experts.

Stakeholders from the industry and academia participating in the IFIS-2024 congress made poster and oral presentations on a wide range of topics such as sustainable food systems, innovative approaches applied in food science and technology, functional foods, food packaging, food additives, nanotechnological applications, sustainable gastronomy, industry 4.0 and digitalisation within the framework of food innovation and sustainability. In the face-to-face congress, participants from universities and the industry came together to exchange ideas on innovation and sustainability in the field of food science and technology, as well as to establish new collaborations within the framework of academia and academia-industry cooperation. An intensive participation from 25 different companies in teh sector took place in our congress. Approximately 95 oral and 91 poster presentations were made in the congress and approximately 400 participants from academia, industry, undergraduate and graduate students attended the congress.

We would like to thank the sponsoring companies (Cargill, Eti, Bor Şeker, Erişler Gıda, IFF Turkey, Stern, Palsgaard, Remik, Interlab, Balparmak, Elvan, Mila Su, Pin, Colorworks, Cafe Crown), the members of the congress organising committee consisting of faculty members and lecturers of Yıldız Technical University Food Engineering Department the scientific committee members who contributed to the congress, our undergraduate and graduate students in Yıldız Technical University who supported the organisation of the congress, the congress scientific committee, invited speakers and everyone who attended the congress.

We have received very positive feedbacks about the congress we organised on 14-16 May at Yıldız Technical University Davutpaşa Congress Center. We hope to meet at the "II. International Food Innovation and Sustainability" congress as the the continuation of the IFIS-2024, which we plan to hold in 2026..

With Best Regards,

Dr. Ömer Said TOKER

INVITED SPEAKERS



Prof. Dr. FERRUH ERDOĞDU

Co-Editor in Chief in Journal of Food Engineering

ANKARA UNIVERSITY DEPARTMENT OF FOOD ENGINEERING

Innovative Food Processing Systems for Sustainability: Computational Design and Manufacturing for Beyond Industry X.0



Prof. Dr. ALİ COŞKUN DALGIÇ

GAZIANTEP UNIVERSITY DEPARTMENT OF FOOD ENGINEERING

Digital Transformation Tools in Food Engineering: Process Simulation and Virtual Reality (VR) Applications in Food Production Processes



Prof. Dr. MUSTAFA ÇAM

ERCIYES UNIVERSITY

A Solid State Fermentation for the Enrichment of Functional Properties of Corn Flour



Prof. Dr. ŞENAY ŞİMŞEK

DEPARTMENT HEAD AND PROFESSOR, DEAN'S CHAIR IN FOOD SCIENCE, PURDUE UNIVERSITY

Navigating the Future: Emerging Trends and Sustainability in the Food Industry



Prof. Dr. YEKTA GÖKSUNGUR

EGE UNIVERSITY

Sustainability and Biotechnology:New Approaches to Utilization of Food Industry Wastes in Bioprocesses



Assoc. Prof. Dr. ÖZGE KAHRAMAN ILIKKAN

BAŞKENT UNIVERSITY DEPARTMENT OF FOOD PROCESSING

Innovative Food Products Required for Long Space Missions



Assist. Prof. Dr. GÜLİZAR BALCIOĞLU

YILDIZ TECHNICAL UNIVERSITY

Sustainability in the Food Industryand Life Cycle Assessment



PROF.DR. M. ZEKİ DURAK

PRESİDENT OF TURKİSH PATENT AND TRADEMARK OFFİCE

Successful Intellectual Property Practices in Food Technology



Prof. Dr. REMZİYE YILMAZ

HACETTEPE UNIVERSITY

Fermentation for a Sustainable Food Future: Valorization of Food Waste



Dr. ESRA BÖLÜK

FOOD TECHNOLOGIES SPECIALIST

The Importance of Collaborations between Academy and Industry



SİNEM GEDİK, M.SC.

CUSTOMER INNOVATION MANAGER

Innovation Capabilities at Cargill



AYLİN AKSOY

R&D DIRECTOR

Building of an Innovation Culture: Cargill's Perspective



GUPSE SÜREN

CORPORATE RESPONSIBILITY PROJECT MANAGER

Sustainability at Cargill



UFUK ALPAT

LABORATORY TECHNICAL MANAGER

Sustainable Beekeeping Model in Rural Development Regions



Dr. ABDULLAH ERİŞ

BOARD MEMBER OF ERIS GIDA

The Importance of Sustainability to Increase Export Potential



Palsgaard®
Heart working people

EYMEN BALTAŞI ÇIRAĞILOĞLU

MANAGING DIRECTOR, TURKIYE AT PALSGAARD

A Cultural Heritage of Palsgaard : Sustainability and Innovation



iff

AYNUR ÇELİK

CREATION&DESIGN DIRECTOR, TURKIYE AT IFF

Upcycling as a Novel Approach for Recycling of Food-By Products: Rose and Cacao Extract Applications



SternIngredients
Turkey

CENK ENGİN

OPERATIONS MANAGER AT STERNINGREDIENTS TURKEY

Mostly Used Enzymes in Baking: Short Overview and Benefits

IFIS 2024

Program Guide

International Food Innovation and Sustainability Congress

ifis@yildiz.edu.tr

OPENING

16 May 2024, Thursday-Davutpasa Congress Center– Main Hall

08:00 - 09:30	**REGISTRATION-OPENING COCTAIL**
09:30 - 10:30	**A MOMENT OF RESPECT AND THE INTERNATIONAL ANTHEM** **OPENING AND PROTOCOL SPEECHES** Prof.Dr.Omer SIMSEK (On behalf of YTU Food Engineering Department) Prof.Dr.Osman SAGDIC (Dean of Faculty)
10:30 - 10:45	**COFFEE BREAK**
10:45 - 11:15	**Prof. Dr. Ferruh ERDOGDU** Innovative food processing systems for sustainability: computational design and manufacturing for beyond industry X.0
11:15 – 12:00	**Aylin AKSOY (R&D Director)** Building of an Innovation Culture: Cargill's Perspective **Sinem GEDIK M.Sc.** (Customer Innovation Manager) Innovation Capabilities at Cargill **Dr.Esra BOLUK** (Food Technologies Specialist) The Importance of Collabrations Between Academy and Industry
12:00-12:20	**Dr.Abdullah ERIS** (Board Member of Erisler Gıda) The Importance of sustainability to increase export potential
12:20-13:30	**LUNCH**

ifis@yildiz.edu.tr

SESSION I-A:–16 May 2024,Thursday, 13:30-14:30
Chair: Prof. Dr. Ferruh ERDOGDU
Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

13:30-13:50

Prof. Dr. Hamit KOKSEL
Innovative Approaches for Sustainable and Healthy Grain-Based Foods

13:50-14:00

Kubra UZUNER, Ayse Neslihan DUNDAR, Oya Irmak SAHIN, Mahmud Ekrem PARLAK , Furkan Turker SARICAOGLU
Effect of Ohmic Heating System on The Mechanical and Barrier Properties of Biodegradable Films Obtained From Black Cumin Seed Meal

14:00-14:10

Busra Akdeniz OKTAY, Elif Turabi YOLACANER
Optimization of the vacuum microwave-assisted extraction conditions for betaxanthin-rich bioactives from cactus pear (Opuntia ficus-indica L.)

14:10-14:20

Nur Sena AKDENIZ, Elif Turabi YOLACANER
An Optimization Study for Vacuum Microwave-Assisted Extraction of Betacyanin-rich bioactives from Amaranthus caudatus L. flowers

14:20-14:30

Ozer ATIL
Developing an Improver for Freezer Process Bakery Products (Turkish Simit) and Investigating the effects of each ingredients

SESSION I-B: 16 May 2024, Thursday, 13:30-14:30
Chair: Prof. Dr. Yekta GOKSUNGUR
Davutpasa Congress Center– Green Hall

13:30-13:50

Hamza SGHROUCHNI, Semra TASDURMAZLI, Isil VAR
Optimization of a method for isolating Clostridium perfringens bacteriophages

13:50-14:00

Ezgi BITIM, Muge Urgu OZTURK, Ali TOPCU, Tugba BULAT, Selin ACIKEL, Melissa ORHAN, Gulten TIRYAKI GUNDUZ, Nurcan KOCA
Effects of the Factors on the Formation of Petroleum Odour by Penicillium commune in Fresh Kashar Cheese

14:00-14:10

Hatice Sevgi COBAN, Muhammet Zeki DURAK
Evaluation of CRISPR Profiles of Streptococcus thermophilus Isolates from Yoghurt Samples

14:20-14:30

Fatmanur Poyraz EKINCI, Humeyra ISPIRLI, Enes DERTLI
Lactic Acid Bacteria Profiles of Bee Products, Food and Beekeeping Applications

14:30-14:45 **COFFEE BREAK AND POSTER PRESENTATIONS**

SESSION II-A:–16 May 2024,Thursday,14:45-15:45
Chair: Prof. Dr. Nevzat KONAR
Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

14:45-15:05

Prof. Dr. Sencer BUZRUL
High Hydrostatic Pressure Applications of Foods

15:05-15:15

Sarhan MOHAMMED, Ahmet Hilmi CON
Biosynthesis of nanoparticles using microorganisms and their application in the food sector

15:15-15:25

Belemir BEZIRHAN, Murat KAYA, Mustafa CAM
Determination Of The Ph And Temperature Degradation Kinetics Of The Eritadenine Compound Of
The Shiitake Mushroom (Lentinula Edodes)

15:25-15:35

Elif ATAY, Ipek COSKUN, Aylin ALTAN
Electrospun Fibers Reinforced with Nanoparticles and Their Use in Extending the Shelf Life of Foods

15:35-15:45

Merve AYDIN, Ismail TONTUL, Selman TURKER
Extraction of Phenolic Compounds from Pomegranate By-products using Green Processes

SESSION II-B:–16 May 2024,Thursday,14:45-15:45
Chair: Prof. Dr. Omer SIMSEK
Davutpasa Congress Center– Green Hall

14:45-15:05

Prof. Dr. Remziye YILMAZ
Fermentation for a Sustainable Food Future: Valorization of Food Waste

15:05-15:15

Ozen SOKMEN, Ayse Neslihan DUNDAR, Sine OZMEN TOGAY, Ufuk BAGCI
The Microbiological Properties of Sourdoughs from the Marmara Region

15:15-15:25

Merve YUKSEL, Nurcan DOGAN, Cemhan DOGAN, Serap BERKTAS, Mehmet HAYTA, Mustafa CAM
Fungal Solid-State Fermentation followed by UV-B application to enrich vitamin D content of Wheat Flour

15:25-15:35

Saliha GHARBI, Anass ELYEMLAHI, Hanane BAKRIM, Mostafa LAMHAMDI, Mounir HASSANI ZERROUK, Mohammed BAKKALI, Amin LAGLAOUI1, Abdelhay ARAKRAK1,Ouiam EL GALIOU
Optimization of Rhizobial Strain Culture Conditions for Maximum Exopolysaccharides Production: The Impact of Physiological Parameters

15:35-15:45

Nezahat OLCAY, Shahab IQBAL, Knut FRANKE
Optimization of Solid-State Fermentation Conditions Using Trametes Versicolor for Improving Antioxidant Properties of Carob Waste

15:45-16:00 **COFFEE BREAK AND POSTER PRESENTATIONS**

SESSION–III-A: 16 May 2024,Thursday,16:00-17:00
Chair: Prof. Dr. Mustafa CAM
Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

16.00-16.10

Irem CANTURKOGLU KIYAK, Zulal Sila BASTURK, Sevil Cikrikci ERUNSAL
Printability Evaluation of Carob Added Dark Chocolate

16:10-16:20

Husnu KASAR, Suleyman GOKMEN, Hasan YETIM, Ferhat BOZDUMAN
Innovative approaches in the food industry: Microwave plasma technology and applicability in foods

16:20-16:30

Ozlem YUNCU-BOYACI, Hulya Serpıl KAVUSAN, Sıla CALISKAN, Meltem SERDAROGLU
Chitosan and Pomegranate Seed Oil-Based Gelled Emulsion as an Animal Fat Replacer in Meat Emulsions: Effects on Oxidation Parameters and Color Stability

16:30-16:40

Mutlu PILAVTEPE-CELIK, Atanur YILDIRIM, Zeynep MERT, Buse KARAKAS
Distinguishing Fresh and Frozen-Thawed Vermilion Snapper (Rhomboplites aurorubens) Using Image Analysis

16:50-17:00

A. Necat KIRKIL
Leveraging Food Safety, Quality, and Sustainability: Third-Party Certification and the Impact of FSSC 22000 in the Food Industry

SESSION- III-B: 16 May 2024, Thursday, 16:00-17:00
Chair: Prof.Dr.Arzu BASMAN
Davutpasa Congress Center– Green Hall

16:00-16:10

Eda Nur AYAR-SUMER, Yannick VERHEUST, Beraat OZCELIK , Katleen RAES
LC-Q-TOF-MS/MS characterization of free and bound phenolic compounds of fermented Lactarius deliciosus and its potential antioxidant activities

16:10-16:20

Mahmut Ekrem PARLAK, Furkan Turker SARICAOGLU
Beyond of Plant Proteins: Amyloid-like Protein Fibrils

16:20-16:30

Suzan UZUN
Sustainable Solutions: Carbon Dots in Food Packaging

16:30-16:40

Emel Onder FIRAT, Ibrahim Sani OZDEMIR, Oznur KARAOGLU, Muhammet ARICI
Effects of Growing Region, Year of Harvest and Altitude on Fatty Acid, Sterol and Tocopherol Compositions of Giresun Tombul Hazelnut Oil

16:40-16:50

Bilgen OZSOY, Buse BIYIKLI, Cansu YAY, Alper YELLICE, Onur GUNESER, Hilal ATA, Umut CIFTCI, Muge ISLETEN HOSOGLU
Sustainable Protein Production: Exploring The Efficacy of Alkaline Extraction from Diverse Sources

16:50-17:00

Gonca Bilge OZEL, Huseyin Guray CIFTCI, Ezgi AYTAC
Monitoring The Quality Changes And Shelf Life Of Food Products By Spectroscopic And Chemometric Methods

17:00-18:00 **POSTER PRESENTATIONS**
WISDOM WALK & CAMPUS TOUR

2nd DAY

17 May 2024, Friday-Davutpasa Congress Center– Main Hall

08:30 – 10:00	**REGISTRATION**
09:00 – 09:30	**Prof. Dr.Ali Coskun DALGIC** Digital Transformation Tools in Food Engineering: Process Simulation and Virtual Reality (VR) Applications in Food Production Processes
09:30 – 09:50	**Ufuk ALPAT** (BALPARMAK Laboratory Technical Manager) Sustainable Beekeeping Model in Rural Development Regions
09:50 - 10:20	**Prof. Dr. Senay SIMSEK** Navigating the Future:Emerging Trends and Sustainability in the Food Industry
10:20 - 10:40	**Prof. Dr. M. Zeki DURAK** Successful Intellectual Property Practices in Food Technology
10:40 - 11:00	**Gupse SUREN** (Cargill Corporate Responsibility Project Manager) Sustainability at Cargill
11:00-11:20	**COFFEE BREAK AND POSTER PRESENTATIONS**
11:20-11:50	**Prof. Dr. Mustafa CAM** A Solid State Fermentation for the Enrichment of Functional Properties of Corn Flour
11:50-12:10	**Aynur CELIK (IFF)** Upcycling as a Novel Approach for recycling of food by-products: Rose and Cacao Extract Applications
12:10-12:30	**Eymen BALTASI CIRAGILOGLU (Palsgaard)** A cultural Heritage of Palsgaard:Sustainability and Innovation
12:30-12:40	**Cenk ENGIN** (General Manager of Stern Turkiye) Mostly Used Enzymes in Baking: Short overview and Benefits
12:40-13:30	**LUNCH**

SESSION IV-A:–17 May 2024, Friday, 13:30-14:30
Chair: Prof. Dr. Figen ERTEKIN
Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

13:30-13:50

Prof.Dr. Ferruh ERDOGDU
Future of Food Engineering in the view of sustainable processing and industrial expectitions

13:50-14:00

Ozan KARATAS, Rahmi UYAR, Berkay BERK, Mecit Halil OZTOP, Ferruh ERDOGDU
Developing a Radio Frequency Process for Honey De-Crystallization

14:00-14:10

Mervenur KOMURKURU, Ertan ERMIS, Beyza VAHAPOGLU, Muhammed OZGOLET, Ibrahim PALABIYIK
Effects of Rhodiola rosea and Withania somnifera powders on textural and functional properties of chewing gum

14:20-14:30

Burge KOSE, Deniz UYGUNOZ, Emek DERUN, Nurcan TUGRUL
Development Of Alternative Leather Production Methods From Different Fruit Wastes

SESSION IV-B: 17 May 2024, Friday, 13:30-14:30
Chair: Prof. Dr. Remziye YILMAZ
Davutpasa Congress Center– Green Hall

13:30-13:50

Prof. Dr. Yekta GOKSUNGUR
Sustainability and Biotechnology:New Approaches to Utilization of Food Industry Wastes in Bioprocesses

13:50-14:00

Elif Gulsen KARABACAK, Ahmet Hilmi CON
Recent Advances in the Production of Microbial Exopolysaccharide (EPS) from By-Products and Agri-Food Wastes for the Development of Sustainable Food Packaging

14:00-14:10

Nadide SEYHUN, Salih ERGEN
Effects of Curcumin on Quality Parameters and Shelf Life of Rainbow Trout Fillets

14:10-14:20

Yasemin Sefika KUCUKATA, Beyza Nur GUC, Hasan YETIM, Banu METIN
Biofilm Formation And Autoinducer-2 Production Characteristics Of Meat Spoiler Pseudomonas fragi

14:20-14:30

Berfin SUCU, Isıl VAR, Isılay LAVKOR, Muhammed Nur HACCAR
Molecular And Morphological Characterisation Of Aspergillus Section Flavi Isolated From Wheat Grains

14:30-14:45 **COFFEE BREAK AND POSTER PRESENTATIONS**

SESSION V-A:–17 May 2024, Friday, 14:45-15:45
Chair: Assoc.Prof.Dr. Ertan ERMIS
Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

14:45-14:55

Abdullah Mohammed NAJI, Mustafa CAM
A comparative study into degree of hydrolysis, anti-obesity, anti-diabetic, and antioxidants activities from cow, buffalo, goat, and sheep casein hydrolysates generated upon flavourzyme and neutrase enzymes

14:55-15:05

Mumine GURUK, Patrick FICKERS, Huseyin ERTEN
Investigation of the antioxidant and antimicrobial potantial of two thiols, γ-glutamyl cysteine and glutathione

15:05-15:15

Fatma Nur DEMIRBAS
The Sustainability of Food and Nutrition Security for the Elderly

15:15-15:25

Hale Inci OZTURK, Aysun ORAC
From Sustainable Protein Sources to Bioactive Peptides: The Role of In Silico Analyses

15:35-15:45

Yuksel Ceyda CETIN, Hilal DEMIRKESEN BICAK
Exploring Gastrophysics: The Role of the Senses in Nutrition

SESSION V-B:–17 May 2024, Friday, 14:45-15:45
Chair: Dr. Ivana ČABARKAPA
Davutpasa Congress Center– Green Hall

14:45-14:55

Yılmaz OZCAN, Abdullah KURT, Omer Said TOKER
Glycosylation of Turkey (Meleagris gallopavo) Skin Gelatin with Maltodextrin: Effects of Glycosylation Time on Physical, Structural and Rheological Properties

14:55-15:05

Gizem CALISGAN UNAY
Towards Sustainable Agri-Food Industry: Mitigating Carbon Footprint from Farm to Fork

15:05-15:15

Ruya KURU-YASAR, Sahin YILMAZ, Ozlem USTUN-AYTEKIN, Fikrettin SAHIN
Boron Levels in some Edible Salts Consumed in Turkiye

15:15-15:25

Yunus E. TUNCIL, Omer F. CELIK, Elanur DASTAN, Omer F. CETINER, Orhan BAS, Zafer BULUT, Stephen R. LINDEMANN, Mehmet I. TUGAY, Muhammet DEGERMENCI, Beyza SUVARIKLI-ALAN, Mehmet NIZAMLIOĞLU
Hazelnut (Corylus avellana L.) skin dietary fibers provides saccharolytic activity in the distal colon of mice

15:35-15:45

Necattin Cihat ICYER, Nesrin KURAN
Reducing solid fat intake: Fat content profile of packaged foods offered for sale in Türkiye

15:45-16:00 **COFFEE BREAK AND POSTER PRESENTATIONS**

SESSION–VI-A: 17 May 2024, Friday, 16:00-17:00
Chair: Assoc. Prof.Dr. Furkan Turker SARICIOGLU
Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

16:00-16:20

Assoc. Prof. Dr. Ozge KAHRAMAN ILIKKAN
Innovative Food Products Required for Long Space Missions

16:20-16:30

Slađana RAKITA, Nedeljka SPASEVSKI, Olivera DURAGIĆ, Jasmina LAZAREVİĆ, Aleksandra BAJIĆ, Ivan SAVIĆ, Ivana SAVIĆ GAJIĆ
Exploring the nutritional benefits of camelina seed and its by-products

16:30-16:40

Merve SABUNCU, Dilek DULGER ALTINER, Yasemin SAHAN
Gluten-free Functional Purple Potato Flour

16:50-17:00

Halide Yıldırım TUGRUL, Ece SUREK
Melanin: A Potential Functional Ingredient for Food

SESSION-VI-B: 17 May 2024, Friday, 16:00-17:00
Chair: Prof. Dr. Meltem SERDAROGLU
Davutpasa Congress Center– Green Hall

16:00-16:20

Assist. Prof. Dr. Gulizar BALCIOGLU
Sustainability in the Food Industry and Life Cycle Assessment

16:20-16:30

Ivana ČABARKAPA, Slađana RAKITA
Reducing the negative impact of invasive crayfish Faxonius limosus in the Danube by smart exploitation of their meat and shells

16:30-16:40

H. Beste ONER, Ozge FILIZ, Ozgun KOPRUALAN AYDIN, Nazlı SARIKAHYA, Hilal SAHIN NADEEM, Figen KAYMAK ERTEKIN
Encapsulation by Ionic Gelation Method of Pure Sulforaphane Extracted from Cabbage Seeds: Optimization of Process Conditions and Determination of Stability

16:40-16:50

Hicran ARSLAN, Muhammet Irfan AKSU
The effect of encapsulated raspberry powder on the lipid oxidation of modified atmosphere packaged chicken nuggets during child storage

16:50-17:00

Feyza TOSYA, Sibel BOLEK
Investigation of Alternative Methods for the Use of Nitrite and Nitrate in Meat Products

3rd DAY

18 May 2024, Saturday, Davutpasa Congress Center

SESSION VII-A: 18 May 2024, Saturday, 09:00-10:00

Chair: Prof. Dr. Ali COSKUN DALGIC

Davutpasa Congress Center– Prof. Dr. Ferruh Erturk Hall

09:00-09:10

Aypar SATI, Isil OZGEN
Calculation of the Carbon Footprint of Restaurant Menus

09:10-09:20

Oznur SAROGLU, Ayse KARADAG, Zeynep Hazal TEKIN CAKMAK, Salih KARASU
Investigating the Rheological, Microstructural, and Textural Properties of Liposomal Gels Derived from Salep and Xanthan Gum

09:20-09:30

Duygu OZMEN, Omer Said TOKER, Saniye AKYIL OZTURK
Lemon Fiber: A Sustainable Solution for Healthier Cream Fillings

09:30-09:40

Sukran ASGIN, Furkan Turker SARICAOGLU, Adnan Fatih DAGDELEN
Investigation of the Use of Menthol and Organic Acid-Based Deep Eutectic Solutions as Plasticizers in Food Packaging

09:50-10:00

Fahri YEMISCIOGLU, Kubra SUMER, Gulin CAMLI
Invest in the Future:Sustainability and Innovation

SESSION VII-B: 18 May 2024, Saturday, 09:00-10:00

Chair: Prof. Dr. Enes DERTLI

Davutpasa Congress Center– Green Hall

09:00-09:10

Busra Nur ISTANBUL, Zuhal ALKAY, Miguel Angel ALVAREZ GONZALES, Emine ESEN, Alev Yuksel AYDAR, Stephen R. LINDEMANN, Yunus Emre TUNCIL
Gut Microbiota Modulation Properties of Various Dietary Fibers Extracted from Olive Oil Industry Byproducts

09:10-09:20

Irem BULDUR, Fazilet MIDIK
Artificial Intelligence in the Field of Gastronomy

09:20-09:30

Basak Ebru OZCAN, Meliha ARSLANTURK, Ayse KARADAG
Green synthesis of metallic nanoparticles by plant-based extracts and their food applications

09:30-09:40

Nisa AKKUZU, Canan Yagmur KARAKAS, Dilara DEVECIOGLU, Funda KARBANCIOGLU GULER, Osman SAGDIC, Ayse KARADAG
Emulsion-based edible chitosan film enriched containing propolis extract to extend the shelf life of strawberries

09:40-09:50

Cihat GUNER, Hakan BASDOGAN
Production of Functional Noodle from Black Carrot Pulp with Sustainability Approach

10:00-10:15 **COFFEE BREAK**

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Chair: Assoc. Prof. Dr. Yunus Emre TUNCIL
Davutpasa Congress Center– Prof.Dr.Ferruh Erturk Hall

10:15-10:25
Betul CETINKAYA DEMIR, Seda ARIOGLU-TUNCIL
Diet, Gut Microbiota and Health: Knowns, Unknowns and Future Perspectives

10:25-10:35
Sultan DEMIRCI, Serdar MARASLI
Sustainable Oat Processing via Contract Farming in Eti

10:35-10:45
Ilay YILMAZ, Furkan Turker SARICAOĞLU
Functional Properties of Lentil Protein Subfractions

10:45-10:55
Sıla Satı SIMSEK, Ilyas ATALAR
Investigation The Effect of Different Production Conditions on Flavour Components and Sensory Properties in Strawberry Flavored Milks

10:55-11:05
Gamze DUVEN, Aycan YIGIT CINAR, Sine OZMEN TOGAY
Effects of Social Media Literacy on Food Safety and Sustainability

11:05-11:15
Merve SABUNCU, Gunnur GULKUN,Gamze DUVEN, Reem MOHAMED, Yasemin SENEL ŞAHAN, Sine OZMEN TOGA
Use of Different Raw Materials in Production of Tarhana and Evaluation of Their Sensory Properties

11:15-11:25
Nurullah DEMIR, Gulay OZKAN, Esra CAPANOGLU GUVEN
Evaluation of Quality Properties and Antioxidant Activity of Bingöl Honey

SESSION VIII-B: 18 May 2024, Saturday, 10:15-11:35
Chair: Prof.Dr. Fatih TORNUK
Davutpasa Congress Center– Green Hall

10:15-10:25
Emine Gizem ACAR, Derya Kahveci KARINCAOGLU
Upcycled foods: Sustainable valorization of food side streams

10:25-10:35
Muhammed OZGOLET, Salih KARASU
Enhancing gluten-free muffins with milk thistle seed proteins: Evaluation of physicochemical, rheological, textural, and sensory characteristics

10:35-10:45
Jonida BITURKU, Erta DODONA, Seit SHALLARI, Ilir KRISTO, Adrian MAHO, Gjergji MERO
Toward Sustainable Food System: Enhancing Agricultural Diversity by Growing Nigella sativa L Under Agroecological Condition of Albania

10:45-10:55
Aysenur VURUCUOGLU, Mert Akin INSEL, Aysegul BODUR-YILMAZ, Gunay BAYDAR-ATAK, Omer Alp ATICI, Hasan SADIKOGLU
CFD Simulation of a Nozzle Utilized in Ice-cream Filling Process

10:55-11:05
Ozum OZOGLU, Hasan Huseyin IPEKCI, Mihriban KORUKLUOGLU, Aytekin UZUNOGLU
Electrochemical Detection of E. coli with Paper Based Electrode

11:05-11:15
Mehmet Tunahan CELEBI, Hakan BASDOGAN
Production of Oil Reduced Functional Noodle with Sustainability Approach

11:15-11:25
Franck Gerard BRUWIER, Cagla OZER
An Innovative Approach in Gastronomy: Soufflé and Mousse

CLOSING MENTIONS

SOCIAL PROGRAMME: BOSPHORUS TOUR (2H)

PHOTO GALLERY





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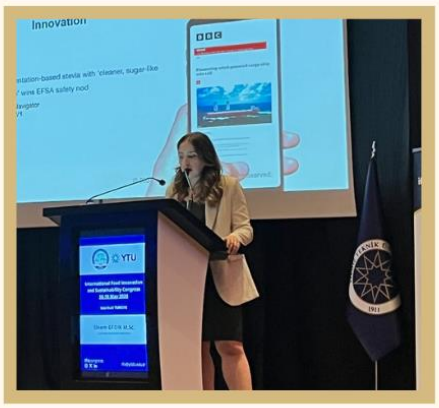






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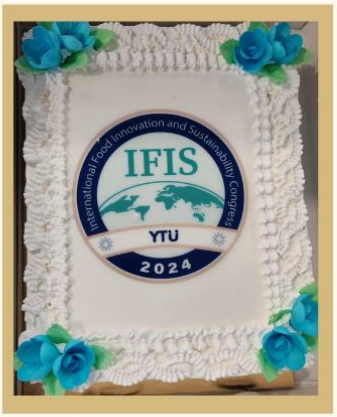












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ORAL AND POSTER PRESENTATIONS



A total of 186 papers, including 95 oral and 91 poster papers, were presented at the International Food Innovation and Sustainability Congress.



All kinds of academic/ethical responsibilities for abstracts belong to the authors. The abstracts of the papers were published in English language.

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Innovative Food Processing Systems for Sustainability: Computational Design & Manufacturing for beyond Industry X.0

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Starting with Appert's process in glass bottles in 1810, producing heat-preserved foods in hermetically sealed containers has contributed to the improvement of nutrition and health in a significant way. While this has been followed by aseptic processing, these two approaches of conventional thermal processing have become the major pillars of the food industry. However, the recent trends in the manufacturing industry questioned the high energy consumption of these processes with the current sustainability focus. This indicated the requirement to innovate the conventional approaches with novel technologies for the sustainability focus to reduce the carbon footprint of the process in this view. Setting up the process parameters for improving safety and quality, on the other hand, highlights the additional challenges. In addition to these concerns, recently increased food safety issues, especially with the low moisture food products, point out the challenges for this required transformation. This transformation also coincides with the challenges of environmental-friendly food processing under the umbrella of the European Green Deal and indicates the novelty requirement in the conventional process lines with increased quality without compromising the safety. The objective of this presentation is therefore to present the recent industrial-oriented novel innovative thermal processing approaches with their challenges to replace conventional processing for sustainability in the view of process design and optimization for quality and safety. While process design and optimization are the required background for industrial process sustainability specifically for energy efficiency, improved food safety and quality assurance through sustainable processes will further require the virtualization (mathematical modeling-based simulation) schemes supported with artificial intelligence and machine learning applications (in addition to the use of IoT and big data simultaneously). These are expected to be the key components of designing sustainable processes with computational control of the processes. With the introduction of Industry 5.0 and beyond industry x.0, combining the digitalization with virtualization will be more significant for improved smarter sustainable approaches to innovate the food processing in the view of quality, safety, and efficiency.

Keywords: Sustainability, industry x.0, novel processing, virtualization, digitalization.

Digital Transformation Tools in Food Engineering: Process Simulation and Virtual Reality Applications in Food Production Processes

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Due to the rapid increase in the global population and the corresponding increase in nutritional needs and quality expectations, there is an urgent need to use resources efficiently, reduce losses in production systems, and reduce environmental impacts. To contribute to solving these problems, there is an increasing demand for digital technology applications in the control, modeling, optimization, and data analysis of food production systems. In this context, digital transformation tools have a significant impact on research and education in food engineering as well as industrial applications. This study aims to examine the role of digital transformation tools, especially process simulation and virtual reality applications, in production processes in food engineering. Process simulation creates digital models of production processes, enabling scenarios of various production parameters to be analyzed from technical, economic, and environmental perspectives. When digital models communicate with real-world production systems, digital twins are created. This application increases production efficiency, reduces waste, and improves quality. Virtual and augmented reality can be used in various areas such as training, simulation, design, and inspection in manufacturing plants. This technology allows users to simulate and control real-world scenarios and to understand production processes more effectively. This study includes research on process simulations and application examples in training activities. There is also a review on which food engineering application areas virtual and augmented reality will be used.

Keywords: Process simulation, virtual reality, digital transformation.

A Solid State (Fungal) Fermentation for the Enrichment of Functional Properties of Corn Flour

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The global population is expected to reach 10 billion by the middle of this century and 18 billion by the end of this century. As if this were not enough, the amount of calories demanded and consumed per person increases almost linearly day by day. Some options have been used throughout history to compensate for this energy demand. Briefly, we can divide them into two as plant and animal foods. However, plant and animal based foods have impacts on the environment. No matter what criteria are used, it is clear that carbon dioxide emissions, water consumption, and field use per gram of protein in meat production are higher than plant proteins. Corn, wheat and rice have by far the highest production rates globally. These 3 cereals have common drawbacks like poorness in aminoacids, proteins and vitamins. In this study, we aimed to improve the nutritional and functional properties of corn by a fungal solid state fermentation method. The spores of two edible mushrooms, Hericium erinaceus (HE) and Pleurotus eryngii (PE), were obtained and then inoculated into the corn biomass aseptically. The resulting biomasses were stored at ambient conditions for 12-14 days until full coverage of corn by the mycelia of respective fungus. The colonized biomasses were treated with UV-B for various time intervals (1-120 min) to convert ergosterol into vitamin D2. The biomasses were dried, milled and passed through a sieve (850 µm). Significant increases were observed in the contents of samples fermented with HE and PE compared to control in terms of lipids, proteins, free fatty acids, free amino acids, total phenolics, antioxidants, water solubility, water absorption index, ergosterol, and Vitamin D2. The color of the samples fermented with HE and PE was clearly different (visually and instrumentally) from the control. Total peptide content analysis indicated that both fungi contributed to the formation of peptides but HE was more aggressive which produced higher amounts of peptides. In addition to the above improvements, vitamin D2 levels reached were striking. The concentrations of vitamin D2 in corn fermented with HE and PE were 16.1 and 18.9 µg/100 g corn, respectively. The content of vitamin D2 in 100 g of fermented corn was found to be enough for an adult person to meet the daily recommended amount of 15 µg.

Keywords: Corn, solid state fermentation, vitamin d2, *Hericium erinaceus*, *Pleurotus eryngii*.

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Navigating the Future: Emerging Trends and Sustainability in the Food Industry

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As the global population approaches nine billion, the food industry faces unprecedented challenges. These include feeding a growing population, minimizing environmental impacts, and adapting to changing consumer preferences. This talk, "Navigating the Future: Emerging Trends and Sustainability in the Food Industry," explores innovative solutions and emerging trends that are shaping the future of food production and consumption. Firstly, we will delve into the advancement of alternative proteins, which stand at the forefront of sustainable food sources. Innovations in plant-based proteins and cultured meats are not only addressing the environmental strains caused by traditional livestock farming but are also aligning with the ethical and health preferences of modern consumers. We will examine the technologies driving these alternatives, their market potential, and their role in sustainable food systems. Secondly, the presentation will highlight the role of agricultural technology, or AgTech, in enhancing food production efficiency. Precision agriculture, which uses AI and IoT-based technologies, optimizes the amount of water, fertilizers, and pesticides, thereby reducing costs and environmental footprints. The integration of vertical farming and hydroponics within urban settings is also redefining the concept of farm-to-table, offering fresh produce directly to urban populations while significantly cutting down transportation emissions and spoilage. Furthermore, we will discuss the impact of climate change on food security and how the industry responds with resilient crop varieties and farming practices. Advances in genetic editing, such as CRISPR technology, have opened new avenues for developing crops that can withstand extreme weather conditions, pests, and diseases, thereby ensuring stable food supplies in the face of climatic uncertainties. Consumer trends also play a crucial role in shaping the industry. The increasing demand for transparency and traceability in food sourcing and production has spurred the adoption of blockchain and other traceability technologies. These tools enhance consumer trust and improve food safety by enabling quicker, more efficient responses to contamination issues. Finally, the talk will address the regulatory and ethical considerations surrounding these innovations. As we embrace new food technologies, navigating the regulatory landscapes governing their development and implementation is crucial. Additionally, ethical considerations, particularly concerning genetic modifications and animal welfare, will be explored to understand their implications on consumer acceptance and industry practices. In conclusion, "Navigating the Future: Emerging Trends and Sustainability in the Food Industry" aims to provide a comprehensive overview of food production's current and future landscapes. By highlighting key innovations and trends, this talk will offer insights into how the industry can sustainably meet future demands while staying aligned with environmental and social goals.

Keywords: Sustainability, emerging trends, AI and IoT-based technologies, food industry, climate change.

Sustainability and Biotechnology: New Approaches to Utilization of Food Industry Waste in Bioprocesses

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When globally generated wastes are categorized as food, glass, metal, paper, plastic, rubber, leather, and wood wastes, the food industry and food wastes constitute the most significant waste group with approximately 931 million tons annually. Food waste, despite being produced for human consumption purposes, is the term given to food that is discarded, lost, damaged, contaminated or unavoidably generated during the production process. According to the data from the Food and Agriculture Organization of the United Nations (FAO), approximately one-third of the food produced worldwide emerges as waste, resulting in an annual economic loss of around $750 billion. These organic wastes, when generated, are disposed of through methods such as composting, incineration, dumping in open areas and/or landfills, anaerobic treatment for methane production, and recycling. Among these methods, incineration and dumping into open areas particularly increase global carbon emission values and greenhouse gas emissions, leading to irreparable damage such as global warming and climate crisis. Most food wastes with high moisture content create a suitable environment for microbial growth due to their rich nutrient components. This situation enables the production of economically valuable bio-products through bioprocessing of food wastes. Utilizing biotechnological processes for the production of bio-products from these wastes has become one of the most researched areas in the scientific community in recent years, aiming to decrease global carbon emission values and create economic value. This presentation will provide information on the utilization of some food industry wastes such as waste figs, whey, brewer's spent grain, potato waste, and waste wafer sheets in the production of economically valuable color pigments, pullulan polysaccharide, and bacterial cellulose using biotechnological methods. Waste fig refers to cracked fruits generally having no market share, with damage occurring during pre-harvest, post-harvest, and storage stages. Whey is a by-product of cheese production, where for every ton of milk processed into cheese, approximately 150-200 kg of cheese is produced along with 800-850 kg of whey. Brewer's spent grain is a lignocellulosic waste generated in the brewing industry after the mashing stage, comprising about 85% of the total brewery waste. Potato waste is a starch-rich waste generated after cutting in French fries production. Waste wafer sheets consist of defective, glued, broken, contaminated, incorrectly packaged, or mislabeled wafer sheets, accounting for approximately 10% of total wafer production. Biotechnological processes offer promising solutions for both environmental conservation and economic sustainability through the utilization of these food wastes. Due to the rapid increase in the global population and the corresponding increase in nutritional needs and quality expectations, there is an urgent need to use resources efficiently, reduce losses in production systems, and reduce environmental impacts. To contribute to solving these problems, there is an increasing demand for digital technology applications in the control, modeling, optimization, and data analysis of food production systems. In this context, digital transformation tools have a significant impact on research and education in food engineering as well as industrial applications. This study aims to examine the role of digital transformation tools, especially process simulation and virtual reality applications, in production processes in food engineering. Process simulation creates digital models of production processes, enabling scenarios of various production parameters to be analyzed from technical, economic, and environmental perspectives. When digital models communicate with real-world production systems, digital twins are created. This application increases production efficiency, reduces waste, and improves quality. Virtual and augmented reality can be used in various areas such as training, simulation, design, and inspection in manufacturing plants. This technology allows users to simulate and control real-world scenarios and to understand production processes more effectively. This study includes research on process simulations and application examples in training activities. There is also a review on which food engineering application areas virtual and augmented reality will be used.

Keywords: Sustainability, biotechnology, food waste, bioprocesses, economic sustainability

Innovative Food Products Required for Long Space Missions

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Space foods are specialized foods designed for astronauts to consume on short or long space missions. Space food therefore needs to be compact, crumb-free, easy to consume, lightweight, and have a longer shelf life. The journey of food in space began with the Mercury Missions in the 1960s with the question of whether humans could consume food in space. Since then, with the development of technology, many of the problems related to food in space have been overcome. Recently, many studies have been carried out, from food processing to bioregenerative systems, to prepare mankind for the journey to Mars, especially with experiments designed both on the ground and at the International Space Station. In addition, functional, bioengineered, 3-D printed foods as well as various supplements such as probiotics and psychobiotics have also been emerging as systems created for innovative solutions for space food systems in space.

Keywords: Space foods, innovative food products, shelf life.

Sustainability in the Food Industry and Life Cycle Assessment

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The food sector generates a huge impact on the environment, being responsible for 30% of global emissions and 70% of global water withdrawal. However, one-third of the food produced is lost along the supply chain before reaching consumers, and the vast amount of food waste is still managed unsustainably, ending up in landfills eventually. On the other hand, as many as 750 million people, or 10% of world population, suffer from hunger and there is an ongoing concern that this will exacerbate because the high food prices threaten global food security. How we manage our food supply and food waste is an example of unsustainable production and consumption practices. The way we produce and consume food therefore should change if we are to reach UN sustainable development goals by 2030 and the climate change mitigation targets set out in the Paris Agreement. In this sense, life cycle assessment (LCA) emerges as a strong approach to assess the comprehensive environmental footprint of a specific product or service, as well as to identify potential environmental enhancements resulting from the adoption of various strategies in manufacturing and supply chain management.

This talk is aimed at discussing the importance and current status of LCA for a sustainable transformation of the food sector. A broad overview of the sustainability of different food systems will be provided, besides what the primary sustainability concerns are in the food supply chain, including food production, retail, consumption, and finally waste management. It will explore the key concepts and limitations of LCA once it is applied in the food sector and how to avoid shifting burdens along its life cycle. Moreover, given the synergies between food-water-energy systems and growing interest in developing more sustainable products, this session will present examples how cutting-edge research through credible and comparable life-cycle based information can aid to develop possible solutions in terms of sustainability. Additionally, the developments in sustainable packaging and the importance of energy use in agri-food and industrial-food production systems will be discussed. The challenges at different stages of the food supply chain will be highlighted in addition to how sustainable practices can be integrated into it complying with circular economy principles. It will draw recommendations for policy makers and other stakeholders towards achieving more sustainable food production and consumption.

Keywords: Sustainability, life cycle assessment, food supply chain, environment, energy, water.

Fermentation for Sustainable Food Future: Valorization Food Waste

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The food industry, being one of the largest worldwide, holds primary significance for national economies. However, in alignment with some of the UN's sustainable development goals, there is a pressing need to halve global food waste per capita by 2030 to mitigate losses along production and supply chains. Fermentation processes play a pivotal role in sustaining the circular bioeconomy. Fermentation, a biochemical process involving bacteria, yeast, and other microorganisms, breaks down organic matter into valuable substances like alcohols or acids. Fermentation supports the circular bio-economy in various ways, including the production of affordable bio-based functional ingredients for food and feed, which are rich in nutrition and health benefits. Moreover, it enhances safety and sustainability across food and feed value chains, reduces reliance on unsustainable sources for food and feed ingredients, and improves the organoleptic and nutritional qualities of healthy food and feed ingredients, thus garnering consumer approval. In here, we address the utilization of food waste in fermentative processes, exploring composition, platforms, and applications of fermentation products. We offer a framework for food residue fermentation based on existing applications and suggest future research directions informed by analyzed information. Ultimately, fermenting food residues should be deemed a requisite step towards waste minimization, fostering a circular economy, and fostering the development of more sustainable production and consumption practices.

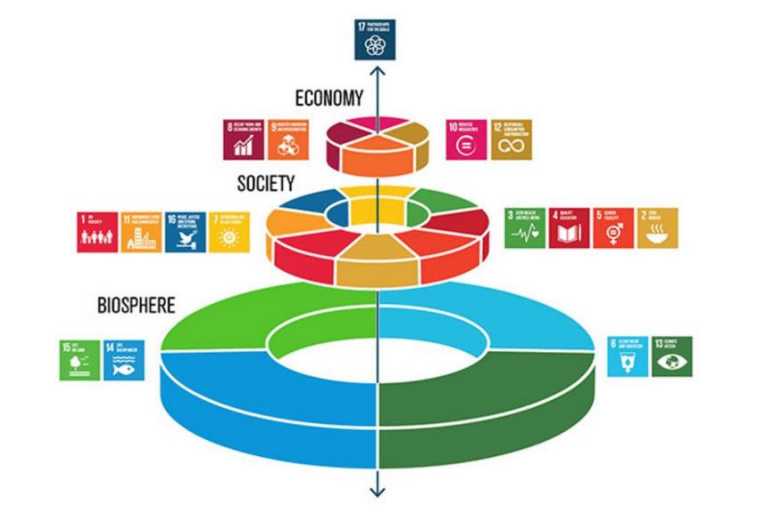


Figure 1: The UN SGDs according to their scope and focus.

Keywords: Valorization, food waste, fermentation, sustainability

Importance of Collaborations between Industry & Academy

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Our vision is to deliver new value to Cargill by working effectively with the external world. Bringing external Innovation as an integrated component of a business strategies/systems to support growth and business performance innovation. External Innovation is developing, augmenting and accessing desirable intellectual property and capabilities for defined business outcomes through partnerships with external organizations. Academy is one of the most important channels for value added collaborations and provides a higher growth rate for a company. There can be the ability to enter new markets and develop new revenue streams in a matter of months. As another beneficial aspect, collaboration achieves that use of design thinking to develop customer centric solutions that increase product success / decrease product failure. On the other hand, It is important for these two important partners to come together and build strong relationships. However, there may be some gaps and challenges; Such as not being able to use common terminology, not being able to provide correct project categorization, not being able to create realistic success metrics on the right timeline. Government incentives and increasing the opportunity to come together with independent organizations can solve possible problems. Together, through collaboration, investment, and a shared vision for innovation, we can achieve this.

Keywords: Academy, industry, collaborations, external innovation.

Innovation Capabilities at Cargill

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At Cargill, we have more than 160,000 employees across 70 countries bringing the expertise of 159 years. Still, most importantly we are bringing together the people, ideas, and resources that can impact lives worldwide. Our Food & Bio enterprise delivers the innovative solutions manufacturers need to craft the food and drinks people want; and provides nature-derived, bio-based products to industrial customers. Underneath our Food & Bio enterprise, Cargill Food Solutions is active in 40 countries, with 3 leading regions (APAC, EMEA, America), operating more than 240+ operating locations with 21k employees. Turkey as a part of the EMEA region has 4 plants & 3 offices. Cargill Food Innovation & RD Centers are around the globe with 2k employees. We could apply more than 20+ different key technologies within our R&D expertise. Have 50+ R&D facilities including 8 Innovation Centers. The Cargill Innovation Centers features a wide range of capabilities and staffing, including full-service research and development and professional chefs who work with customers to develop new products and demonstrate how existing ones can be better prepared. Cargill Innovation Strategy delivers value through innovation with top talents and world-class capabilities. Focusing on insights & science leads to innovations and leveraging additional tools or approaches. To bring world-class capabilities, we invest in core R&D capabilities, expand our product development pipeline, and invest in differentiated platforms aligned with our strengths (e.g., fermentation). **Core technologies** are thermal processing, powder processing (starch & sweeteners), separations, fermentation, application technology, enzyme, frying, and coating (edible oil solutions). **Enabling sciences** are protein & lipid & carbohydrate chemistry, material science, process modeling, micro & molecular biology, data science, nutrition, sensory, and analytical.

Keywords: Innovation, sustainability, Cargill.

Building of an Innovation Culture: Cargill's Perspective

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Cargill's perspective for innovation means investing in state-of-the-art facilities that reduce environmental footprints. It means partnering with startups and tech giants alike to pioneer breakthroughs in food science. And importantly, it means engaging our 2,500 scientists and innovators who focus daily on turning creative ideas into practical, sustainable practices. Our priorities for this are generating useful ideas that are new, better or unique, bringing new perspectives on solving problems, putting a creative idea into practice, and encouraging divergent thinking to stimulate innovation. Building a culture of innovation is about more than just new ideas. It's about fostering an environment where diverse thinking thrives and where the status quo is continually challenged. At Cargill, we're committed to attracting top talent who are not only skilled but are passionate about making a real difference. This commitment is evident in our rigorous talent management processes, our strategic R&D investments, and our partnerships across industries. As we move forward, our focus remains on developing solutions that are not just good for business, but good for the planet and the people. Sustainability is not optional for us; it is a business imperative. That's why we are dedicated to making significant, positive impacts that extend beyond our company to the global community. We, as leaders, must prioritize these areas: Investing in Talent, R&D Commitment, and Creating Space for Experimentation. In this point, diversity of thought is critical also. We must build inclusive innovation teams that reflect the global community we serve. Even during difficult times, we must dedicate resources to research and development. Because innovation doesn't happen by accident, innovation thrives on bold ideas. Cargill is committed to playing a leading role in this journey.

Keywords: Innovation culture, vision, Cargill's perspective.

Sustainability at Cargill

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As Cargill, our ambition is to have the most sustainable food supply chains in the world.From small family farms to global shipping lanes, Cargill works every day to implement new sustainable practices to reduce our impact on the planet and protect people.Through our long history, we have seen agriculture be part of the solution to the world's most urgent challenges. We know that we must address climate change and conserve water and forests, while meeting the rising demand for food. These are complex challenges, but we have overcome many obstacles to keep our food system resilient and we will continue. We feel a deep responsibility to protect the planet and its people, to ensure a cleaner, safer future for generations to come.We've set priorities that account for the diverse environmental, social and economic impacts of our business. Still, we realize that no company can take on these challenges on its own. Through connection and collaboration with farmers, our customers, and global and local communities, we believe our food system will remain resilient.We believe accountability drives progress. Our sustainability goals are ambitious, but achievable – and we'll hold ourselves to the highest standards of transparency until we've accomplished them. Our ESG report, supply chain grievance dashboards and other public information can be found on our web page. Regenerative agriculture is a way of farming that builds climate resiliency into farm operations. As we move forward in our vision to make regenerative agriculture commonplace across our global supply chains, one initiative we are drawing key learnings from is our 1000 Farmers Endless Prosperity program in Türkiye. Now in its sixth year, the program has grown well beyond its name, engaging more than 6,000 corn, sunflower, and canola farmers, and covering more than 70,000 hectares. The program equips farmers with training, digital agriculture tools, and consultancy services focused on regenerative agriculture. Farmers are employing practices that improve climate resiliency and have also seen their yields increase by up to 20%.

Sustainable Beekeeping Model in Rural Development Regions

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Beekeeping is a socio-economic activity in Turkey that has been continuing as a tradition for many years. Turkey is among the most important countries in terms of honey production in the world with its over 9 million beehives and around 115.000 tons of annual crop. However, the average honey production is around 12.8 kg/hive which is far below the world average of 20 kg/hive. One of the most important problems of beekeeping in Turkey is that technical beekeeping practices are not well known because of insufficiently trained beekeepers. Due to these characteristics, beekeeping is an important source for people who live in rural areas and can be done by all family members. Therefore it is an important business area for women and young people living in these regions. Within the scope of this program, a literature research has been carried out to determine the status and needs of the target beekeepers. During the study, 455 beekeepers were interviewed for obtaining the demographic structure of Turkish beekeepers. The Project has been undertaken with the support of "European Bank of Reconstruction and Development" (EBRD), and primarily women and young people living in rural development regions are targeted to be trained as beekeepers. For this purpose, different training programs are organized in the form of on-line learning, utilizing a moto caravan designed for educational purposes and on-site class training by working in collaboration with expert academicians. In order to provide access to the on-line learning program, an accessible web page was designed for all trainees. For mobile training an appropriate training vehicle is designed and prepared to perform applied on-site training in the field. Good beekeeping practices, general problems encountered by beekeepers and specific topics requested by beekeepers were chosen as main topics of class training. With the establishment of a sample apiary, it is ensured to demonstrate the good beekeeping practices to the newly trained beekeepers. Eventually different training opportunities will be provided in accordance with the needs of the beekeepers in order to make the best use of the beekeeping potential of Turkey and to ensure its sustainability.

Keywords: Honey, beekeeping, training.

The Importance of Sustainability to Increase Export Potential

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For business, sustainability is a key element for the long-term success of companies. Environmental practices such as environmentally friendly production, use of renewable energy and circular economy increase the competitiveness of exporting businesses and enable them to open up to new markets. Sustainability helps achieve long-term economic development by preserving natural resources and minimizing environmental impact. To increase export potential, it is vital for businesses to adapt sustainable production methods. When it comes to sustainable production, environmentally friendly production processes based on renewable energy sources should come to mind by using resources effectively. Energy efficiency is an important component that reduces companies' costs and carbon emissions by reducing the amount of energy used in their production processes. For companies, the transition to renewable energy sources, technologies that optimize energy consumption and circular economy models play a critical role in sustainable efficient production. Efficient use of energy, recycling, choice of environmentally friendly transportation methods and optimization of logistics processes can be listed as some of the basic examples that can be used in sustainable production processes. Renewable energy technologies, which are solar, wind, geothermal and hydroelectric clean and unlimited energy solutions that provide a sustainable future for our planet, are becoming increasingly accessible and economical, offering businesses and consumers environmentally friendly energy options that will reduce their dependence on fossil fuels. In this way, an important opportunity is provided to increase export potential. Another way that companies can serve sustainability is to produce more environmentally friendly products that consumers can use. The production of sustainable environmentally friendly products such as energy-friendly household products, environmentally friendly cleaning products and organic textile products will not only offer new market opportunities for companies, but will also be important factors that contribute to a sustainable world. In order for institutions to adapt to sustainable concepts, they must be aware of their corporate social responsibilities and comply with international standards regarding sustainability. Sustainable Development Goals can be future guides for exporting companies.

Keywords: Sustainable business, sustainable export, renewable energy sources, environmental sustainability.

A Cultural Heritage of Palsgaard: Sustainability and Innovation

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In the early 1900's, a businessman Einar Viggo Schou, who returned to his country Denmark after his successful career in the oil industry of England, begun to look for an answer to an important question that had been on his mind for many years while working in the field; "How could water and oil be mixed homogeneously and stably?" Einar found the answer in 1917 to this question and it was recorded as the world's "first commercial emulsifier". Einar's discovery, which formed the basis of all known commercial emulsifiers with the name. ''Palsgaard Emulsion Oil'', would change the food industry forever and pave the way for industrial food production. Shortly after receiving the patent for ''Palsgaard Emulsion Oil'', Einar founded the Palsgaard company and its first factory, which was born as an innovation and is still headquartered on the same campus as its original invention. Today, with 6 production facilities on 4 continents and 7 application centers, one of which is in Istanbul, Palsgaard introduces plant-based emulsifiers to countless products in more than 120 countries every day. Palsgaard supplies products to personal care & polymer applications as well as chocolate, bakery products, meat products, dairy products, ice cream, and plant-based products in the food industry, with our CO2-neutral factories, our unique & innovative products, and our niche expertise since 2018. Our unique & innovative products in the field are shaped by our expertise of over 100 years; with a deep sense of responsibility for future generations. We constantly improve our products to meet today's consumer and producer expectations.

Keywords: Emulsion oil, sustainability, innovation.

Upcycling as a Novel Approach for Recycling of Food-by Products: Rose and Cacao Extract Applications

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Food waste is a key concern globally and consumers are highly interested in products that can address this problem. Most of the food waste is sent to landfills, where it decomposes and emits methane. Methane is 28-34 times more potent than carbon dioxide and one of the biggest contributors to climate change. Therefore, strategies for recycling of food waste and reduction of their harmful effects are very crucial for environmental, economic and climate issues. Upcycling is one of the several strategies that can be implemented to address the food waste challenge by creating new, high-quality products from surplus food or waste streams that occurred during the food chain. There are three main ways to help manufacturers address the issue of food waste: Valorizing, Preventing and Minimizing Food Waste. It is possible to valorize waste by upcycling the side streams and bringing upcycled ingredients to the industries. Upcycling process transforms food by-products into a new product with a higher economic value or a completely different usage purpose. Upcycled foods use ingredients that otherwise would not have gone to human consumption, are procured, and produced using verifiable supply chains, and have a positive impact on the environment. Examples of ingredients that can be upcycled include sub-grade produce (like bruised apples and misshapen carrots and tomatoes), scraps from food preparation (like onion skins and potato peels), and by products from food processing (like pomace, seed, and pulp, peel, stem). IFF has an Upcycled extract range such as rose extract and cacao shell extract. Rose extract is obtained from rose water released during the rose oil production process. Roses harvested from rose gardens in Türkiye. Cacao shell extract is manufactured from cacao shells harvested in Madagascar by application of ethyl alcohol extraction process. These upcycled extracts are used in essence and flavor creation. IFF can help valorize the side streams either by assessing and processing them for flavor and ingredient creation or with enzymes to increase valuable yield from side stream products.

Keywords: Upcycling, food waste, cacao shell extract, rose essential oil.

A Comparative Study into Degree of Hydrolysis, Anti-Obesity, Anti-Diabetic, and Antioxidants Activities from Cow, Buffalo, Goat, and Sheep Casein Hydrolysates Generated Upon Flavourzyme and Neutrase Enzymes

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Bioactive peptides can be obtained from foods such as milk, eggs, meat, fish, soy, and wheat. However, milk proteins are now considered the most important source of bioactive peptides. Bioactive peptides are found in an inactive form within structural proteins and can be released in various ways, including enzymatic hydrolysis, fermentation with lactic acid bacteria, and gastrointestinal digestion. Bioactive peptides from several protein sources, particularly milk proteins, have many biological properties, including antioxidant, antimicrobial, antidiabetic, antihypertensive, anticancer, and antitumor activities. While there are numerous studies on the bioactive components of cow, camel, donkey, and human milk, there are insufficient studies on goat, sheep, and buffalo milk. To date, no comparative studies have been found using neutrase and flavourzyme enzymes to produce bioactive peptides of cow, buffalo, goat, and sheep casein. For this reason, this study has attempted to provide preliminary information for future studies by evaluating the bioactive peptides derived from the casein of cow, buffalo, goat, and sheep skimmed milk. Cow (CwC), Buffalo (BuC), Goat (GoC), and Sheep (ShC) hydrolysates were generated using flavourzyme (CwCF, BuCF, GoCF and ShCF) and neutrase (CwCN, BuCN, GoCN and ShCN) each for 12 hours, and investigated their potential to inhibit pancreatic lipase (PL), anti-diabetics (i.e.,α-amylase and α-glucosidase). Degree of hydrolysis (DH%) and antioxidant activity including DPPH and ABTS were also examined. Results revealed that goat casein had the strongest pancreatic lipase inhibition (66.34±0,08%), followed by sheep casein (50.01±3.97%) when compared to buffalo casein and cow casein. The hydrolysates of buffalo and cow casein using flavourzyme enzyme showed significant improvement in the inhibition of α-amylase at 91.09±1.13% and 86.96±0.09%, respectively. The hydrolysates of goat casein using flavourzyme and cow casein using neutrase exhibited the highest degree of hydrolysis at 257.13±5.24% and 153.25±0.78%, respectively, while hydrolysates of goat casein using flavourzyme and neutrase enzymes show higher antioxidant activity in ABTS (18.21±0.02 mg TE/g sample) and DPPH (4.86±0.11 mg TE/g sample) compared to other casein samples. The hydrolysates casein from cow, buffalo, goat and sheep skimmed milk using flavourzyme and neutrase enzymes could be a valuable source to produce functional foods that offer antioxidant properties and show promise in inhibiting pancreatic lipase activity and managing diabetes.

Keywords: Casein hydrolysates, anti-obesity, anti-diabetic, antioxidant.

Upcycled Foods: Sustainable Valorization of Food Side Streams

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Food loss and waste have been a global problem that has led to several attempts to reduce and utilize food waste. Since much of the waste generated throughout food production is inevitable, one of the approaches in the field is using the side or waste streams of the food industry to develop new food ingredients as well as new food products, so-called "upcycled ingredients/foods". Upcycling presents a promising route for sustainable food waste valorization since it provides nutritious and edible foods for human consumption as the end product instead of converting the food waste into landfills, incineration, or animal feed. On the other hand, researchers and industry are well aware that the acceptance of such products among consumers requires special attention, and several works have already been published looking at this aspect. The present talk will provide an overview of the current situation regarding the production of upcycled foods, with a holistic approach including the economic and environmental aspects, and will have a special focus on consumer awareness and acceptance of such products. Several examples from the authors' own work will be explained, including the production of several bioactive components from waste streams of fruit juice and seed oil production as well as their applications in model systems.

Keywords: Upcycled foods, food waste, bioactive components, consumer behavior.

Investigation of the Antioxidant and Antimicrobial Potential of Two Thiols, γ-Glutamyl Cysteine and Glutathione

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Agents containing free sulfhydryl (-SH) groups such as L-cysteine and *N*-acetylcysteine have been reported to have the potential for use to produce antioxidant and antibacterial products. γ-glutamyl cysteine (gGC, $C_8H_{14}N_2O_5S$) is a dipeptide comprised of cysteine and glutamate that forms in most living cells via glutamyl cysteine ligase (GCL) catalysis. Following the addition of glycine, glutathione synthetase converts it to glutathione (GSH, $C_{10}H_{17}N_3O_6S$). However, studies have focused on glutathione in recent years, the antioxidant potential of γ-glutamyl cysteine is also a research subject. In this study, the antioxidant properties of gGC and GSH were compared to the synthetic antioxidants in the food industry. Analysis with 2,2-diphenyl-1-picrylhydrazyl (DPPH) resulted in the following order of IC_{50}; T (0.08±0.01), butylhydroxyanisol (BHA) (0.13±0.03), GC (0.3±0.01), GSH (0.41±0.00), butylhydroxytoluol (BHT) (0.42±0.02). The antimicrobial properties of these two compounds were determined by agar diffusion and microdilution methods against gram-negative and gram-positive bacteria, yeast (*Candida albicans*) and mold (*Penicillium digitatum* and *Colletetrichum* sp.). According to the agar diffusion test, both gGC and GSH were ineffective against *Escherichia coli* growth, while the zone of inhibition for *Listeria monocytogenes*, *Staphylococcus aureus* and *Bacillus cereus* were 15.20-15.11; 12.95-12.31 and 11.67-9.2 mm for gGC and GSH, respectively. Minimal inhibition concentration was determined as 10 mM, 5 mM, 10 mM, and 5 mM for gGC on *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus, and Bacillus cereus* respectively, while for GSH it was determined as 5 mM, 10 mM, 10 mM respectively with no effect on *E. coli*. Neither compound had any inhibitory effect on yeast and mold growth. With this study, the antioxidant and antimicrobial ability of gGC, the precursor of GSH, was determined to be higher. Both, gGC and GSH can be used as candidate materials in the food and pharmaceutical industries.

Keywords: γ-Glutamylcyteine, glutathione, antioxidant, antimicrobial.

Encapsulation by Ionic Gelation Method of Pure Sulforaphane Extracted from Cabbage Seeds: Optimization of Process Conditions and Determination of Stability

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Cabbage, one of the cruciferous vegetables, has important phytochemicals as sulforaphane having potential antibacterial and anticancer effects. Since the pure sulforaphane is volatile, sensitive to pH, temperature, heat, light, and oxygen, as well as being soluble in oil, it results in low stability and bioaccessibility. Therefore, pure sulforaphane needs to be encapsulated to preserve its stability and regulate its releasing properties without losing its characteristics. In this study, sulforaphane extracted from cabbage seeds using hybrid ultrasound and microwave methods was purified and the pure sulforaphane was encapsulated using the ionic gelation method to increase its bioaccessibility and stability. For this purpose, the encapsulation process with the ionic gelation method using independent process variables as sulforaphane oil mixture concentration (1-3%), chitosan concentration (0.1-0.5%) and waiting time (1-30 min) was optimized targeting maximum encapsulation efficiency (%) and minimum *in vitro* gastric release. As a result, optimum processing conditions providing maximum encapsulation efficiency and minimum in vitro gastric release were determined as 1.41% sulforaphane oil mixture concentration, 0.18% chitosan concentration and 6.88 min waiting time. In addition, the purified sulforaphane and microencapsulated sulforaphane were tested at three different temperatures (60, 75, 90°C) and three different pH values (2.2, 4.0, 6.5) with different times (2, 4, 6, 10 and 24 hours) to investigate the kinetic stability of sulforaphane and the reaction rates (k), half-life times ($t_{1/2}$) and R^2 values were determined according to the first-order reaction kinetics. It has been observed that the microencapsulation process applied to sulforaphane ensures a controlled release of sulforaphane, thus maintaining its stability better when exposed to pH changes and high temperatures and the degradation reaction occurs more slowly.

Keywords: Sulforaphane, ionic gelation, microencapsulation, stability.

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Chitosan and Pomegranate Seed Oil-Based Gelled Emulsion as an Animal Fat Replacer in Meat Emulsions: Effects on Oxidation Parameters and Color Stability

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In this study, the effects of using O/W gelled emulsion (GE) containing chitosan and pomegranate seed oil as a fat replacer were evaluated in model system meat emulsion. For this purpose, four different meat emulsion formulations were prepared where beef fat was substituted with GE as C (20% beef fat), GE50 (10% GE, 10% beef fat), GE75 (15% GE, 5% beef fat), and GE100 (20% GE). Color parameters, and lipid (peroxide and TBARS) and protein (carbonyl and sulfhydryl) oxidation analyses of meat emulsions were determined during the storage at +4°C for 12 days. The utilization of GE has led to an increase in the L*, a*, and b* values of the samples. It is believed that the reduction in the size of fat globules in samples containing GE increases the reflectance of light, thereby increasing the L* values. Throughout the storage period, generally, GE50 exhibited the highest a* value, whereas, on the 12th day, there was no significant difference observed among the a* values of the reformulated samples. The C group had the lowest b* values throughout the storage period. In line with a* values, the C and GE50 groups had the lowest hue angle values. Due to having the highest hue angle value, the GE100 exhibited lower redness than other counterparts. At the beginning of the storage, the GE100 had the lowest peroxide value. On the 6th and 12th days, no significant difference was found between the meat emulsions, while on the 9th day, the highest peroxide value belonged to the GE50. It is considered that this situation may have arisen from the high content of unsaturated fatty acids in pomegranate seed oil. Besides that, the peroxide values of the samples did not exceed the limit value (25 meqO_2/kg) and showed fluctuations throughout the storage period. Except for 3rd day, the replacement of beef fat with GE has resulted in decreased TBARS values of the samples, with the lowest TBARS values observed in the GE75 and GE100. In this case, the antioxidant properties of chitosan can be mentioned. Throughout storage, the highest carbonyl content (14.46 nmol/mg protein) was observed in C, whereas the lowest values were detected in the GE75 and GE100 on the 9th and 12th days. After the 3rd day of storage, reformulated samples exhibited the highest sulfhydryl groups. In this case, it can be said that the use of GE is effective in preventing protein oxidation through the preservation of sulfhydryl groups. These results indicated that the utilization of GE formulated with chitosan and pomegranate seed oil presents the opportunity to prevent oxidation as a natural antioxidant for meat emulsions.
The authors are thankful for the financial support of Ege University Scientific Research Projects Coordination under project number FM-YLT-2023-27380.

Keywords: Meat emulsion, gelled emulsion, fat replacer, chitosan, pomegranate seed oil.

Reducing Solid Fat Intake: Fat Content Profile of Packaged Foods Offered for Sale in Turkiye

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People are advised to avoid high amounts of saturated fatty acids (SFA) and trans fatty acid content as a requirement for maintaining a healthy lifestyle. Avoiding consumption of trans fatty acids and not consuming excessive SFA in the diet play an important role in reducing the risk of coronary heart disease (CHD). The REPLACE (Review, Promote, Legislate, Assess, Create, Enforce) action package for trans fatty acids was created by the World Health Organization (WHO), and it is aimed at eliminating trans fatty acids from the content of packaged foods globally by 2023. WHO also recommends in its dietary guidelines a total fat intake of 20 to 35% of total energy to sustain vital activities, and 10% of this fat intake should not come from SFA. However, uncontrolled consumption of processed and packaged foods may cause the recommended daily SFA limit to be exceeded. The nutritional content table, usually found on the back of packaged foods, provides information about the fat, saturated fat, and energy value of the food product. In this study, the nutritional content tables of 1407 packaged food products available in both national and international markets in Türkiye were analyzed. Fat content, saturated fat content, energy amount (kcal), and *trans* fat content information of packaged foods divided into 11 categories were determined as bakery products category (n = 312), ready-to-eat foods category (n = 127), spreads and sauces category (n = 83), category of oils category (n = 52), pastry ingredients category (n = 53), snack category (n = 117), chocolate and wafer category (n = 221), ice cream category (n = 87), emulsified meat products category (n = 127), breakfast cereals, bars, baby food category (n = 189), powdered drinks category (n = 43). This information obtained from the food product in each category was evaluated using Principal Component Analysis (PCA) and Cluster analysis. As a result of the study, the food categories with the highest fat content, highest saturated fat content and energy were determined, and declarations such as containing or not containing *trans* fat in these food products were noted. With the obtained data, the situation of packaged foods in Turkey in terms of fat content in the consumer's healthy food choice is summarized.

Keywords: Edible oils, saturated fatty acids, *trans* fatty acids, food labeling.

Effect of Ohmic Heating System on the Mechanical and Barrier Properties of Biodegradable Films Obtained from Black Cumin Seed Meal

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In today's food packaging applications, many materials are produced from fossil fuels. These materials are non-renewable and biologically non-degradable, leading to significant environmental problems. Agricultural food by-products and/or waste products that can be used as biodegradable materials are seen as the best alternative to synthetic packaging materials produced from fossil fuels like petroleum. Oilseeds such as black cumin seeds are primarily used in the oil industry due to their high oil content. Moreover, the by-product of black cumin seeds, has availability, low cost, high digestibility, and high nutritional value, with about 20-30% protein content achievable from the seed pulp. In film production, heating is required to dissolve the protein, which can lead to changes in the functional properties of the film. In this study, protein isolation was carried out from the pulp obtained as a by-product of oil extraction from black cumin seeds, and black biodegradable/edible protein-based films were prepared with an electric field strength of 5-20 V/cm and exposure time of 30 minutes. The effect of ohmic heating (OH) on the tensile strength (TS), elongation at break (EAB), and water vapor permeability (WVP) of these films was evaluated and compared to films produced using traditional methods. The water vapor permeability of food packaging films should be as low as possible, thereby limiting moisture transfer between the food and the surrounding atmosphere. The WVP values of film samples varied between 1.55 and 1.77 g.mm/m2.hour.kPa, for both the control group and the ohmic-treated films. On the other hand, the tensile strength values significantly increased to 12.25 MPa when exposed to an electric field strength of 10 V/cm, up from 5.0 MPa. Similarly, the EAB values also decreased from 193.93% to 108.19% in response to exposure to an electric field between 5-20 V/cm, leading to significant changes in the mechanical properties of the films.

Keywords: Protein-based films, biodegradable films, ohmic heating.

The Sustainability of Food and Nutrition Security for the Elderly People

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Food safety is crucial in the nutrition of the elderly due to their heightened susceptibility to foodborne illnesses, stemming from factors like reduced immunity, physiological changes, malnutrition, diseases, and medication side effects. The importance of clean and safe food consumption is emphasized for the elderly, especially in regions with existing gaps in food safety policy and education. Ensuring food safety for the elderly is essential for maintaining their health and well-being, as it directly impacts their susceptibility to foodborne diseases and overall nutritional status. In order to ensure food and nutrition security for everyone, both now and in the future, sustainable food systems are essential. For these systems to efficiently provide food security and nutrition, food must be resilient, sustainable, and efficient. Furthermore, the idea of sustainable food security highlights the significance of sustainable eating habits and diets in guaranteeing food and nutrition security. To improve nutrition security, the importance of not only food production and supply but also sustainable food systems should be emphasized. Since sustainable food systems are essential to maintaining sustainable food security, sustainability should be at the center of initiatives to address nutrition and food security. In order to promote food security and nutrition for everyone while maintaining the capacity to satisfy the demands of future generations, sustainable, resilient food systems that offer healthy diets must be achieved. By addressing the underlying causes of hunger and malnutrition, the ultimate objective is to create food systems that can maintain food and nutrition security over the long run. Food sustainability is of great importance in the nutrition of the elderly due to its impact on both health and the environment. The global population growth is known to strain natural resources and continues to emphasize the need for sustainable food production systems. Elderly individuals are particularly vulnerable to unhealthy dietary patterns, making a transition to sustainable solutions essential for promoting healthy aging and preventing chronic diseases. Good nutrition throughout life, including in older age, is vital for healthy aging and disease prevention. Sustainable food consumption is key to addressing the challenges of an aging population and ensuring economic and societal well-being. Micro-nutrient deficiencies common in the elderly can be mitigated through balanced diets, emphasizing the importance of sustainable food practices for optimal health in older individuals. In conclusion, it is possible to improve food and nutrition security for older people by emphasizing nutrient-dense meals, sustainable food systems, and attending to the unique nutritional needs of the elderly.

Keywords: Food safety, food and nutrition sustainable, healthy life, elderly people.

The Microbiological Properties of Sourdoughs from the Marmara Region

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Irritable bowel syndrome (IBS) is one of the most common gastrointestinal diseases. The main cause of these diseases is fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) obtained from the diet, such as lactose, glucose, fructooligosaccharides, galactooligosaccharides, sorbitol, mannitol, and components like these. Fructans are the main FODMAP carbohydrates found in bread made from wheat, rye, barley, and their derivatives. Sourdough fermentation enables the production of suitable bread for IBS patients by reducing the amount of fructans. In the scope of the project, lactic acid bacteria (LAB) obtained from a total of 66 sourdough samples from 11 cities, including both summer and winter seasons in the Marmara region, were examined to determine their ability to reduce FODMAP levels. During the isolation of LAB from the samples, at least 5 different colonies were selected. All selected strains were identified as Gram-positive and catalase-negative. The species-level identification of the isolated LAB strains from the samples was performed using 16S rDNA sequence analysis. It was found that the strains isolated from Edirne and Tekirdağ cities during the winter season belonged to the same species (*Lentilactobacillus parabuchneri*). Additionally, it was determined that the strain isolated from sourdough collected in Balikesir City during the summer belonged to *Lactiplantibacillus plantarum*, which is commonly found in sourdoughs.

Keywords: Bread, sourdough, lactic acid bacteria, irritable bowel syndrome (IBS), FODMAPs.

From Sustainable Protein Sources to Bioactive Peptides: The Role of *in Silico* Analyses

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In the domain of human nutrition, protein sources play a critical role in sustaining vital physiological functions. As the world population increases and natural resources decrease, the need for sustainable and environmentally friendly alternative protein sources has increased. In this context, sustainable resources, such as food industry by-products or wastes, insects, and algae, attract attention due to their nutritional content. The isolation of proteins from these sources is of increasing importance today since these practices have the potential to transform food by-products/wastes or sustainable resources into more valuable bioactive components. In particular, the conversion of these proteins into bioactive peptides, which possess various physiological functions beneficial to human health, will further enhance the added value of these protein isolates. This transformation will also meet the growing demand for natural functional or therapeutic ingredients. This study addresses the process of obtaining bioactive peptides from sustainable protein sources and the role of *in silico* analyses in this context. The conversion of proteins to peptides generally occurs through enzymatic hydrolysis, and various mass spectrometry methods, especially liquid chromatography–tandem mass spectrometry (LC-MS/MS), are generally used to identify the resulting peptides. *In silico* methods play a crucial role in understanding the structure and functionality of these identified peptides. *In silico* analyses serve as a cost-effective, time-efficient, and labor-reducing alternative to *in vitro* and *in vivo* tests. These computer simulations are invaluable tools for predicting peptide interactions, deciphering structure-function relationships, assessing bioavailability, and identifying potential health benefits. The models developed through *in silico* analyses offer a novel approach for the production and optimization of peptides with targeted properties, as well as for enhancing their biological activities. Therefore, the integration *in silico* methods with protein isolation from sustainable sources will enhance the efficiency of research in these fields, thereby facilitating the development of new and functional food components. Exploring and evaluating the functional properties of peptides derived from these proteins can offer innovative practical solutions for sustainable food systems. Additionally, utilizing food industry wastes or by-products for this purpose will also make significant contributions to a sustainable environment and economy.

Keywords: Food proteins, functional peptides, computational analyses, by-products, mass spectrometry.

Distinguishing Fresh and Frozen-Thawed Vermilion Snapper (Rhomboplites Aurorubens) Using Image Analysis

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Color, as an essential visual quality characteristic of fish that determines consumer preferences and purchasing decisions, provides a quick indication of its freshness. However, determining whether fish has undergone previous freezing poses a challenge. Traditional methods such as sensory evaluation, physicochemical, biochemical, and microbiological analyses, despite being time-consuming and costly, have been employed for this purpose among various fish species. This study aimed to differentiate between frozen-thawed and fresh fish samples through image analysis. A dataset comprising frozen-thawed and fresh Vermilion Snapper (Rhomboplites aurorubens) images was analyzed using LensEye software to assess surface area, color, and brightness changes in both skin and eyes. Whole fish samples, frozen at -20°C and at -60°C, undergoing three thawing cycles, were examined through images taken monthly. The "two image method" and the "region of interest" (ROI) method were employed for analysis. LensEye software was used to analyze the L*, a*, b*, and ΔS values of skin and eyes for all fish images. Results showed notable differences in color and brightness in the skin between fresh fish and freeze-thaw cycles, though not between thawing cycles. The average L* value of fresh fish before freezing at -20°C was determined as 61.34 ± 1.31. After thawing, there was a significant decrease in the L* value (53.75 ± 1.97). For the eye color analysis, while L* and a* values remained relatively unchanged, there was a significant increase in b* values. The average b* value for eye of fish images was 2.09 ± 1.59 before freezing at -60°C; it increased up to 6.39 ± 0.68 after the third thaw. The results of this study showed that color analysis successfully distinguished both the skin and eye color values of frozen fish from fresh ones, demonstrating the efficacy of image analysis in differentiating between fresh and frozen fish.

Keywords: Color analysis, fish quality, frozen-thawed fish, image analysis, vermillion snapper.

Effects of the Factors on the Formation of Petroleum Odour by *Penicillium Commune* in Fresh Kashar Cheese

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Food safety is applied by many dairy producers to inhibit the growth of microorganisms. Despite these measurements, several quality problems may be encountered due to the growth of mold and yeast in the production of fresh Kashar cheese. To prevent the cheese from mold and yeast deterioration, potassium sorbate can be used as an efficient preservative within the permissible limits. However, fresh Kashar cheeses treated with potassium sorbate may have a petroleum/gas odor, resulting in increases in consumer complaints. The reason for the petroleum odor is known as the formation of 1,3-pentadiene. This volatile compound, 1,3-pentadiene, is primarily produced from the decarboxylation of sorbate by some sorbate-resistant molds and yeasts. In addition, several production factors may cause the production of this odor defect. The aim of this study is to investigate the factors that may promote the formation of petroleum odor in fresh Kashar cheese at a technological level to assist cheese producers in addressing this problem Within this scope, *Penicillium commune* isolated from fresh Kashar cheese, which was proven to be resistant to sorbate and 1,3-pentadiene producer was inoculated to the surface of fresh Kashar cheese. Then, the effects of several production factors such as different storage temperatures (4°C and 10°C), moisture content (low and high surface moisture), microorganism load (102 and 104 cfu/cm^2), and sorbate concentration (1% and 3%) was investigated After the inoculation and during storage at different conditions, pH, water activity, moisture content, sorbate concentration, petroleum odor level, 1,3-pentadiene levels and mold counts were determined. No significant differences were observed in pH and water activity levels depending on the factors. The mold counts in all cheese samples were found as 3.5-4 log cfu/g on the 30th storage day and remained at similar levels throughout storage. Therefore, all cheese samples inoculated with mold strain even with low inoculation levels began to give petroleum odor after 30-day storage. Although the inoculation level and storage temperature gave some differences in the petroleum odor scores, the most prominent factor was found as sorbate concentration. High sorbate concentration resulted in increase in petroleum odor perception and 1,3-pentadiene contents, especially after 60-day storage. Sorbate could not be detected in samples inoculated with *Penicillium commune* after 30-day storage which showed that the mold could break down sorbate and release petroleum odor. As a conclusion, samples containing high sorbate concentration had high 1,3-pentadiene contents and high scores of petroleum odor. Cheese manufacturers need to control the sorbate level to inhibit the formation of petroleum odor.

Keywords: Potassium sorbate, Kashar cheese, 1,3 pentadiene, petroleum odor.

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Leveraging Food Safety, Quality, and Sustainability: Third-Party Certification and the Impact of FSSC 22000 in the Food Industry

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Food safety is the concept of ensuring that food is prepared and consumed in a manner that doesn't pose health risks to consumers. It encompasses a range of measures aimed at maintaining the quality and safety of food throughout the entire supply chain. However, the failure to implement these measures correctly at any stage of the food supply chain may result in various food-related issues, including contamination by microbial pathogens, toxic chemicals, physical hazards, allergens, or even radioactive substances, all of which can jeopardize consumer health. Changes in food habits, heightened consumer awareness, and the globalization of food supply chains have increased the importance of food safety. As supply chains extend across multiple countries and continents, ensuring consistent compliance with various food safety regulations and standards has been challenging. Varying regulations across different countries and the diverse interpretations of these regulations further complicate matters, creating obstacles to the implementation of internationally recognized food safety standards. Forces driving the development of food safety standards include shortcomings in traditional audits, the globalization of food supply chains, emerging supply strategies, costs of individual supplier assessment schemes, national and international legal responsibilities, customer requirements, enhancing consumer confidence, global or local food crises, limited capacities of public institutions, weak food legislation regulations in developing countries, consumer/customer demand for quality alongside food safety, adaptation to rapidly changing requirements and trends worldwide, increasing demands from customers and retailers, and environmental awareness and sustainability. In response to these challenges, third-party food safety management schemes have emerged as vital tools for ensuring food safety and quality. These schemes offer comprehensive, proactive, and systematic approaches to managing food safety risks throughout the supply chain. They are based on internationally recognized principles such as hazard analysis, critical control points, traceability, risk management, and continuous improvement. ISO 22000 and ISO 22000 based Food Safety and Quality scheme FSSC 22000 are two top standards in the food sector. These standards provide numerous advantages, including lower certification costs, alignment with international standards, and flexibility in addressing risks. FSSC 22000, in particular, is recognized by the Global Food Safety Initiative (GFSI) and offers benefits such as longer certification validity, integration with other ISO standards, and a risk-based, flexible approach suitable for organizations of all sizes. The adoption of food safety management schemes like FSSC 22000 is driven by various factors, including the need to access global markets, competitive pressures, cost reduction, customer requirements, and sustainability concerns. By implementing these schemes, organizations can enhance their operational efficiency, mitigate risks, preserve brand reputation, and foster consumer loyalty. In conclusion, food safety is a top priority in protecting consumer health and ensuring the quality of food products. Third-party food safety management schemes like FSSC 22000 play a crucial role in addressing the challenges posed by global supply chains and varying regulations, thereby facilitating the consistent implementation of food safety standards worldwide.

Keywords: Food safety, FSSC 22000, sustainability, certification, quality.

Fungal Solid-State Fermentation Followed by UV-B Application to Enrich Vitamin D Content of Wheat Flour

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The increasing prevalence of vitamin D deficiency and insufficiency is widely observed worldwide. Many developing or transitioning countries are promoting the fortification of foods with various components to combat malnutrition and the risks of hunger. Fortification is known as the addition of components (such as vitamin D, dietary fiber, protein, provitamin A, iodine, selenium, iron, etc.) that are either insufficient or completely absent in the food. In this study, wheat underwent solid-state fermentation with fungi (*Pleurotus eryngii, Hericium erinaceus*) and biofortification was achieved through UV-B application. The wheat biomass subjected to solid-state fermentation underwent phototransformation of a fungal-derived ergosterol component to vitamin D2 through UV-B application. There is no literature evidence of a study involving UV-B application after grains are colonized by fungi. Therefore, the range of UV-B application durations (0, 1, 5, 10, 20, 30, 45, 60, and 120 min) was kept wide. The highest concentration of vitamin D2 was determined at 30 minutes for *H. erinaceus* and at 45 minutes for *P. eryngii*. In the uncolonized wheat used in the study, D2 vitamin was not observed, whereas in the colonized wheat (*Pleurotus eryngii, Hericium erinaceus*), the formation of D2 vitamin was detected. It was determined that the amount of D2 vitamin increased in colonized samples with varying degrees following UV-B application. In wheat samples colonized with *H. erinaceus* without UV-B application, the D2 vitamin content was determined to be 13.33±1.70 µg/100g, while in wheat colonized with *P. eryngii*, it was found to be 15.90±2.74 µg/100g. However, in samples subjected to UV-B application, it was observed that the D2 vitamin content reached 67.67 µg/100g for *Pleurotus eryngii* at 45 minutes and 45.14 µg/100g for *Hericium erinaceus* at 30 minutes. Although only a small amount of D2 vitamin has been converted in the colonized wheat samples, it is observed that they enriched in terms of the ergosterol component. The ergosterol content in the samples was found to be in the range of 3.56-7.43 mg/100g. In conclusion, wheat, one of the most consumed grains, was enriched in terms of vitamin D2 through fungal solid-state fermentation followed by UV-B application.

Keywords: Wheat, solid-state fermentation, *Pleurotus eryngi*, *Hericium erinaceus*, vitamin D2, ergosterol.

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Exploring Gastrophysics: The Role of the Senses in Nutrition

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Gastrophysics is an emerging field of study focused on exploring the dining experience through psychological and sensory investigations. It is formed by the combination of the word “gastro” from gastronomy and the word “physics” from psychophysics. The objective of this study is to introduce the concept of “gastrophysics,” a multidisciplinary field with potential benefits for enhancing public health, which is not widely known in our country, by bringing together studies related to it. In this way, gastrophysics research can play a significant role in promoting healthy eating. Recent research reported visual attractiveness of food plays a crucial role in influencing consumers’ dining experiences and overall satisfaction. Furthermore, studies suggest that the shape of foods can influence perceived taste. Rounded shapes tend to evoke perceptions of sweetness, whereas angular shapes are more commonly associated with bitterness and saltiness. Factors such as the dining experience, ambiance, visual presentation of the food, sizes, and weights of the cutlery along with their color and material, as well as taste and aroma, all contribute to the overall perception of a meal. Studies on promoting healthy eating attitudes are expected to continue with the investigation of the different combinations of shape, aroma, and other characteristics of foods that affect the consumer's healthy choices. Therefore, studies in this field can be a key tool in coping with common health issues such as obesity and metabolic syndrome disorders.

Keywords: Gastrophysics, flavor, sense, nutrition, health.

Investigation the Effect of Different Production Conditions on Flavour Components and Sensory Properties in Strawberry Flavored Milks

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Milk, which is made more delicious with the addition of flavour, becomes preferable for people of all age groups. In flavored dairy products, the purpose is to produce the product of the requested quality without missing its flavour due to heat treatment. In this study, pasteurization and UHT heat treatment were applied using milk with two different fat contents with flavour added at dosages of 0.1% and 0.2%. As a result of the analysis, the missing flavour components in different heat-treated milk were investigated. In addition, milk with two different fat ratios between 3.9% - 4% and 3% - 3.1% was used in the study. Thus, the effect of the fat ratio was also analyzed. Analytical analysis methods were used to analyze the changes in flavour profile with heat and sensory analysis was done. Milk is a complex nutrient due to the fatty acids and proteins it contains. Therefore, the SPME Solid-Phase Microextraction (SPME) analysis method in gas chromatography (GC) was selected to better analyze the volatile components. The SPME analysis method is a method used for the determination of volatile flavour substances, which are generally found in low amounts in food products. In analysis taken by various separation methods such as distillation and extraction, the missing of volatile substances in the flavour can be observed. SPME analysis doesn't use solvents. Also, a one-step method that skips multi-step procedures such as sample preparation, extraction, and concentrating. The Quantitative Descriptive Analysis (QDA) method was used as the sensory analysis method. The QDA method describes the density of products according to specific profile characteristics. The panelists evaluate the intensity of each attribute using a scale from 0 to 10. As a result of the analyses, quantitative decreases in flavour components as well as fatty acids were analyzed with flavour application and different heat treatments. Some flavour components were more found in low-fat milk. Thus, the probability of the volatile components to adhere to fat globules in high-fat milk was also reflected in the analysis results. The volatile flavour components cis-3-Hexenol and cis-3-Hexenyl acetate have a green profile. These components were more abundant in low-fat milk, while missing were observed with heat treatment. Components such as ethyl butyrate, methyl cinnamate, and gamma-decalactone which provide sweet fruit and creamy profiles were analyzed more in low-fat milk. Acids such as acetic acid, butyric acid, and lactic acid were analyzed at higher levels in high-fat milk. And no direct effect on taste was observed. When the sensory analysis data were examined, jammy, fruity, and green profiles scored higher in 0,2% dosage flavour exposure. Compared to pasteurized milk, UHT-treated milk had lower fruity-green profiles. In low-fat milk, sweet-green profiles scored higher than in high-fat milk. In high-fat milk, acidic-creamy profiles received higher scores. Thus, analytical analysis data were supported by sensory analysis data.

Keywords: Strawberry flavouring, flavour component, milk, heat.

Optimization of the Vacuum Microwave-Assisted Extraction Conditions for Betaxanthin-Rich Bioactives from Cactus Pear (*Opuntia Ficus-İndica* L.)

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The color of the food is one of the important quality parameters for consumer acceptance. Betalains are one of the natural color molecules divided into two groups: yellow-orange colored betaxanthins and red-violet colored betacyanins. Betaxanthins and betacyanins are plant-based natural food colorants containing water-soluble pigments. This property makes betalains to include food applications easily. To utilize betalains from different food sources, the extraction should be applied to either conventional or novel green technologies. Green technologies are promising alternatives to conventional methods of extracting higher quantity and quality of desired compounds. Microwave-assisted extraction (MAE) is one of the green extraction technologies. Microwaves disrupt cell walls and release the desired compounds using dipole rotation and ionic conduction mechanisms. The present study was designed for the vacuum MAE of betaxanthin-rich bioactives from cactus pear (Opuntia ficus-indica L.). Moreover, some extraction conditions were optimized using response surface methodology (RSM) through a Box-Behnken design. Four independent process parameters having three levels each were optimized: vacuum pressure (X_1), extraction time (X_2), ethanol percentage in the solvent (X_3), solid to solvent ratio (X_4). Experimental and statistical analysis showed that the optimal conditions in vacuum MAE for betaxanthin extraction were 108.79 mmHg vacuum pressure, 2.47 min of extraction time, 20% ethanol percentage, and a solid to solvent ratio of 29.43 g/mL. In these conditions, total betaxanthin content (TBC) was measured as 594.48 mg betaxanthin/ kg dry matter. In addition, total phenolic content (TPC) and total antioxidant capacity (TAC) were reached to 7.75 mg GAE/g dry matter and 47.48 mmol TE/ kg dry matter, respectively. The quadratic polynomial model was found significant with a high coefficient of determination values of 0.9978 for TBC. This study highlighted that vacuum MAE reduces the solvent consumption and operation time for the extraction of betaxanthin-rich bioactive compounds from cactus pear. MAE of betaxanthin is a highly recommended method to obtain natural food colorant from cactus pear.

Keywords: Betaxanthin, cactus pear (*Opuntia ficus-indica* L.), vacuum microwave assisted extraction.

This study was supported by The Scientific and Technological Research Council of Turkey (Project no: 222O444).

An Optimization Study for Vacuum Microwave-Assisted Extraction of Betacyanin-Rich Bioactives from *Amaranthus Caudatus* L. Flowers

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Color plays a significant role in food's image, safety, and nutritional quality. Changing consumer preferences and potential harmful effects of the artificial colorants have driven researchers to natural colorants. Betacyanins stand out in coloration and antioxidant, anticancer, and antibacterial properties. Red beetroot (E 162) remains the predominant source of betacyanins, the earthy-off flavor caused by geosmin and specific pyrazine derivatives in foods limit its usage. An alternative source for betacyanins *Amaranthus caudatus* L. flowers has been investigated for its purple-red color due to its betacyanin content, rich nutritional profile, encompassing protein, fiber, riboflavin, calcium, magnesium, and diverse bioactive compounds. Conventional extraction (CE) is characterized by long processing times and high solvent usage. New technology vacuum microwave-assisted (VMAE) is considered advantageous due to lower time consumption, reduced solvent usage and prevention of heat-related losses. This study highlights the significance of green technology and next-generation extraction systems compared to traditional method on *Amaranthus caudatus* L. flowers by its superior efficiency, reduced solvent usage, and environmental friendliness in obtaining high-yield extracts, while utilizing Response Surface Methodology (RSM) to determine optimal extraction conditions for total betacyanin content (TBC), total phenolic content (TPC), and total antioxidant capacity (TAC). The independent variables for CE were X_1, extraction period (1, 2, 3 hours), X_2, temperature (30, 40, 50 ºC), X_3, ethanol ratio (40, 50, 60%), and X_4, sample: solvent ratio (1:10, 1:20, 1:30). The independent variables for VMAE were X_1, pressure (150, 300, 450 mmHg), X_2, extraction period (3, 9, 15 min), X_3 and X_4 were the same as CE. Optimum conditions for CE and VMAE were given as X_1:3h, X_2:50°C, X_3:30.75%, X_4:1:30 and X_1:450 mmHg, X_2:15 min, X_3:24.45%, X_4:1:26.21, respectively. In optimal conditions VMAE yielded higher responses compared to CE, accomplishing this in a period of 15 min compared to 3 hours. TBC, TPC and TAC in CE were 2096,4 mg/kg, 14,607 mg GAE/g, 163,366 mmol TE/kg, respectively. TBC, TPC and TAC in VMAE were 2285,982 mg/kg, 16,864 mg GAE/g, 192,508 mmol TE/kg, respectively. As a result, VMAE is more effective than CE on behalf of extraction of betacyanins from *Amaranthus caudatus* L.

Keywords: Betacyanin, *Amaranthus caudatus* L. flower, vacuum microwave assisted extraction, optimization.

This study was supported by TÜBİTAK under the project code 222O444.

Optimization of Rhizobial Strain Culture Conditions for Maximum Exopolysaccharides Production: The Impact of Physiological Parameters

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Exopolysaccharides (EPS) production is affected by the strain itself in its operating environment, where conditions such as culture time, temperature, inoculum volume and age, pH, medium composition (carbon source, nitrogen source, stressor, etc.) and many other factors immediately affect EPS productivity, structure and composition. Numerous studies have been carried out on EPS production by rhizobial strains, mainly focused on exploring the influences of medium composition and growth conditions on the amount of EPS generated. And to this end we carried out a study of nine factors influencing the yield of EPS production in the four rhizobial strains studied, two *Rhizobium mesosinicum* strains (HCBA11-2 and MD13), *Rhizobium sullae* (BG15) and *Bradyrhizobium cytisi* (B21), In order to improve the composition of the culture medium to achieve optimal production of these polysaccharides, with the aim of their potential use in various sectors such as food processing, agriculture, pharmaceuticals, and many others. Trials were carried out to determine the conditions conducive to EPS production by growth of the four selected strains in a chemically defined YEM medium, examining in particular temperature, pH, sodium chloride, carbon and nitrogen sources, metal ions, surfactant and incubation time. we obtained the best strain in terms of EPS yields from B21 (0,830 ± 0,005 OD), followed by BG15 (0,807 ± 0,027 OD) and MD13 (0,636 ± 0,005 OD), and as the lowest production was of HCBA11-2 (0,580 ± 0,007 OD).

Keywords: Exopolysaccharides, rhizobial strains, production factors, culture medium, yield optimization.

Beyond of Plant Proteins: Amyloid-Like Protein Fibrils

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Proteins, like all other materials, tend to increase their thermodynamic stability by minimizing their total free energy and entropy. The most important strategy used by proteins to reduce free energy is the three-dimensional nature consisting of secondary, tertiary, and quaternary structures. Proteins use these structures to minimize free energy by hiding hydrophobic amino acid sequences in the core of the three-dimensional molecule. However, these natural protein conformations are degraded, either reversibly or irreversibly, in the presence of entropy-increasing factors, such as temperature and pH, that is, they become denatured. Stress conditions that cause protein denaturation and the way these conditions are eliminated determine the new conformation of the protein. The principle of the formation of amyloid-like protein fibrils (PF) lies in manipulating these denaturation conditions. All proteins have at least one amino acid sequence called "amylome" that can initiate the PF formation under appropriate conditions. However, considering their high free energy, these sequences often appear at the core of the three-dimensional protein structure in the native conformation. Therefore, the initiation stage of the PF formation is denaturation of the three-dimensional network by using external stresses such as high temperature that reveals the amylomes from the core of the protein molecule. Appropriate elimination of the stressors that create this chaotic environment triggers the second step of the PF formation: aggregation. Amylomes belonging to different, or the same protein molecule interact to form ß-sheet and cross-ß structures. This aggregation, which greatly reduces the free energy of proteins even compared to their natural state, is an auto-catalytic reaction. Therefore, the third and final stage is propagation, each aggregating amylome pair triggers the next one, accelerating protein fibrillation. This irreversible process continues until no more amylome in the environment can connect the fibril structure and the unique product of this auto-catalytic bio-reaction is PF with an incomparable aspect ratio and functional properties. At this stage in human history, it has become mandatory to substitute animal proteins with plant ones; so much so that the world's rich-poor inequality has widened, the number of cattle for slaughter exceeded 1 billion, and greenhouse gas emissions from these animals have become one of the main factors leading to global warming. Yet plant proteins are globular, and their higher hydrophobicity limits their functional properties. However, in the last quarter-century, food scientists have discovered that plant-based proteins can also be aggregated into PF structures and the number of studies on plant-based PF is increasing by the day. In this regard, there are still dozens of unresolved question marks: Can plant-based PF be the solution to this crisis? Why are plant-based proteins less likely to self-assemble into PF than animal proteins? Does the self-assembly of plant proteins into PF become limited by their sub-fractions? Is there any less costly way to produce plant-based PF? As food scientists, we must discuss the possible answers to these questions before the world turns into an uninhabitable place; for both us humans and the billions of animals we breed for slaughter.

Keywords: Amyloid-like protein fibrils, plant-based proteins, sustainability, thermodynamic stability.

Reducing the Negative Impact of Invasive Crayfish *Faxonius Limosus* in the Danube by Smart Exploitation of Their Meat and Shells

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Invasive Alien Species (IAS) are identified as one of the five top direct drivers of biodiversity loss, pointing to one of the most significant threats for humanity in the next decade. Spiny-cheek crayfish *Faxonius limosus* is a native species to Eastern North America but has been recorded so far in more than 20 European countries and listed as IAS of Union concern. The first record of *F. limosus* in Serbia was in the Danube River near Apatin in 2002. Nowadays, this species has established itself along the entire Serbian section of the Danube River and its tributaries. Considering available data and high dispersal rate of this species, it can be assumed that its invasive range in Serbia is more extensive than it is documented, with a tendency for a high degree of expansion in the future. It is an omnivorous species that feeds on aquatic vegetation, fish eggs and invertebrates, and thus affects biodiversity. The spiny-cheek crayfish shows several characteristics such as rapid maturation, short lifespan, high fecundity, and second mating period, which facilitate its fast population growth, giving it high invasive potential. Additionally, the negative impact of *F. limosus* on the native crayfish populations in Europe is expressed in competition for habitats, in which the invader is more adaptive; it is a carrier of crayfish plague, lethal for the European native crayfish, and can destabilize riverbanks and modify other habitats, due to its burrowing behavior causing substantial economic damage. Generally, the economic damage caused by IAS could cost Europe billions of euros per year, and damage costs are continuing to rise. Considering that *F. limosus* is one of the most important aquatic invaders in European inland waters, prevention, control, and eradication of this species represent the greatest challenge in the field of biodiversity maintenance. Due to their high prevalence, it is too late for their prevention. On the other hand, the introduction of predators will have worse consequences for biodiversity; therefore, monitoring and reducing the abundance of this species seems like the best possible solution. Since this species is one of the most critical aquatic invaders in European inland waters, there is an urgent need to address the problem of its impact on biodiversity. Methodological approaches to be used intend to preserve biodiversity, turning the acquired knowledge into a variety of eco-products, in line with the concept of zero waste. These include food products with spiny-cheek crayfish meat intended for human/pet consumption, adsorbent for heavy metal ions removal from wastewater, rubber product filled with crayfish shell powder, and active chitosan-based biomaterial made from shell powder. This approach will significantly contribute to the formation of the ecological concept of the circular economy.

Keywords: Invasive species, spiny-cheek crayfish, zero waste, eco-products.

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Exploring The Nutritional Benefits of Camelina Seed and Its by-Products

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Camelina sativa is gaining increasing global attention due to its environmental adaptability, as it can be grown in a variety of climates with low water and nutrient requirements, and often on marginal and saline soils compared to other oilseeds. Its strong resistance to microbiological diseases and insect pests renders its cultivation less environmentally detrimental, thereby reducing the need for pesticides and herbicides. The cultivation of camelina is also driven by its remarkable abundance of protein, fat, and valuable bioactive compounds, all contributing to a myriad of positive health effects. Camelina seeds contain approximately 24-35% crude protein and 36% fat, of which 40-60% are polyunsaturated fatty acids. The nutritional composition of camelina is comparable to other commonly cultivated oil seeds. Additionally, camelina seeds serve as a valuable natural source of antioxidants, particularly tocopherols, phytosterols, phenolic acids, and flavonoids. Camelina seed oil exhibits notable stability, elevated levels of n-3 fatty acids particularly alpha-linolenic acid (ALA) (approximately 35-40 %), and moderate antioxidant potential. These qualities, accompanied by numerous health benefits, render camelina oil appropriate for human consumption as an ingredient in functional foods. During the production of oil from camelina seeds, by-products such as meals or cakes are obtained; depending on the oil extraction conditions (solvent extraction or mechanical pressing). These byproducts are recognized as valuable sources of proteins (35-40%), amino acids, and bioactive compounds. Camelina byproducts contain noteworthy (high) levels of essential amino acids, particularly leucine, lysine, and valine. Among non-essential amino acids, glutamic acid is predominant, followed by arginine, aspartic acid, and proline. Camelina byproducts contain glucosinolates, with the most prevalent being those with the glucocamelinin structure. These glucosinolates are linked to positive health effects, such as protection from certain types of cancer and exhibiting immune-modulatory properties. Additionally, camelina byproducts are rich in tocopherols, especially in γ-tocopherols. Tocopherols have antioxidant potential and can prevent oxidative changes in lipids, which is important considering that camelina has a high level of polyunsaturated fatty acids that are sensitive to lipid oxidation. The by-products also contain phenolic compounds, with gallic acid being the most abundant, followed by syringic and caffeic acid. The content of these phenolic compounds was higher in the camelina cake obtained by mechanical cold pressing than in the camelina meal obtained by solvent extraction. Furthermore, camelina cake demonstrated a higher antioxidant activity in neutralizing DPPH radicals than camelina meal. The obtained results confirm that camelina oil and its by-products obtained after oil extraction represent a high-value raw material that can be utilized in various applications, including the food, feed, or pharmaceutical industries.

Keywords: Camelina oil, camelina cake, omega-3 fatty acids, tocopherols, antioxidant potential.

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CFD Simulation of a Nozzle Utilized in Ice Cream Filling Process

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The ice cream filling process is a complex system that requires a detailed understanding of fluid flow, phase change, and structural features to enhance operational efficiency and product quality. Computational Fluid Dynamics (CFD) simulations emerge as an essential tool in advancing our understanding of complex fluid flow phenomena across various industrial applications where the presence of complicated geometries and varying operating variables like viscosity, pressure, and temperature complicates these processes. In this study, a CFD study is carried out to understand the intricacies of the flow of ice cream through a nozzle that is utilized in the ice cream filling process. The ice cream is assumed as a Newtonian fluid, with an apparent viscosity of 7500 cP and a density of 1.13 g/ml. The simulation was conducted in a three-dimensional environment with appropriate meshing. Pressure and velocity profiles were illustrated, and the results are discussed in detail. The methodology presented here applies to all processes including a similar nozzle flow and the results of this study provide crucial insight into the fluid flow through a nozzle for the ice cream processes and enlighten further optimization opportunities.

Keywords: Computational fluid dynamics, nozzle flow, newtonian fluid, ice-cream filling process.

Gluten-Free Functional Purple Potato Flour

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In recent years, the increasing concern for healthy nutrition, coupled with the rising prevalence of conditions such as celiac disease and wheat allergies, has contributed to the preference for functional flours. Primary examples of functional flours include legume flours (chickpea, lentil flour, etc.), grain flours (sorghum, buckwheat, etc.), seed flours (amaranth, flaxseed, chia, etc.), and root vegetable flours (potato, turnip, red beet, carrot, etc.). Common characteristics of these flours include gluten-free composition, high nutritional values, low carbohydrate content, and suitability for a healthy diet. Purple potatoes (*Solanum tuberosum L.* var. Vitelotte) are characterized by high levels of carbohydrates, protein, dietary fiber, vitamins (B3, B6, and C), and minerals (potassium, magnesium, phosphorus, iron, and zinc). These potatoes, with higher anthocyanin, flavonoid, and phenolic content levels compared to yellow potatoes, possess significantly increased antioxidative effects. The aim of this study is to produce flour using purple potatoes grown in Turkey by preserving their nutritional properties and color. To enable a comparative analysis of the results, yellow potato flour was also produced and analyzed under the same conditions as a control sample. The physicochemical properties, chemical composition (mineral and organic acid content), antioxidant activity, and *in-vitro* biological activities (bioaccessibility, antidiabetic activities, anti inflammatory*)* analyses were conducted for both the produced purple and yellow potato flours.

Keywords: Purple potato flour, gluten-free, *in-vitro* bioaccessibility, *in-vitro* antidiabetic activities, *in-vitro anti inflammatory*.

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LC-Q-TOF-MS/MS Characterization of Free and Bound Phenolic Compounds of Fermented *Lactarius Deliciosus* and Its Potential Antioxidant Activities

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Lactarius deliciosus, commonly known as saffron milk cap, is a wild mushroom species that has been registered as a geographical indicator in Turkey. It contains bioactive compounds, including phenolic compounds, which are known for their antioxidant activity and health benefits. However, the bioactivity and bioavailability of these compounds are often limited because of their low solubility and complex structural forms. In response to this challenge, our study investigated the potential of fermentation as a means of enriching the nutritional value and elevating free phenolic levels. In this study, we focused on the fermentation of *L. deliciosus* using *Lactiplantibacillus plantarum* for 72 h. We aimed to explore the effects of fermentation on both bound and free phenolics (BP and FP, respectively), which play crucial roles in determining the bioactivity and health-promoting properties of mushrooms. We conducted a comprehensive analysis of the phenolic profile and content, as well as antioxidant activity, of both FP and BP. Remarkably, our findings revealed that the total phenolic content (TPC) of BP surpassed that of FP in the mushroom, indicating the potential importance of these bound forms in contributing to the overall antioxidant capacity. Moreover, we observed a significant increase in the TPC of the FP following *L. plantarum* fermentation, particularly at the 24-hour, suggesting the release of phenolic compounds from their bound forms during fermentation. To further characterize the phenolic composition of fermented *L. deliciosus*, we employed advanced analytical techniques including UPLC-Q-TOF-MS/MS. This analysis enabled us to tentatively identify 28 bioactive compounds, including various classes such as hydroxybenzoic acids, hydroxycinnamic acids, flavonoids, terpenic acids, stilbenes, other polyphenols, and vitamins. Principal component analysis (PCA) was used to explore overall differences among the fermented *L. deliciosus* fractions, indicating significant changes in their phenolic composition and bioactivity as a result of fermentation. Interestingly, the unfermented (0h) *L. deliciosus* fractions exhibited clear differences from their fermented counterparts, highlighting the transformative effects of fermentation on mushroom phenolic compounds. Additionally, volcano plot analysis revealed 332 features with significantly different levels ($p < 0.05$, $FC \geq 2.0$) during fermentation, underscoring the dynamic metabolic changes occurring in *L. deliciosus* during the fermentation process. In summary, the findings of our study indicate that lactic acid fermentation holds great promise for enhancing the bioactivity and bioaccessibility of phenolic compounds in mushrooms, thereby presenting a promising avenue for the development of functional foods that boast improved health benefits. These results not only deepen our understanding of the role of fermentation in unlocking the nutritional potential of mushrooms but also offer valuable insights for future research in this field.

Keywords: Lactic acid fermentation, *Lactarius deliciosus*, phenolics.

Effects of *Rhodiola Rosea* and *Withania Somnifera* Powders on Textural and Functional Properties of Chewing Gum

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This study investigated the effects of adding Rhodiola (*Rhodiola rosea*) and Ashwagandha (*Withania somnifera*) root powders to sugary and sugar-free chewing gum formulations on some functional and textural properties. The root powders were added in different particle size ranges (0-30, 30-63, and 63-100 μm) and concentrations (1% and 3%, w/w). Textural, sensory, color, antioxidant capacity (DPPH, ABTS), total phenolics, thermal and FT-IR analyses were performed. The sugar gum sample with 3% Rhodiola root extract in the 30-63 μm particle size range had higher DPPH, ABTS, and total phenolics content (0.94 mg TE/g, 31.4 mg TE/g and 4.8 mg GAE /g, respectively). Adding 1% Ashwagandha extract in the particle size range of 0-30 μm to the sugar gum sample resulted in lower values (0.12 mg TE/g, 1.51mg TE/g, and 0.24 mg GAE/g, respectively). The highest hardness values were detected in chewing gum samples with Rhodiola root extract. There was no significant difference between stickiness and chewability ($p<0.05$). DSC analysis of root powders revealed exothermic heat flow. Sensory evaluation showed that the sugary gum sample had the highest overall acceptability score. In contrast, the sugar-free gum sample containing 3% Rhodiola root powder in the 30-63 μm particle size had the lowest score. The data obtained from this study demonstrate that adding root powders into gum formulations causes adverse effects in some textural and sensory properties depending on particle size range while enhancing antioxidant capacity and total phenolics significantly.

Keywords: Chewing gum, rhodiola, ashwagandha, plant root powder.

Toward Sustainable Food System: Enhancing Agricultural Diversity by Growing *Nigella Sativa* L. Under Agroecological Condition of Albania

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One of the foremost challenges confronting humanity is the imperative to produce sufficient and nutritionally adequate food to meet the demands of a rapidly expanding global population. It is estimated that 95 % of our food is directly and indirectly produced through the soil. Sustainable agricultural practices play a vital role in ensuring the long-term viability of our food production system. By embracing sustainability principles, such as crop rotation, reduced tillage, integrated pest management, and biofertilizer, we can mitigate the negative impact of agriculture on the environment while simultaneously enhancing productivity and resilience. On the other hand, securing world crop diversity is a global concern and prerequisite for future food and nutritional security. With regards to this, this study aimed to evaluate and characterize Nigella Sativa L based on some biometric traits: plant height, capsule number, capsule weight, number of seeds per capsule, 1000-seed weight, and yield. For experimental purposes, 8 domesticated populations of Nigella Sativa L were used. Investigation was carried out during May - September 2023, in a completely randomized design with three replications at the Didactic Experimental Field of Korca University under field conditions using sustainable agricultural practices. The results showed that the average length of the entire vegetation period was 112 days. The population originating from Turkey performed the highest value of biometric traits with a plant height of 47 cm, a number of capsules of 42, number of seeds per capsule of 98, and a seed yield of 5.7 g. With the implementation of advanced and suitable agricultural technology, farmers in Albania can consistently supply this raw material of a specified quantity and quality for use in the food, pharmaceutical, and cosmetic industries.

Keywords: Sustainable agricultural production, *Nigella sativa*, food demand, food quality.

Functional Properties of Lentil Protein Subfractions

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Nowadays, the importance of plant sources, and therefore the importance of plant proteins, is increasing as it is difficult to access foods of animal origin. The most widely used system for classifying plant proteins is based on solubility and extractability in a range of solvents. Based on his work and a literature search, Osborne concluded that four groups of simple proteins are present in plant tissues, including seeds, while most of the other groups have not been shown to occur. These four groups, known since then as the "Osborne fractions", are albumins, globulins, glutelins, and prolamins. However, the globulin sub-fraction is further subdivided into legumin and vicilin sub-fractions. In this study, lentil protein isolate (LPI) and its different solubility properties were utilized to obtain different sub-fractions, and their different functional properties were compared. The SDS-page image demonstrated that LPI was successfully divided into sub-fractions. The albumin-rich (ALB) fraction was the best soluble at almost all pH ranges. Especially in pH ranges below the isoelectric point, all of the fractions dissolved better than LPI. The highest emulsifying and foaming properties including emulsion activity and stability indexes and foaming capacity and stability, of ALB sub-fraction were determined as 115.41±5.59%, 300±13.33%, and 172.08±28.78%, respectively. The reason why ALB sub-fraction showed superior properties amongst all sub-fractions is thought to be due to its low molecular weight and short amino acid structure. Foam stability was higher than LPI (64.58±14.10%) in all sub-fractions. With the alkaline solubilization-isoelectric precipitation method, one of the most common techniques, not all of the albumin sub-fraction precipitates, and is not included in the isolate. This study emphasizes that the loss of the ALB sub-fraction by alkaline solubilization-isoelectric precipitation is important for functional properties. Plant-based proteins have different sub-fractions which show different functional characteristics depending on the sub-fractions and extraction techniques.

Keywords: Lentil Sub-fractions, osborne fractions, albumin, globulin, glutelin.

Innovative Approaches in the Food Industry: Microwave Plasma Technology and Applicability in Foods

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The microwave with plasma technology has not been yet widely used today and in this study, this technique is discussed to bring it to the food industry due to its advantages. Although the initial installation cost of microwave plasma technology is high, the long maintenance periods, short processing times, and lower labor costs promise to increase its applicability in the food industry. Plasma, also defined as a collection of charged particles that constantly move and interact with each other, is the fourth state of matter. In food technology, plasma can be applied hot or cold. Inert gases are used in plasma formation and low-level microwave energy is also used. Additionally, the use of oxygen gas in the current system increases oxidative stress on microorganisms found in foods. Since plasma formation occurs under a strong vacuum, it also effectively provides microbial inactivation in food systems. Cold and low-pressure plasma technology has emerged as a promising and innovative method for microbial inactivation on dry food surfaces. Therefore, microwave plasma system has an important potential to be used in many food systems such as spices, dried fruits, and vegetables. As a result, using microwave plasma not only contributes to extending the shelf life of foods but also prevents food poisoning, hence this technique needs to be further investigated and considered in food applications.

Keywords: Microwave plasma, food, quality characteristics, microbial inactivation.

Investigation of the Use of Menthol and Organic Acid-Based Deep Eutectic Solutions as Plasticizers in Food Packaging

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Plasticizers are one of the most preferred additives to improve the properties of packaging materials. However, most plasticizers used have toxic effects that harm the environment and human health. Therefore, it has become important to develop new plasticizers without toxic effects and to investigate the possibilities of using these plasticizers in packaging materials. In this study, the possibilities of using deep eutectic solvents (DES) classified as "generally recognized as safe (GRAS)" as plasticizers in food packaging materials were investigated. DESs based on menthol (M) and organic acids (levulinic acid (Lev) and pyruvic acid (Pyr)) were added to polylactic acid (PLA) films at 5%, 10%, and 20% by casting method. To evaluate the plasticizing effect of DESs, di-2-ethylhexyl phthalate (DEHP) and epoxidized soybean oil (ESBO), the two most widely used plasticizers in the packaging industry were used as controls in the study. The mechanical and barrier properties of PLA films containing DES, ESBO, DEHP, and without plasticizers were analyzed. When the mechanical analysis was examined, it was determined that the plasticizers added to the PLA films improved the mechanical properties of the films, but the rate of plasticizers added was important. The tensile strength (TS) values of PLA films prepared using the same amount of plasticizer showed a significant change depending on the type of plasticizer ($p<0.05$). The TS was the highest in films with 5% plasticizer added. This value was 22.49±0.90 MPa, 25.94±0.29 MPa, 20.28±0.47 MPa, 18.14±0.45 MPa for M-LEV, M-PYR, ESBO and DEHP, respectively. In PLA film without added plasticizer, the TS value was found to be 11.96±0.29 MPa. When the elongation at break (EAB) analysis findings were evaluated, it was determined that the EAB increased as the ratio of ESBO plasticizer added to the PLA film increased. At the same time, the EAB decreased as the ratio of other plasticizers increased. The EAB of PLA films without plasticizers was 266.03±0.38%. The results of the oxygen permeability analysis showed that ESBO and DEHP addition at different ratios increased oxygen permeability, while plasticization with DES decreased the oxygen permeability of PLA films. When the results of the water vapor permeability analysis were examined, it was found that the water vapor permeability of the PLA film without plasticizers was 1.04±0.01 $g/m^2 \cdot h \cdot Pa$, while it decreased significantly when plasticizers were added ($p<0.05$). As a result, it was determined that DESs can be used as a substitute for commercially used plasticizers in PLA films. It is thought that studies to be carried out to investigate alternative plasticizers without toxic effects and the possibilities of using these plasticizers in packaging materials are important in terms of human health and environmental pollution.

Keywords: Deep eutectic solvents, plasticizer, food packaging, PLA films.

Evaluation of Quality Properties and Antioxidant Activity of Bingol Honey

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Honey is a complex natural product that is produced by *Apis mellifera* bees from the nectar or secretions of plants, and the content of carbohydrates, flavour and aroma constituents vary considerably. Honey promotes human health due to its bioactive compounds, including phenolic compounds such as benzoic acid and esters, cinnamic acid and esters and other flavonoids such as quercetin, kaempferol and rutin. Thanks to its high nutritional value and fast absorption of carbohydrates, it has been a suitable nutrient for all age groups since ancient times. Honey's essential antioxidants enhance its overall antioxidant potential. The components present include polyphenols such as flavonoids and phenolic acids, enzymes like glucose oxidase and catalase, ascorbic acid, carotenoid-like molecules, organic acids, proteins, and amino acids. The unique flavor of Bingöl honey originates from the flora and endemic plants of the region. Bingöl honey, produced with 1719 beekeepers and 163 000 hives, received the geographical indication registration certificate as of 2022. This study aims to determine the physicochemical properties of honey samples as defined in the Turkish Food Codex Honey Communiqué and bioactive properties such as total phenolic, total flavonoid, phenolic compounds and antioxidant properties of Bingöl honey, which are obtained in high quality and safe conditions in 5 different regions where beekeeping is widely practiced. Honey samples were obtained from honey producers in 5 different regions (Karliova (3), Genç and Central districts) in Bingöl province. Total phenolic and total flavonoid content were determined spectrophotometrically. The individual phenolic compounds present in honey were isolated using a RP-C18 column coupled with HPLC. CUPRAC and DPPH methods were employed to measure antioxidant activity. All samples were determined to have quality measurements that agreed with the codex once the findings were analyzed. The total phenolic results ranged between 24.31 and 52.65 mg GAE/100g. Each location exhibited statistically significant differences in total phenolic content. The total flavonoid content ranged from 9.96 to 30.84 mg quercetin Eq./100g. DPPH values varied between 7.59 mg and 31.76 mg TE/100g. In terms of both total flavonoid and DPPH values, along with the Central and Genç districts, the two regions in Karlıova are similar within themselves. The CUPRAC values ranged from 36.08 to 78.37 mg TE/100g. Significant differences were observed between samples, excluding the two locations in Karlıova. Consequently, despite the limited variations among honey samples, the analytical findings revealed significant statistical differences.

Keywords: Bingol honey, bioactive compounds, total phenolic, total flavonoids, antioxidant activity.

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The Effect of Encapsulated Raspberry Powder on the Lipid Oxidation of Modified Atmosphere Packaged Chicken Nuggets during Chilled Storage

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Further processed poultry products, such as chicken nuggets, are among the meat products in which lipid oxidation is rapid in terms of their composition. Therefore, the shelf life of chicken nuggets is short and can be extended by modified atmosphere packaging as well as the addition of antioxidants. In recent years, natural additives obtained from various plants or fruits in lyophilized or powder form have begun to be used frequently in meat and meat products due to their contribution to improving the quality and extending the shelf life. One of these additives is encapsulated raspberry powder or lyophilized water extract, which has strong antioxidant properties. In the current study, the usability of chicken nugget production without phosphate and/or with phosphate + raspberry powder and its effects on lipid oxidation were examined for the first time. The raspberry powders, encapsulated by using maltodextrin (12-16 DE; 40.0%, m/m) with a spray dryer, were used in nugget production. The nuggets produced (phosphate levels: 0.0% and 0.3%, raspberry powder levels: 0.0%, 0.5%, and 1.0%) were packaged in a modified atmosphere using a gas composition of 40% CO_2 + 60% N_2 and were stored at 2.0±0.5 ºC for 120 days. Lipid oxidation (TBARS) was determined on the 0th, 30th, 60th, 90th, and 120th days of storage. Both the use of raspberry powder ($P<0.01$) and the use of phosphate ($P<0.01$) in nugget production prevented lipid oxidation during 120 days of storage. During storage, the lowest values were determined in samples containing phosphate + 1.0% raspberry powder ($P<0.05$). However, TBARS values are within acceptable limits (<1 mg MDA/kg) in all samples with 0.5% and 1.0% raspberry powder added in addition to phosphate.

Keywords: Encapsulated raspberry powder, chicken nugget, lipid oxidation, MAP, shelf-life

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Biosynthesis of Nanoparticles Using Microorganisms And Their Application in the Food Sector

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The food sector currently faces significant challenges, such as the use of chemicals and energy, which will be exacerbated by population growth and food shortages. Therefore, it is crucial to replace conventional methods with new ones, and the application of nanotechnology, particularly green technology, can significantly reduce the usage of toxic chemicals and energy. Nanotechnology is a key advanced technology that enables contribution, development, and sustainable impact, and it has the potential to transform various areas of the food sector, including biosensors, bio-preservation, food packaging, and other areas of the food industry. The negative impact of nanoparticle production using physical and chemical methods has created a need for environmentally safer synthesis methods. Thus, in the last decade, nanotechnology research activities have shifted towards a safe, simple, sustainable, cost-effective, environmentally friendly, and non-toxic system protocol. Green synthesis, as part of bio-inspired protocols, provides a reliable and sustainable method for the biosynthesis of nanoparticles by a wide range of microorganisms, including bacteria, actinobacteria, fungi, yeast, microalgae, and viruses, rather than current synthetic processes. Therefore, microbial synthesis of nanoparticles, which combines microbiology and nanotechnology, is one of the greenest techniques for sustainable production. In this presentation, we will discuss the latest advances and innovations in the biological synthesis of nanoparticles using green synthesis by different groups of microorganisms and the application of these nanoparticles in different food sectors.

Keywords: Innovation, sustainability, nanotechnology, green synthesis, microorganisms.

Biofilm Formation and Autoinducer-2 Production Characteristics of Meat Spoiler *Pseudomonas Fragi*

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The spoilage of meat under refrigerated conditions poses a significant challenge, leading to considerable economic losses. *Pseudomonas fragi*, identified as a major contributor to chilled raw meat spoilage, is known for its biofilm production capabilities. Biofilm formation is often associated with Quorum Sensing (QS), a bacterial communication system that utilizes signaling molecules, such as autoinducers, to sense population density. While Gram-negative bacteria typically produce autoinducer-1 (AHL), including acylated homoserine lactones, and Gram-positive and Gram-negative bacteria both produce autoinducer-2 (AI-2), little is known about the impact of AI-2 on *P. fragi*-induced meat spoilage. Despite being unable to produce AHL, *P. fragi* has demonstrated the ability to produce AI-2. In this study, 83 *Pseudomonas* isolates were isolated from beef and minced meat samples. Molecular analysis using rpoD primers revealed 15 putative *P. fragi* and 57 P. bubulae isolates, a species closely related to *P. fragi*. All isolates exhibited active motility, swarming, swimming, and twitching movements. Biofilm production was assessed using the Congo red agar test, and 37 biofilm-positive isolates were further analyzed using a well-plate spectrophotometer. To evaluate AI-2 production, luminescence generated by the *Vibrio harveyi* strain biosensor was employed. Out of the 83 isolates 15 exhibited luminescence.. Future analyses will involve elucidating if the production of biofilm and AI-2 is correlated. This study aims to uncover the relationship between spoilage activities and the Quorum Sensing phenomenon, exploring ways to reduce meat spoilage and minimize economic losses, thereby reducing economic losses associated with spoilage-causing pseudomonads.

Keywords: Autoinducer-2, biofilm, pseudomonas, quorum sensing.

Melanin: A Potential Functional Ingredient for Food

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Melanin, derived from the Greek word 'melanos' meaning black; is a pigment composed of quinone and hydroquinone monomers, commonly found in animal and plant cells. Melanin types are classified according to their sources as animal, plant, fungi or bacteria. Melanin is naturally found in cephalopods, such as Nigeva Sativa, Inonotus hispidus, Sporisorium reilianum and Auricularia auricula. It can also be examined in 5 groups according to their chemical and physical properties: eumelanin, pheomelanin, neuromelanin, allomelanin and pyomelanin. Its extract possesses positive effects on health including antioxidant, anti-inflammatory, hypoglycemic and anti-hyperlipidemic. The potential usability of melanin in the food industry has been increasing since it can improve the heat and light stability of foods, can be used as a natural colorant, and can remain stable when it is used with other additives. Moreover, it can be used to increase food stability during storage because it extends the shelf life by delaying fat oxidation and showing preventive effects against major foodborne pathogens. The beneficial properties of its will increase the chance of melanin for being used as a functional food ingredient. This study presents melanin as an emerging functional ingredient or additive by showing its important health effects, and great potential as an agent to improve food storage stability and to be used in food products.

Keywords: Melanin, functional ingredient, food additive, antioxidant, natural colorant.

Sustainable Oat Processing Via Contract Farming in Eti

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Oat (*Avena sativa*) is in the class of whole grains comprising the entire grain seed that includes bran, germ, and endosperm. Besides being the sixth important crop, oat is a well-balanced source of protein, fiber, lipids, polyphenols, and specific micronutrients. In terms of macronutrients, oat has a high and unique protein composition that differs from other cereals. Moreover, oats contain functionally important levels of β – glucan, recommended as a regular ingestion of 3 g from cereal sources by the US Food and Drug Administration (FDA). In the scope of oat β – glucan, there are several studies about regulating the glycemic response, lowering total and LDL serum cholesterol levels, and improving digestion. Also, the lipid content of oats is higher than other cereals with about 10%. The lipid content of oat is rich in palmitic (C16:0), oleic (C18:1), and linoleic (C18:2) acids. Despite the high content of unsaturated fatty acids, phenolics in oat protect against lipid oxidation. Oats have a unique, phenolic compound known as avenanthramides, which are not present in other cereal grains. Oat avenanthramides provide health benefits for many diseases related to cellular dysfunctions and human pathologies, including cardiovascular diseases. Besides a high-quality macro- and micronutrient content, the oat intake provides an improvement of health-related microbial metabolites in the human gut microbiome. The fact that oat has so many effects on health has brought it to an important position among functional food ingredients. While the most well-known oat-based products belong to the breakfast category, such as muesli, oatmeal, and granola, oats have many uses in food such as cereal bars, cookies, crackers, and cakes. Eti Food Producing and Trade S.A., the company that processes oats the most in Turkey, has been producing oatmeal since 1992 and closely controlling the quality of the oats used in ETİ with the contract farming it carried out in 2012. Thanks to contract farming carried out with approximately 383 farmers in 2023, approximately 13000 tons of high-quality oats were produced. Produced oats are used as an important raw material in approximately 40 products produced by Eti Food Producing and Trade S.A. In addition, R&D projects and product development studies, specific to oats, are also carried out effectively within Eti Food Producing and Trade S.A.

Keywords: Cereal, oat, contract farming, sustainability.

Optimization of a Method for Isolating *Clostridium Perfringens* Bacteriophages

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Clostridium perfringens (*C. perfringens*) is a gram-positive bacterium and an anaerobic foodborne pathogen found in nature, particularly in soil and wastewater. This pathogen also exists in the gastrointestinal tract of humans and animals, causing food poisoning and other illnesses. *C. perfringens* possesses toxins responsible for disease pathogenesis and can form spores resistant to environmental stress. Numerous strategies have been used to inactivate *C. perfringens*, such as heat and pressure treatment, modified atmosphere, and chemical and natural agents, but these solutions remain ineffective. Bacteriophages (phages) have been studied as valuable antimicrobial alternatives for killing pathogenic bacteria. Phages can infect and lyse the bacterial host in a specific way that can be used to inactivate *C. perfringens*. This study aimed to optimize a method for isolating *C. perfringens* bacteriophages from wastewater samples and testing their lytic activity against *C. perfringens*. For this purpose, in the isolation of *C. perfringens* bacteriophages, Tryptone Sulfite Cycloserine agar (TSC), Tryptic Soy Agar and Broth (TSA and TSB), and Fluid Thioglycolate (FT) were tested as different growth media. Besides, the isolation process was also assessed in the presence or absence of liquid paraffin and agitation. Consequently, the most effective isolation method that showed the maximum number of bacteriophage plaques was the use of TSC agar and TSB, while agitation and the use of liquid paraffin showed no change. In conclusion, it could be said *C. perfringens* bacteriophages can be recovered using this isolation technique and used as natural antimicrobial agents to combat this food-borne pathogen.

Keywords: *Clostridium perfringens*, bacteriophage, isolation.

Recent Advances in the Production of Microbial Exopolysaccharide (EPS) from by-Products and Agri-Food Wastes for the Development of Sustainable Food Packaging

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Exopolysaccharides (EPS) consisting of repeated sugar units linked by glycosidic bonds are important polymers in many areas such as providing textural structure in food, producing fermented foods and promoting health. Considered as a new biomaterial, EPS has found application in many different industries such as textile, detergent, glue, petroleum, cosmetics, and pharmaceuticals. The antioxidant, prebiotic and antimicrobial properties of EPS as well as its non-toxicity, biocompatibility, and biodegradability, position it in an important place in food packaging. Today's changing food consumption trends and holistic lifestyle aim to reduce or eliminate food additives and create the least possible environmental impact. Based on this, the scientific community and the food industry aim to reduce the use of non-degradable plastics, which are still widely used in the food production chain. Compared to conventional plastic packaging, the use of EPS-based materials can be an environmentally friendly solution that reduces dependence on fossil sources and carbon footprint. Most of the polymers used in the industry are derived from algal, plant and animal sources, but there is an increasing interest in the use of microbial EPS, which can form viscous solutions even at very low concentrations and have a pseduoplastic structure. Microbial EPSs are in an advantageous position due to their physico-chemical properties. Although there are many EPS produced by microorganisms, their use in industry is limited due to high production costs and limited production quantities. Low-cost microbial production of EPSs can be an important alternative to plant polysaccharides in industrial applications. A prerequisite for EPS production is the development of a production medium that is competitive with synthetic chemical products in terms of cost and efficiency, and the creation of technological conditions. For this reason, there is increasing research into the economic production of biopolymers by reducing production costs through the use of some cheap waste/by-products as substrate and by optimising the fermentation process. However, the main difficulty in the production of EPS-based packaging is compliance with food safety and security standards. Prototypes also show limitations in terms of water vapour permeability and mechanical properties, as well as high production costs. Despite all these limitations, food packaging technology is constantly evolving to develop functional edible packaging films that can exploit all the properties of microbial EPS. The aim of this study is to describe the principles, importance and applications of using EPS, which is cheaper and more sustainably produced from waste, in films and coatings for food packaging.

Keywords: Sustainability, exopolysaccharide, food packaging, waste assessment.

Boron Levels in Some Edible Salts Consumed in Turkiye

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Boron is an element commonly found in nature and is of great importance in terms of glass, ceramic, cleaning and bleaching, cosmetics, agriculture, energy, health, aircraft, and metallurgy sectors in Turkiye, which has a large portion of the world's boron reserves. Boron enters the body mainly through foods and drinking water. Thus, boron intake through food and drinking water varies depending on geographical conditions and dietary characteristics. Studies in recent years have focused particularly on the biological importance of boron and its positive effects on human health especially in mineral and hormone metabolism, bone development, antioxidant defense system, wound healing, energy metabolism, immune system, and mental performance. In this study, boron levels were determined by the ICP-MS method in 15 edible salts consumed in Türkiye. The average boron level in salts was determined as 1.1 ± 1.2 (median: 0.6) ppm. The minimum and maximum boron levels were 0.05 and 3.83 ppm, respectively. According to the data from the Turkiye Nutrition and Health Survey, the average daily salt consumption is 10 g. When the calculation is made accordingly, it is seen that the contribution of salt consumption to daily boron intake is 0.01 mg on average. Determining boron levels in edible salts is also very important for epidemiologic studies and establishing a database of boron levels in salts in Turkiye.

Keywords: Boron, edible salts, salt, ICP-MS, trace element.

Antioxidant Activity of Essential Oils and Ethanolic Extracts of Four Medicinal Plants Alone and in Combination

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The present study aims to evaluate the antioxidant activity of ethanolic extracts and essential oils from aromatic plants of the Lamiaceae family (Thymus algeriensis and Salvia rosmarinus), Anacardiaceae (Pistacia lentiscus), and Myrtaceae (Eucalyptus polybracetea). The polyphenols were measured using the Folin-Ciocalteu method, revealing that the essential oils and ethanolic extracts were relatively rich in polyphenols. Their antioxidant properties were tested using the synthetic DPPH radical trapping method. The IC50 values were determined based on the graph representing the percentage of inhibition of the DPPH radical by essential oils and ethanolic extracts. According to our results, there is a correlation between the level of polyphenols present in the different essential oils and ethanolic extracts and their ability to neutralize free radicals. Several combinations were made between the essential oils and ethanolic extracts to determine the type of interactions existing between the combined substances. The results were represented in the form of isobolograms, showing additive and super-additive effects in combinations of essential oils, and super-additive and sub-additive effects in combinations of ethanolic extracts.

Keywords: Essential oils, ethanolic extracts, DPPH, combination.

Printability Evaluation of Carob Added Dark Chocolate

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3D Printing (3DP) is an innovative technology that has been developing rapidly for use in different areas, such as food and biomedical applications. Extrusion-based printing is one of the commonly used types for food printing. It can facilitate the fabrication of complex structures, improvement of personalized nutrition, and modification of food texture and composition. At this point, chocolate comes to the front as a very appropriate product to be printed owing to its unique properties, such as shear-thinning behavior and melting properties. In this study, dark chocolate was reformulated with carob extract as a sucrose replacer and optimum conditions were found for its successful printability. MyCusini (Print2Taste GmbH, Freising, Germany) was utilized during the printing process for both carob-added dark chocolate and commercial printer chocolate given by the printer company. Up to 40% (w/w) carob addition into dark chocolate couverture gave very close printability values to commercial printer chocolate. It was also seen that the selected 3D shape had a crucial impact on printability success due to its height and printing time. This work demonstrated the high potential of food printing for shaping the future of food.

Keywords: 3D printing; chocolate printing; printability; emerging food technology.

Effects of Growing Region, Year of Harvest and Altitude on Fatty Acid, Sterol and Tocopherol Compositions of Giresun Tombul Hazelnut Oil

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In this study, the effect of geographical origin, harvest year, and orchard altitude on the fatty acid, sterol, and tocopherol compositions of the Giresun Tombul Hazelnuts was investigated. The principal component analysis (PCA) carried out on the biochemical data set showed distinct clustering tendencies among the hazelnuts samples. Significant differences were found in the contents of fatty acids, sterols, and tocopherols between hazelnuts harvested from Protected Designation of Origin (PDO) and non-PDO regions across two distinct harvest seasons. The compositions of fatty acids and tocopherols were found to be significantly influenced by geographical origin, notably affecting oleic acid, saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), and α-tocopherol. Higher contents of palmitic, stearic, linoleic, and α-linolenic acids were observed in PDO hazelnuts, while oleic and eicosenoic acid contents were lower, compared to non-PDO samples ($p < 0.05$). Except for Δ5-avenasterol and Δ7-stigmastenol, the sterol composition was generally not affected by the geographical origin. The fatty acid (excluding linoleic acid), sterol (excluding campesterol, sitostanol, and Δ7-Stigmasterol), and tocopherol composition were substantially influenced by the harvest year. It was noted that samples from 2021 contained higher levels of palmitic, stearic, and arachidonic acids, but lower levels of oleic, linoleic, and eicosenoic acids than 2022 samples. Furthermore, all tocopherol components in the 2022 samples were significantly higher ($p < 0.05$) than 2021 samples. Altitude was primarily seen to influence the composition of fatty acids, particularly SFA composition, while it had minimal effects on sterol (except for campesterol) and tocopherol compositions. An increase in altitude resulted in a decrease in the contents of saturated fatty acids (palmitic, stearic, and arachidonic acids), and an increase in the contents of polyunsaturated fatty acids (linoleic and α-linolenic acids). This study highlights that the lipid composition of hazelnuts varies depending on various factors such as geographical origin, growing season, and to some extent, altitude, even within the same cultivar.

Keywords: Hazelnut, hazelnut oil, fatty acids, sterols, tocopherols.

Evaluation of CRISPR Profiles of *Streptococcus Thermophilus* İsolates from Yoghurt Samples

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This study aims to determine the CRISPR profiles of *Streptococcus thermophilus* isolates. For this purpose, 24 of the isolates from a total of 137 *Streptococcus thermophilus* bacteria from six different local yogurt samples including Afyon/Dinar, Uşak, Konya/Karapınar, and Tokat regions of Turkey were obtained. 16S rRNA ribosomal gene sequence analysis was completed for microbial identification of *Streptococcus thermophilus* isolates and strain-specific CRISPR I-II-III and IV primers were used to group CRISPR profiles of the isolates. It was determined that the isolates commonly had CRISPR II and IV profiles, while only one isolate had a CRISPR III profile. The technological properties and starter potential of these isolates are planned by culture-dependent analysis and PCR-based techniques for screening specific genes.

Keywords: Yoghurt starter cultures, *Streptococcus thermophiles*, CRISPR profiles.

Lemon Fiber: A Sustainable Solution for Healthier Cream Fillings

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The quest for sustainable alternatives to replace fat in food products while maintaining desired textural and rheological properties, alongside significant nutritional value, presents a considerable challenge in the food industry. Lemon fiber, a by-product of the citrus industry rich in dietary fiber and bioactive compounds, has garnered attention due to its beneficial health properties and favorable rheological characteristics. This study explores the potential of incorporating lemon fiber (at levels ranging from 0.5g to 1.5g per 100g) as a fat substitute in filling creams, utilizing response surface methodology to optimize formulations with reduced fat content while preserving spreadability and firmness. The findings indicate that the addition of lemon fiber led to a significant decrease in the a_w (water activity) and pH values of the samples as fiber content increased, highlighting its impact on the physicochemical properties of the creams. Samples with a fiber-to-fat ratio of 1.5:25 exhibited the highest firmness and work of shear values, closely followed by the control sample. Encouraged by these results, the fiber content was increased to 3g per 100g, resulting in further improvements in rheological behavior, with the 3:10 fiber-to-fat ratio sample showing no significant difference compared to the control**.** The study also assessed the impact of lemon fiber-shortening ratio on textural properties using various analyses, including viscosity, frequency sweep, temperature sweep, and physicochemical evaluations. The results underscored the importance of optimizing this ratio to achieve desirable textural and rheological properties in fat-reduced filling creams. Notably, a sample comprising 10% oil and 3% fiber demonstrated the most favorable results, effectively reducing fat content from 30% to 10% while maintaining comparable textural properties to the control sample. Furthermore, the study contextualizes the growing trend of utilizing industrial gelling agents such as gelatin and gums in the gastronomy and food industry to enhance textural attributes. Lemon fiber emerges as a promising alternative to traditional fat replacers, offering the potential to contribute to the creation of more sustainable and healthier food products aligned with industry demands. In conclusion, the incorporation of lemon fiber as a fat replacement in filling creams presents an innovative approach to address the dual objectives of reducing fat content and enhancing nutritional quality without compromising on texture or rheological properties. Future research may delve deeper into optimizing lemon fiber formulations across a broader range of food applications, further solidifying its role as a viable and sustainable ingredient in the food industry.

Keywords: Lemon fiber, rheology, texture, sustainability.

Green Synthesis of Metallic Nanoparticles by Plant-Based Extracts and Their Food Applications

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Nanotechnology is a science that deals with preparation of nano-size particles ranging from 1 to 100 nm employing diverse synthesis strategies, and particle structure and size modification. Nanoparticles are considered to be the building blocks for nanotechnology and are referred to as particles with at least one dimension <100 nm. Noble metals such as gold, silver, and platinum are utilized for the synthesis of nanoparticles and designated as metallic nanoparticles (MNPs). Green synthesis of nanoparticles using living cells through biological pathways is a more efficient technique and yields a higher mass when compared to other related methods. The green synthesized methods are eco-friendly, non-toxic, cost-effective, and also more stable when compared to other biological, physical, and chemical methods. This study focused on recent information on the green synthesis of MNPs by using plant-based extracts, and the latest research on using them as antimicrobial agents and food additives, and in food packaging. Nowadays, the use of extracts derived from different plant parts such as root, seed, leaf, flower, and fruit has been increasingly common in the green synthesis of MNPs. Plant-based extracts are the sources of several components and biochemicals such as proteins, pigments, and many other organic compounds that can role as stabilizing and reducing agents to synthesize green nanoparticles. Furthermore, phenolic compounds in plant extracts act as reducing agents in obtaining MNPs and also help prevent oxidation reactions by scavenging free radicals. Silver, gold, copper, platinum, iron, zinc oxide, and titanium dioxide nanoparticles are the most commonly studied MNPs obtained by green synthesis. The application of MNPs to food is a very important issue today. MNPs are used as antimicrobial agents against many pathogenic microorganisms such as *Enterococcus faecalis*, *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella typhi*, and as additives in food processes to improve shelf life, flavor, and many other properties. Moreover, it has been stated in many studies that the traceability of food throughout storage and transportation is increased by using MNPs in new smart and intelligent packaging. Silver nanoparticles, as one of the most researched MNPs, have many applications in the food industry due to their biological properties such as antimicrobial, antioxidant, anti-inflammatory, anti-cancer, and anti-diabetic. The use of many MNPs synthesized with plant-based extracts in certain doses in food processes can be considered safe, however, their direct intake at certain amounts, long-term exposure and potential bioaccumulation in the human body can raise concerns. Therefore, more *in vivo* toxicological investigations are needed to better understand the safety of biosynthesized MNPs.

Keywords: Green synthesis, nanoparticles, plant extracts, antimicrobial, food packaging.

Effects of Curcumin on Quality Parameters and Shelf Life of Rainbow Trout Fillets

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Rainbow trout (*Oncorhynchus mykiss*) is the most farmed and consumed fish in Turkiye. In 2023, inland farming of rainbow trout represented 76 percent of inland aquaculture production. Since the shelf life of rainbow trout fillets at refrigeration temperature is short (7 days maximum), different food preservation methods and materials are applied to elongate the shelf life of the fillets. Medicinal plants have been used for many years to improve the shelf life and quality of fish stored at refrigeration temperature. Curcumin is the active ingredient of turmeric (*Curcuma longa*). It has a very dominant yellow-orange color and is also used as a colorant and flavoring agent in foods. The purpose of this study was to determine the effects of encapsulated curcumin on quality parameters and the shelf life of rainbow trout fillets. Curcumin was encapsulated in starch (Pickering) emulsion. Encapsulation significantly improves the stability of curcumin, and the use of Pickering emulsions is a successful system to encapsulate and retain curcumin. The rainbow trout fillets were dipped into the prepared emulsion for 5 minutes and then refrigerated in polyethylene bags at 4°C for 18 days. Rainbow trout fillets with no treatment were used as the control group. Texture, pH, TBA, TVB-N, color measurements and microbiological (total mesophilic and psychrophilic bacterial counts) analyses were performed on 0, 4, 8, 13, and 18. days of storage to observe the quality changes during refrigerated storage. The pH values and microbial counts increased significantly during storage for both groups, but the increase in encapsulated curcumin coated rainbow trout fillets was significantly slower when compared to the control group. The pH of the control group reached to 6.8 on day 4 while the pH of curcumin treated fillets was still below 6.8 on day 13. The total mesophilic bacterial count of the control group exceeded 7 log cfu/g on day 4, which suggested spoilage. Texture results showed that the hardness of encapsulated curcumin coated fillets on day 13 was statistically same with that of day 0, but the control group was already softened on day 4. There were no significant differences between the two groups in terms of TBA, TVB-N and color values during storage. The results of the study showed that dipping rainbow trout fillets in encapsulated curcumin emulsion retarded the microbial growth, delayed the pH and textural changes, and extended the shelf life of the rainbow trout fillets during refrigerated storage.

Keywords: Curcumin, encapsulation, *oncorhynchus mykiss*, rainbow trout, shelf life.

Developing a Radio Frequency Process for Honey De-Crystallization

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Industrial honey de-crystallization is carried out using conventional methods of hot water (12-18 h at 60 °C) or air (24-36 h at 60 °C). Radio frequency (RF) process, with its volumetric heating feature, is an innovative approach to increase process efficiency, and it might have a great potential for honey de-crystallization. In the meantime, the process should assure a complete de-crystallization since even the presence of smaller crystals might lead to further recrystallization during storage. Therefore, the objectives of this study were to introduce an RF de-crystallization approach and monitor this process computationally with time-domain TD-NMR. For this purpose, pine honey samples were processed in a staggered through electrode configuration (10 kW - 27.12 MHz) RF system at 15 cm electrode gap and 5000 V applied potential. The experimental temperature data was used for validating the developed computational model (developed for honey de-crystallization using Comsol Multiphysics V5.6). TD-NMR experiments were, on the other hand, performed to monitor the de-crystallization and determine its kinetics at 40 to 70 °C with a magnet operating at 20.34 MHz. The kinetics data were then implemented in the computational model to predict de-crystallization and crystal distribution through the process. The results were also compared with the conventional processing. Experimental TD-NMR data was used to determine the kinetics (D- and z-values) of the de-crystallization process, and these kinetic parameters were coupled with temperature change during RF processing through the developed and validated model. The results demonstrated the NMR monitoring for RF processing while the experimentally validated computational model well determined the required process time. TD-NMR data enabled further determination of crystal distribution through the process. Computational results showed that RF processing of honey samples led to a more than 50% decrease in de-crystallization time for 20 kg samples in an industrial scale process compared to conventional approaches. In line with the UN 2030 Sustainable Development Goals (SDGs) for the use of clean energy and reducing process carbon footprints, this study is expected to shed light for a novel industrial processing.

Keywords: Honey, de-crystallization, radio frequency, NMR, mathematical modeling.

Gut Microbiota Modulation Properties of Various Dietary Fibers Extracted from Olive Oil İndustry by-Products

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The aim of this study was to extract dietary fibers from the olive oil industry byproducts (wastewater and pomace) and to determine their chemical structures and functional properties. For these purposes, dietary fibers in wastewater (DFww) were obtained by ethanol precipitation method, while water-soluble dietary fibers (WSDFpomace), pectin (PECpomace), and xylan (XYpomace) in pomace were obtained using liquid, acidic and alkaline extraction methods, respectively. The chemical structures of the dietary fibers were investigated by determining the monosaccharide and glycosidic-linkage composition through gas chromatography and mass spectrometry. To determine the functional properties of the dietary fibers, a series of in vitro fecal fermentation analyses was performed, and the microbial metabolites (acetate, propionate, and butyrate) generated during the fermentation were quantified by gas chromatography. In addition, changes in fecal microbiota composition before and after fermentation were determined through 16S rRNA sequencing technology. Monosaccharide and glycosidic-linkage analyses revealed that DFww and WSDFpomace were composed of pectic polysaccharides, but these pectins had a lower branching ratio compared to PECpomace. In vitro fecal fermentation analyses revealed that PECpomaceprovided similar rates of microbial short-chain fatty acids formations, compared to its commercial counterpart. XYpomace and DFww resulted in lower total short-chain fatty acid formation, compared to the other samples. 16SrRNA sequencing analyses revealed that dietary fibers extracted from pomace and wastewater promoted the *Phocaeicola vulgatus* and *Lachnospira* related operational taxonomic units (OTUs), which are known to be beneficial microorganisms in the gut. These results suggest that olive oil industry byproducts, especially pomace, can be utilized as raw materials for the production of functional dietary fibers (especially pectin) that potentially have beneficial effects on the colon.

Keywords: Olive pomace, olive wastewater, miseq, pectin, xylan, functional carbohydrates.

Artificial Intelligence in the Field of Gastronomy

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Gastronomy, as a branch of science that requires creativity, is a field open to development with artificial intelligence applications. Artificial intelligence (AI) is a computer system's ability to simulate human intelligence processes. These include the following processes: learning (acquiring and using knowledge), reasoning (using rules to draw conclusions), and self-correction. Depending on technological developments, artificial intelligence applications have become increasingly widespread in the food sector as well as in many other sectors. The multidisciplinary nature of gastronomy brings together different fields related to artificial intelligence. Contents such as ingredient combination and creating recipes, calorie calculation, creating food images, quality control, and food safety are supported by artificial intelligence. In this review, current artificial intelligence applications in the field of gastronomy are discussed.

Keywords: Artificial intelligence, gastronomy, ingredient combination.

Towards Sustainable Agri-Food Industry: Mitigating Carbon Footprint from Farm to Fork

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The carbon footprint is the equivalent of greenhouse gasses, in terms of carbon dioxide, released into the atmosphere due to the activities carried out by an individual, a country, or an organization. As concerns over climate change escalate, mitigating the carbon footprint of agricultural activities and food processing has become paramount. Agriculture is the source of raw materials from plants and livestock. On the other hand, food processing, the primary customer of agricultural products, is responsible for promoting and directing the production of agricultural materials. The agri-food industry, which emerged as a result of the integration of these two sectors, has undeniable impacts on global warming. Exploring the carbon emission processes within managed ecosystems and the agri-food industry and understanding the greenhouse gasses emitted throughout various stages of food production has become crucial. The objective of this presentation is to delve into the intricate relationship between sustainability and carbon emissions in the agri-food industry, emphasizing the journey from farm to fork. It also envisions the future of global food systems amidst growing population pressures and climate uncertainties. A general food system comprises raw material acquisition, processing, packaging, transportation, preservation, final consumption, and disposal. Rational land use policies, improvement of water, energy, and waste management systems, utilization of carbon capture and sequestration technologies, change in food consumption behavior, and government intervention play a critical role in reducing the carbon footprint of the whole system. In this presentation, methods to mitigate carbon footprint of the food system are discussed, and forward-thinking solutions are proposed to highlight the imperative for concerted actions to steer toward sustainable practices from the agri-food industry point of view.

Keywords: Carbon footprint, greenhouse gasses, agri-food industry, sustainable solutions.

Investigation of Alternative Methods for the Use of Nitrite and Nitrate in Meat Products

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Nitrite and nitrate salts are used as curing agents, preservatives, and color retainers in meat products such as salami, sausages, and fermented sausages. They are added to many foods, especially processed meat products, to prevent food poisoning that may be caused by botulinum toxin produced by the *Clostridium botulinum* as well as to delay the onset of rancidity, produce cured meat flavor or smell, and stabilize the meat's red. However, the addition of nitrite to meat or meat products may induce the formation of carcinogenic and genotoxic N-nitroso compounds. For this reason, searches continue to reduce or completely replace the use of nitrite and nitrate salts in foods. Herbal extracts, spices, vitamins, and fruits have been investigated as alternatives as these materials or their ingredients exhibit antioxidant and/or bacteriostatic properties that prevent nitrosamine formation. Furthermore, non-destructive technologies and minimally harmful processing technologies have been developed to reduce or replace the addition of nitrite or nitrate. These alternatives are considered by producers and consumers as an attractive practice even though they may also have some risks. Antimicrobial packaging, in which antimicrobial substances are incorporated into packaging materials, is particularly promising in the protection of fresh meat and dairy products, especially vacuum-packaged varieties. Various materials such as plastic films and paper-based packaging effectively transport antimicrobial compounds that are effective against foodborne microorganisms. These compounds, including antimicrobial enzymes, peptides, phenolics, fatty acid esters, antibiotics, and metals, can be integrated into packaging materials through film formulation, coating, or immobilization. Incorporating natural antimicrobial substances into edible biopolymer films and coatings is an emerging practice, contributing to the advancement of antimicrobial packaging technologies. In this study, the health risks of consuming processed meat products and more effective methods or additives for replacing nitrite or nitrate were investigated.

Keywords: Nitrite, nitrate, meat products, antimicrobial applications.

An Innovative Approach in Gastronomy: Soufflé and Mousse

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Health is a very huge concern nowadays and because of that gastronomy had to adapt and find some new alternatives to replace the classic ingredients that were used. Another factor is the economic part because especially protein is getting more and more expensive. So, the use of other ingredients and techniques can create an important alternative in both directions. Seaweed and plant-based products have made a big impact on the artisan level and the industrial level. We are talking about seaweed products; agar agar-extracting red seaweed species of *Gelidium* and *Gracilaria;* carrageenan-extracting red seaweed species *Chondris crispus*; seed gum plants; aloe vera- obtained from succulent plant species of the genus *Aloe;* xanthan gam-form *Xanthomonas campestris* fermentation product; *gum Arabic* from *Acacia senegal or Acacia seyal tree;* guar gum from guar beans *Cyamopsis tetragonolobus or* bacterial gels as*;* gellan gum produced by the bacteria *Sphingomonase elodea* used by the food industry to help emulsify, thicken, stabilize, and/or bind compounds. Like many French dishes, soufflé is meant as one of the high points of culinary arts that first appeared in the 1750s by Carême. It is also light, and puffy, and takes a great deal of skill to master. The name soufflé comes from the French verb souffler, which means to blow up or puff up, and accurately describes what happens when baked. The basic two parts of a soufflé are the custard base (creamy texture given by egg yolk and cream) made by adding flavorings that provide flavor, and the meringue base provides rising that carries the literal meaning of soufflés. The continuous material consisting of meringue foam is the structure of folded proteins over each other and the air is encapsulated by air. The bubbles are prevented from coming together and the foam structure is preserved. It has become popular in recent years for turning to cheap protein sources and for use in special nutritional situations. Vegetable protein isolates not only meet this purpose but also are a group of products that can be used in new product development with their different functional properties. Foam-forming properties of vegetable proteins are the main concern of this research. The aim is also focused on satisfying the needs of persons who are not consuming animal protein and to show the balance of gastronomy with nutrition in special situations in the example of eggless soufflé emulsion. In this study, it was also tried to reveal the foam formation capacity, stability, and sensory properties of the end product.

Keywords: Gastronomy, innovation, soufflé; vegetable proteins.

Determination of the Ph and Temperature Degradation Kinetics of the Eritadenine Compound of the Shiitake Mushroom (*Lentinula Edodes*)

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Mushrooms are one of the most diverse species on Earth. Although it is estimated that there are 1.5 million species of mushrooms, only 70,000 of them are known to be documented in the literature.*Lentinula edodes*, also known as Shiitake mushroom, belongs to the class *Basidiomycetes* and is referred to as the 'fragrant mushroom' by the Chinese. Shiitake mushroom possesses antioxidant properties and can lower blood cholesterol levels. The Shiitake mushroom, which is a significant source of bioactive compounds, is utilized in both food and medicine fields, with its property of regulating metabolic processes being employed in both traditional and modern medicine. Additionally, it is known as a source of a secondary metabolite called eritadenine, which has the effect of lowering plasma cholesterol. In this study, the changes in extracts obtained from Shiitake mushroom (*Lentinula edodes*), which ranks second in production worldwide, under varying temperatures at different pH levels in a liquid medium have been examined. The extract obtained by classical extraction method was subjected to a boiling process for 228 hours under varying pH conditions (2, 4, 6, 8), and the changes in the bioactive properties of samples taken at 12-hour intervals over time were examined. The extract in different pH environments was evaluated over time for Total Phenolic Content (TPC) and antioxidant activity (DPPH and ABTS). Considering the TFMM values of the samples, for instance, under pH 2 conditions, the initial TFMM value of the sample was determined as 4.28 mg GAE/g DW, while the final sample value was determined as 2.76 mg GAE/g DW. For the pH 4 sample, the initial TFMM value was determined as 4.03 mg GAE/g DW, while for the final sample, it was determined as 4.83 mg GAE/g DW. For the pH 6 sample, the initial and final values were determined as 5.05 and 5.56 mg GAE/g DW, respectively. A partial change was observed for the pH 8 sample, with initial and final values determined as 5.15 and 4.96 mg GAE/g DW, respectively. The ABTS and DPPH results are also in parallel with TFMM. For the pH 2 sample, a significant decrease was observed in DPPH and ABTS (antioxidant activity) results, which showed parallelism with the TFMM results for the other pH values. The changes in the amounts of eritadenine over time were determined using HPLC-DAD. Considering the values of eritadenine in the samples, for instance, under pH 2 conditions, the initial eritadenine value was determined as 130.73 mg EA/100g, while the final sample value was determined as 110.42 mg EA/100g. For the pH 4 sample, the initial eritadenine value was determined as 135.22 mg EA/100g, while for the final sample, it was determined as 171.29 mg EA/100g. For the pH 6 sample, the initial and final values were determined as 131.99 and 159.52 mg EA/100g, respectively. A change was observed for the pH 8 sample, albeit less than the other pH values, with initial and final values determined as 125.73 and 136.7 mg EA/100g, respectively.

Keywords: Shiitake mushroom (*Lentinula edodes*), eritadenine, pH , bioactive compounds, HPLC-DAD.

Optimization of Solid-State Fermentation Conditions Using *Trametes Versicolor* for Improving Antioxidant Properties of Carob Waste

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Carob pods are valuable by-products with high carbohydrate, mineral, dietary fiber, and polyphenol contents. Concerning being a low-cost and rich carbon and nitrogen source, carob pods are considered an interesting alternative for producing high-value-added products by solid-state fermentation (SSF). SSF is characterized by microbial growth in an environment with relatively low water activity and it has gained rising popularity in Western countries due to its potential to enrich secondary metabolites and obtain interesting food ingredients. The principal benefits of SFF are that it is a cheap and environmentally friendly method combined with a high recovery rate and productivity, which can utilize low-cost waste and enable quick downstream processing. *Trametes versicolor* is a white-rot fungus that can grow on many agri-food wastes and can efficiently degrade their lignin structure. Using it in SSF, low-cost industrial by-products can be converted into value-added food items with improved digestibility of their lignocellulosic structures and better availability of the polyphenolic compounds relevant for antioxidant activity. Furthermore, fungal laccase enzyme plays an important role in obtaining soluble dietary fibers with high antioxidative potential and better adsorptive properties. This study aims to develop a sustainable method for producing value-added products with better antioxidant properties from carob pods by using SSF with *Trametes versicolor*. To reach this aim, the Response Surface Methodology was applied to determine the effects of moisture content, fermentation time, and inoculation size (factors) on the properties of fermented carob pods. Total phenolic content, DPPH radical scavenging activity, FRAP antioxidant power, water absorption capacity, and oil absorption capacity were analyzed as responses. Influence of the SSF conditions could be successfully modeled using the Box-Behnken methodology. The results showed that fermentation time significantly affected total phenolic content, DPPH radical scavenging activity, and FRAP antioxidant power. Increasing the fermentation time resulted in a higher DPPH value, while lower total phenolic content and FRAP values were found. Water and oil absorption capabilities were not significantly affected by any of the factors. A fermentation time of 9.1 days was determined to be the optimum condition to maximize antioxidant activity. It is suggested that fermented carob waste can be used as an ingredient for food or feed products to improve nutritional value and enable cost-effective utilization strategies. The effect of SSF of carob pods by *Trametes versicolor* on further nutritional properties, such as dietary fiber and protein content, are worth investigating in the future.

Keywords: Solid state fermentation, *trametes versicolor*, carob, antioxidant properties, sustainability.

Investigating the Rheological, Microstructural, and Textural Properties of Liposomal Gels Derived from Salep and Xanthan Gum

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The combination of liposomes and hydrogels is gaining popularity due to their enhanced biodegradability and ability to facilitate multi-level release. This study aimed to investigate the influence of different polymer concentrations and the incorporation of liposomes on the rheological, textural, and morphological properties of liposomal gels by comparing hydrogels prepared with the same polymers. The liposomal gel consisted of salep and xanthan gum polymers. The total polymer (xanthan gum + salep) ratio was kept constant at 1% (w/w) and three different formulations were prepared with xanthan gum: salep ratios (w/w) of 1:1, 1:3, and 3:1. When liposomes were incorporated into the gels, their size increased, with the highest observed in the K1S3 formulation. There was a significant decrease in the surface charge of the liposomes with the addition of the polymers. Scanning electron microscopy (SEM) analysis revealed a bird net porous morphology with uniform liposome distribution in both hydrogel and liposomal gel matrices, while transmission electron microscopy (TEM) analysis confirmed the spherical structure of liposomes without aggregation. Rheological tests, including viscosity, frequency sweep, and temperature sweep tests, together with 3-interval thixotropy test (3-ITT) analysis, showed that all hydrogel and liposomal gel samples exhibited non-Newtonian shear thinning properties, viscoelastic solid behavior with recovery ability, which increased with increasing salep concentration. Furthermore, the rheological results showed that the presence of liposomes in the gel enhanced its viscoelastic solid characteristic. Texture analysis confirmed the rheological findings and highlighted the contribution of xanthan/salep interaction and the presence of liposomes to higher hardness values in the formulations. It was found that higher salep ratios in the formulation increased the mechanical properties of the liposomal gels obtained. The strong salep-xanthan gum liposomal gels produced in this study show promise for various food applications, particularly with improved temperature resistance, while the developed liposomal gel template allows for the encapsulation of water-insoluble bioactive compounds within hydrogel structures, expanding its potential in the food and pharmaceutical industries.

Keywords: Liposomal gel, SEM, xanthan gum, salep.

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Effects of Social Media Literacy on Food Safety and Sustainability

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Social media literacy is understanding, analyzing, evaluating, and producing content and information on social media platforms. Posts and information on social media platforms may be misleading and created for manipulation purposes. Social media literacy is critical to recognise this danger and question the information we encounter on social media platforms. While 66.2 per cent of the world's population (5.35 billion people) are Internet users, the total number of user IDs on social media platforms has reached 5.04 billion as of February 2024. Reaching such a large audience quickly and at a meagre cost through social media platforms positively and negatively contributes to food safety and sustainability. While the contents on this platform have positive features, such as providing fast and low-cost solutions to react to food safety crises and contributing to the increase in the number of conscious consumers in the creation of sustainable food systems, it also allows the rapid spread of information pollution due to the virality of content created by people who are not competent in food safety and sustainability issues. Provision is one of the negative features. This study discusses the contributions of social media literacy to food safety and sustainability studies and the adverse effects of social media platforms on food safety and sustainability.

Keywords: Social media literacy, food safety, sustainability, misinformation, social media.

Sustainable Protein Production: Exploring the Efficacy of Alkaline Extraction from Diverse Sources

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The world's growing population poses a pressing challenge to food security, requiring innovative approaches to meet the increasing demand for protein. Alternative proteins have gained an increasing interest as a feasible and healthful choice for sustainable dietary solutions. This study investigates the applicability of the alkaline extraction method for the production of protein concentrates (PCs) from a diverse range of domestic and industrial sources, including microalgae biomass (*Spirulina* and de-oiled *Schizochytrium* biomass), legumes (pea, chickpea, lentil, and cowpea), and food industry by-products (tomato, grape and sunflower meal, and cold-pressed hazelnut cake). In this perspective, firstly, the chemical composition of each raw material was revealed. Secondly, their protein yield values were investigated using alkaline extraction. Also, the purity, solubility, and color values belong to different PCs compared with each other. Accordingly, the highest protein extraction yield was obtained from cold-pressed hazelnut cake (25.6%, w/w) with a purity of 65.8%, highlighting the potential of this by-product. Also, very promising protein extraction yield and purity values were obtained with legume-based sources ranging between 18.1-22.8% (w/w) and 62.7-75.9%, respectively. On the other hand, protein extraction yields of PCs obtained from tomato and grape meal were significantly lower than the protein extraction yields obtained from other raw materials. These variations highlight the importance of choosing an appropriate raw material for protein extraction and optimization of extraction parameters to maximize protein yield and purity. The solubility of all PCs was the highest within the alkaline pH range. Unlike PCs obtained from legume sources, other PCs are slightly soluble even under acidic conditions. Specifically, the PCs belonging to sunflower meal, *Spirulina,* and de-oiled *Schizochytrium* biomass showed a wider range of solubility at alkaline pH (8-11). This underlines the importance of solubility which affects the applicability and effectiveness of PCs in different food formulations. Additionally, the color value of PCs was affected by the source of raw material. The highest lightness (L*) value (80.9%) belonged to PC obtained from *Schizochytrium* biomass, while the darkest L* value 43.1% belonged to PC extracted from *Spirulina* biomass. Also, all PCs had positive b* value except PC extracted from *Spirulina* biomass, indicating their slight yellowness. Additionally, among the PCs, the PC extracted from *Spirulina* biomass was the most greenish-blue concentrate with a* and b* values of -7.2 and -11.8, respectively. In conclusion, microalgae biomass, and industrial by-products seemed to have a great potential to be used as alternative protein sources compared to others. The alkaline extraction method for the production of PCs from microalgae biomass and industrial by-products should be optimized and further investigated for their other techno-functional properties.

Keywords: Alternative proteins, by-products, legumes, microalgae, sustainability

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Hazelnut (*Corylus Avellana* L.) Skin Dietary Fibers Provide Saccharolytic Activity in the Distal Colon of Mice

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Hazelnut (*Corylus avellana* L.) skin, an important industrial byproduct, contains a significant amount of dietary fibers; thus, it has been extensively used to increase the dietary fiber contents of various food commodities. However, its functional properties, especially gut microbiome modulatory effects, have not been fully elucidated yet. The aim of this study was to determine the gut microbiome and tissue morphology modulation properties of hazelnut skin dietary fibers and to compare its functionalities with natural and hazelnut dietary fibers. For this purpose, a total of 48 mice (C57BL/6J – 24 male and 24 female), were fed a diet enriched with natural hazelnut, roasted hazelnut, or hazelnut skin dietary fibers for six weeks, and then microbial metabolites, microbial composition, and tissue morphology (crypt and epithelial cell heights, and tunica mucosa and tunica muscularis thicknesses) were investigated in the cecum, proximal colon, and distal colon using gas chromatography, 16S rRNA sequencing, and light-microscope. Our results revealed that hazelnut skin dietary fibers show sex- and segment-dependent effects on microbial metabolite formations. 16S rRNA sequencing revealed that supplementations of hazelnut dietary fibers promoted the *Lactobacillus animalis*, *L. gasseri*, and *Akkermansia muciniphila-related* OTUs, especially in the proximal colon, but the degrees of promotions were hazelnut type-, segment- and sex-dependent. Interestingly, supplementation of hazelnut skin dietary fibers, but not other hazelnut dietary fibers, significantly ($p<0.05$) increased the relative abundance of *Prevotella-related* OTUs in the distal colon regardless of sex, which is known to have a great ability to utilize dietary polysaccharides. Furthermore, supplementation of hazelnut skin dietary fibers resulted in higher crypt height values. These results collectively suggest that hazelnut skin dietary fibers can maintain saccharolytic activity in more distal regions of the colon; thus, hazelnut skin, an industrial product, can be incorporated into food products as a source of functional dietary fiber.

Keywords: 16S rRNA sequencing, short-chain fatty acids, cecum, proximal colon, distal colon

This study was supported by the Scientific and Technological Research Council of Turkey (TUBITAK) under the Grant Numbers of 218O130 and 120Z180.

Application of Propolis Emulsion-Loaded Chitosan Edible Films to Extend Strawberry Shelf Life

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Edible films offer an environmentally conscious alternative to conventional food packaging that aims to maintain food quality and extend shelf life. These films can be enhanced by incorporating bioactive compounds, resulting in additional antimicrobial and antioxidant properties. Among these active substances, propolis stands out due to its phenolic compound-rich composition, which imparts natural antioxidant and antimicrobial effects. This study examined the impacts of incorporating propolis-loaded emulsion into a chitosan matrix and its efficacy in the preservation of strawberries under refrigerated storage conditions. The characterization of edible films was performed by assessing Fourier Transform Infrared (FTIR) spectra, surface morphology, thickness, color, thermal characteristics, mechanical properties, and barrier properties. The evaluation of these films on strawberry quality during cold storage was conducted by measuring weight loss, firmness, color, pH, titratable acidity, total soluble solids, total phenolic content, total anthocyanin content, antioxidant activity, and ascorbic acid content. In contrast to the blank emulsion-loaded films (BEF), the propolis emulsion-loaded films (PEF) demonstrated enhanced mechanical properties, such as tensile strength and elongation at break, along with better oxygen barrier qualities and antioxidant activities. Throughout the 14-day storage at 4 °C, strawberries that were coated showed higher preservation of phenolics, anthocyanins, and ascorbic acid compared to the uncoated control strawberries. Specifically, PEF-coated strawberries had the most significant retention of these compounds. Furthermore, strawberries with PEF-coating exhibited a significantly stronger antifungal activity against *Botrytis cinerea* during the storage period. This research highlights the promising potential of propolis emulsion-loaded films for preserving perishable fruits, with a particular focus on extending the shelf life of strawberries.

Keywords: Edible coating, *B. cinerea*, antifungal activity.

Production of Functional Noodle from Black Carrot Pulp with Sustainability Approach

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With the increasing world population, the demand for food is also increasing, but limited resources have made it necessary to recycle waste into new products. According to the Food and Agriculture Organization of the United Nations (FAO), it contains potentially valuable nutrients such as phenolics, carotenoids, vitamins, dietary fibers, fats and enzymes. It is reported that loss and waste in fruits and vegetables containing bioactive components can reach 60%. It is reported that these food industry waste materials, which contain these bioactive compounds in their structure, have a high potential for use in pharmaceutical production and the food industry. It is also reported that it has anticarcinogenic, antioxidant, antibacterial, anti-inflammatory and antiviral properties due to the components in its structure. Black carrot (*Daucus carota* ssp. *sativus* var. *atrorubens* Alef.), which is a good source of anthocyanins, is intensively processed in the fruit and vegetable juice industry. It is reported that there is an increase in the amount of black carrot pulp in parallel with the processing rate. Although it is a by-product of the fruit juice processing industry, it is a rich source of anthocyanins and other bioactive components. The amounts of sucrose, glucose and fructose in black carrots are respectively; It is in the range of 1.20-3.31%, 1.10-5.60% and 1.0-4.36%; Total dry matter and protein contents were reported to be between 14.23-15.96% and 0.7-1.38%, respectively. In addition, black carrots contain high amounts of anthocyanins, as well as contain iron (4-5 mg/kg), potassium (179-222 mg/kg), phosphorus (252-310 mg/kg), calcium (478-650 mg/kg), sodium (298-447 mg/kg) minerals. However, it is important to transform black carrot pulp, which is still used as animal feed and fertilizer, into high-value-added products. However, this industrial waste has the potential to be used both as a coloring agent and as an element that increases nutritional values in the noodle industry. The consumption level of noodles has become one of the fastest growing sectors in the world, due to their ease of cooking and long shelf life. Over the last decade, consumer food demands have shifted significantly from foods consumed solely to satisfy hunger and essential nutrients to functional foods that prevent nutrition-related diseases and improve consumers' physical and mental well-being. Noodles, in particular, are an important staple food widely consumed worldwide and were among the first foods approved by the Food and Drug Administration as a good vehicle for the addition of bioactive compounds. However, noodles enriched with bioactive compounds of vegetable origin are still limited. The aim of this study is to develop high value-added spreadable noodles from black carrot pulp, which is a waste from the fruit and vegetable industry, and to optimize its formulation. Within the scope of this study, dehydrated black carrot pulp was added to the dough at the rates of 1%, 5%, 10% and 20% during the noodle preparation stage. When the color analysis of the produced noodles was performed, it was observed that as the black carrot pulp ratio increased, the product approached a more purple color. However, as a result of the sensory analysis, it was determined that the most popular product was the product containing 5% black carrot pulp. In addition to all these, total monomeric anthocyanin contents of 0.2 mg/kg, 1.1mg/kg, 2.1 mg/kg and 4.3 mg/kg were determined in the final products, respectively.

Keywords: Environmental sustainability, instant noodles, industrial wastes, functional food, black carrot pulp.

Production of Oil Reduced Functional Noodle with Sustainability Approach

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Noodle is a fast food product of Far Eastern origin and is among the growing categories of packaged food products all over the world. In a busy life, noodles take their place as an economical and delicious food. However, with the developing consumer perception, noodle products have begun to be preferred for their functional benefits and environmentally friendly products as well as taste. The frying step in standard noodle production creates waste oil, and air emissions and requires high energy. The frying step is the most costly process step of noodle production. With the rapidly increasing production volume, there is a need to replace the current methods with more environmentally friendly and economical methods that consume fewer resources. The deep oil frying process is generally used in Standard Noodle production all over the world. As an alternative to this method, boiling in water or steaming can be used to produce larger volumes of thick noodles. With the work we have done as Erişler Food R&D Center, steaming and convection cooking have become applicable for standard noodle products. By the subject of Green Transformation in Industry, within the scope of the study, the standard frying process used for Noodle production was transformed into more environmentally friendly steaming and convectional cooking technologies. These technologies are of limited use for noodle production and can be revised and used according to needs. With this study, the frying step has been removed from the process, waste vegetable oil and air emissions have decreased, and product production can be achieved with less electricity consumption. Since the resulting products contain less fat, their caloric value is lower. In addition, reducing the fat content of the product has enabled the shelf life of the product to be extended by 6 months, which will indirectly reduce the amount of products thrown away as the shelf life has passed. With the cooking and drying technology developed in this study, raw material costs per product were reduced by 50% and energy consumption by 20%. With this study, the company's annual waste oil consumption of 1250 tons will be reduced within the scope of efficient use of resources for a sustainable world, and air emissions will decrease in parallel. The reflection of the 50% reduction in the product's raw material cost on the product will have a positive impact on the consumers.

Keywords: Environmental sustainability, instant noodles, oil reduction, functional food.

Invest in the Future: Sustainability and Innovation

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IFFCO Turkey is a business unit of IFFCO. Main production of IFFCO Turkey is oils and fats. This paper is a summary of IFFCO strategy of sustainability and innovation efforts. Palm oil Sourcing: IFFCO Turkey; under global sustainability policy; is capable of palm oil sourcing from sustainable and environmental friendly sources with RSPO certification modules. IFFCO Turkey supports national agricultural sources: IFFCO Turkey has a brand named as esiflow; which is a well-known palm free innovation product preferred by confectionery sector. Social Responsibility: IFFCO Turkey developed projects on cultural heritage of Türkiye and a project titled as "ask a professional" which is country-wide known. Carbon and water foot print: IFFCO Turkey is conducting many projects under global strategy to minimize production losses, carbon and foot print; as well as usage of environment friendly packages. Youth training and women employement: IFFCO Turkey's strategy on youth training programmes and women employement are another important commitment for sustainability. Food Safety Efforts: IFFCO Turkey food safety commitment is to produce safe and healthy products with mitigation of GE, MCPDE and mineral oils.This paper aims to summarize sustainability and innovation efforts of IFFCO Turkey by emphasizing colloborative effort.

Keywords: Oils, fats, margarine, safety social responsibility.

Sustainable Solutions: Carbon Dots in Food Packaging

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The search for sustainable and environmentally friendly food packaging materials has led to the exploration of novel solutions, among which carbon dots (CDs) have emerged as promising candidates. CDs are nano-sized particles typically derived from natural carbon sources and characterized by dimensions of less than 10 nm. The growing interest has emerged in utilizing CDs in food packaging applications due to their unique properties, including excellent biocompatibility, photoluminescence, and antimicrobial activity. CDs offer opportunities for enhancing the shelf life of food products by providing barriers against oxygen, moisture, and microbial contamination. Moreover, the tunable surface chemistry of CDs allows for functionalization with bioactive compounds, enabling the development of intelligent and active packaging systems capable of real-time monitoring of food quality. Beyond mere protection, CDs enable the development of active and intelligent packaging systems that respond dynamically to changes in food quality. By functionalizing CDs with specific biomolecules or indicators, such as enzymes or pH-sensitive dyes, packaging materials can actively monitor and signal variations in food freshness or contamination, ensuring consumer safety. Recent advancements in the synthesis, characterization, and application of CDs in food packaging materials, emphasizing their potential to address sustainability concerns while ensuring food safety and quality.

Keywords: Carbon dots, food by-product, sustainability, active packaging, and intelligent packaging.

Glycosylation of Turkey (*Meleagris Gallopavo*) Skin Gelatine with Maltodextrin: Effects of Glycosylation Time on Physical, Structural, and Rheological Properties

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Turkey gelatin (TG) was obtained through partial hydrolysis of the skin collagen of Turkey (*Meleagris gallopavo*). TG has similar technological properties to mammalian gelatins and has shown that it can be a good alternative. In this study, the influence of glycosylation time on the physical, structural, and rheological properties of TG. Maltodextrin (MD) was used for glycosylation of TG. Results showed that rheological properties were affected by the glycosylation time limitedly. When glycosylation time increased gelling temperatures of sample solutions decreased. However, the melting temperatures of solutions were increased. Gelling kinetics showed that modifications increased the gelation time of gelatin solutions. Differences in rheological properties resulted by hindering the triple-helix formation during the gelation process with a little longer gelation time. The lightness value (L^*) was not influenced by the glycosylation process. The greenness value ($-a^*$) decreased as glycosylation time increased while the yellowness value ($+b^*$) increased until the 1h process. More glycosylation process did not affect the yellowness value. On the other hand, modifications resulted in similar changes in the structural properties of samples. Reduced effects of glycosylation time were also seen in textural properties. Hardness value decreased from 0.5 h to 1h but dramatical decreasing obtained from 1h to 1.5h. Overall results showed that MD with longer glycosylation processes were not so effective. Lower process time can be a good method for glycosylation of TG with MD.

Keywords: Turkey skin gelatin, glycosylation, rheological properties, physical properties.

Diet, Gut Microbiota and Health: Knowns, Unknowns, and Future Perspectives

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The gut microbiota is a complex ecosystem where different types of bacterial communities are located. The gut microbiota has various functions within the digestive tract, affecting the overall health of the host. There are many factors influencing the colonic microbiota composition. Dietary habits of individuals are among the most important ones, as microorganisms in the colon require an energy source for their growth and they fulfill this energy requirement primarily by utilizing indigestible dietary components. Thus, diet has both a direct and indirect impact on the host's gastrointestinal activity, and hence on health, by influencing the composition and function of the colonic microbiota. For instance, different dietary patterns (Mediterranean diet, FODMAP diet, western-style diet, vegetarian diet, gluten-free diet, etc.) could promote and/or inhibit the growth of different microorganisms localized in the colon. Recent studies conducted to investigate the effect of diet type on colonic microbiota composition have found promising results regarding the maintaining and improving overall health, preventing, or alleviating the symptoms of various diseases with an appropriate nutrition strategy. However, this is only possible if societies have knowledge about the importance and the functions of colonic microbiota, impact of diet on it and concepts of fermented foods, probiotics, prebiotics and synbiotics. The Microbiota Awareness Scale (MAS) was developed in 2020 in Turkey to measure people's awareness of colonic microbiota and related concepts. In addition, research has been conducted to measure the level of knowledge of societies with various questionnaires in this respect. In this presentation, the relationship between colonic microbiota and nutrition, and the opportunities to modulate it through nutrition will be evaluated and the perspectives to increase the knowledge and awareness levels of societies in this context will be discussed.

Keywords: Diet, nutrition, gut microbiome, health.

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Electrochemical Detection of *Escherichia Coli* with Paper-Based Electrode

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Escherichia coli is a crucial fecal coliform indicator microorganism that causes intestinal infections in humans. Thus, it is a significant threat to the food industry as well as public health. Then, detection of *E. coli* is an important issue for food safety. However, common traditional methods are time-consuming, while novel techniques like polymerase chain reaction (PCR) require well-established laboratory equipments and trained experts. As a consequence, rapid, economical, and easy-to-use detection methods are urgent for the food industry. In this context, biosensors have become popular for detection due to their advantages like quick response, high accuracy, low cost, and not needing long preliminary preparation. Then, an electrochemical, antibody-based, and utilized paper electrode biosensor was developed in this study. Multi-walled carbon nanotube (MWCNT) was used for the surface modification that increased the electrocatalytic activity. The use of paper as the electrode material offers the advantage of single-use characteristics, preventing contamination and enabling quick measurements, while also being sustainable and eco-friendly. In this regard, paper electrode optimization was performed first. Then, study conditions of biosensors like pH, incubation time, and antibody-MWCNT hybrid concentrations were done after Ab-MWCNT immobilization. Subsequently, different concentrations of *E. coli* were measured to determine the linear range of the sensor. Consequently, electrochemical flexible single-use biosensors that successfully determine *E. coli* 10^{0}-10^{7} CFU/mL concentration range were developed. Future work will focus on assessing the applicability of these biosensors to food matrices.

Keywords: *E.coli*, paper-based electrode, electrochemical detection, food safety, sustainability

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Development of Alternative Leather Production Methods from Different Fruit Wastes

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Leather, which is used in many sectors in daily life, has until today appeared as traditional animal leather and fossil fuel-based synthetic leather. The production, consumption and end-of-consumption options of traditional animal leather and synthetic leather do not comply with environmental sustainability, whereas the consumption of traditional animal leather does not comply with the ethical rules of sustainability in terms of animal rights and welfare. In order to minimize environmental impacts, new consumption-approach studies are being conducted on new, more sustainable alternatives that can be used instead of fossil and animal-derived leather, which are low-cost, biodegradable, and do not show toxic properties for the environment and human health. Aside from the environmental effects of traditional and synthetic leather, food safety and waste management caused by agricultural wastes that have the same environmental impact also cause negative effects that cannot be ignored. For these reasons, in order to prevent food waste and support the country's circular economy, the alternative leather to be produced will use the peels of apple and orange fruits, which are widely produced in Turkey, and thus transform the waste into a final product. In literature research, it has been determined that the mechanical properties of leather alternatives trying to enter the market are currently not durable enough to compete with animal leather, although they can compete with synthetic leathers, and their contents are synthetic based on polyester and polyurethane and cannot reach the desired levels of sustainability. In this study, the effects of fruit, plasticizer and filler ratio on leather production were examined by creating solutions with apple and orange peels, glycerol, sodium alginate, starch, and lemon oil in different proportions. Fourier transform infrared spectroscopy (FT-IR) was applied for chemical characterization and tensile tests were applied for mechanical characterization of the produced leather. Within the scope of the study, while the use of glycerol and sodium alginate together in order to improve the chemical and mechanical properties of the leather increased the plasticization feature, it was observed that the tensile stress of the leather increased with the increase in the amount of sodium alginate and starch, and the elongation at break increased with the increasing amount of glycerol. The produced leather showed high mechanical strength with a tensile stress of 12.36 mPa and elongation at break of 80%. FTIR spectra showed an amide band (3273 cm^{-1}) and a carbonyl compound band (1738 cm^{-1}) and an amine band (1603 cm^{-1}) in the skin samples. It is anticipated that these completely plant-based materials will have alternative leather potential with wide application areas.

Keywords: Fruit waste, vegan leather, sustainable, biodegradable.

Monitoring the Quality Changes and Shelf Life of Food Products by Spectroscopic and Chemometric Methods

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Food products deteriorate due to chemical or physical reasons as well as microbiological factors (yeast, mold, and bacteria). Shelf-life analyses are based on the deterioration of the quality parameters of the products over time and the identification of these deterioration reactions with kinetic models. In a traditional shelf-life analysis, a limit is set for the product's life and it is maintained under real conditions (temperature, humidity) until the quality parameters start to decline. However, classical shelf-life analyses of industrial products take a long time on the shelves, causing time loss for companies. Although to solve the time problem, accelerated shelf life techniques are used, this shelf life estimation is generally based on a single property that decays the fastest. However, this leads to inconsistencies between the estimated shelf life and the experimentally observed data. Determining shelf life solely based on one quality criterion is incorrect because food is a complex matrix. As an alternative solution, the recently multivariate accelerated shelf life (MASLT) method is used to monitor multi-parameters. The method is based on modifying principal component analysis (PCA) or partial least square analysis (PLS) for accelerated shelf-life analyses. Many chemical analysis and spectroscopy results can be used as multivariate data. Spectroscopy provides monitoring of multi-parameters during shelf life. With the deterioration of food products, peaks observed change, shift to different wavelengths, and new peak formations occur. By following these peak changes, many quality parameters can be monitored. In our preliminary study, eggs were chosen as the model matrix in freshness prediction studies. Fluorescent spectra were used to monitor furosine formation during storage, while UV-Vis spectroscopy was used to monitor pH, viscosity, and protein degradation in egg samples. Although the MASLT method provides more realistic results for shelf life analyses, its applications are still limited in the literature. The method can also be used for process monitoring of different food products.

Keywords: Chemometrics, egg, freshness, UV-Vis, fluorescence spectra.

Molecular and Morphological Characterisation of *Aspergillus* Section *Flavi* Isolated from Wheat Grains

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Grains are of vital importance in both human and animal nutrition in both Turkey and worldwide. The presence of fungi belonging to the *Aspergillus* section *Flavi* and the production of associated mycotoxins in wheat, one of the most produced grains in our country, pose a serious risk to human and animal health globally. Aflatoxins are carcinogenic secondary metabolites produced primarily by various fungi belonging to the *Aspergillus* genus, especially *A. flavus* and *A. parasiticus*. Accurate identification of molds is crucial for the effective assessment of contamination. In our region, the dominance of species belonging to *A.* section *Flavi* in wheat grains and the toxicity information of these species are particularly important for taking preventive measures against mycotoxins before harvest. The aim of this study is to isolate species belonging to *A.* section *Flavi* from wheat samples taken from agricultural fields, warehouses, and silos where wheat cultivation is carried out in Adana province and its surroundings, to identify them based on morphological and cultural characteristics, and to characterize them molecularly. Within the scope of the study, species identification was first performed based on the morphological and cultural characteristics of 25 *Aspergillus* isolates obtained from wheat grains. For this purpose, the macromorphological characteristics of the suspected *A. flavus* strains were determined using selective culture media. Then, the suspected *A. flavus* strains were examined under a microscope for their micromorphological characteristics. For molecular analysis, two DNA regions, the *ITS* and *β-tubulin* gene, were targeted by PCR amplification. In particular, A flavus, which is an aflatoxin producer and frequently found in wheat, has been successfully characterized and detected using both the classical methods and the molecular methods. In this study, it was seen that the detection of fungi belonging to A section Flavi in wheat production areas in and around Adana province, and thus the findings have shown that wheat products may be problematic in terms of mycotoxins.

Keywords: *Aspergillus* section *Flavi*, wheat, isolation, PCR.

Developing an Improver for Freezer to Oven Process Bakery Products (Turkish Simit) And Investigating the Effects of Each Ingredients

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Fermentation stage is one of the most crucial steps in bakery product production. This stage contributes to volume expansion, improvement in taste and aroma characteristics, and the formation of the crumb structure. Freezer-to-oven (FtO) applications aim to completely eliminate this stage, allowing directly baked products after the moulding process for frozen doughs. Among the advantages of this process are shortened production time, increased stability of frozen products, and ease in storage and transportation. However, for a good product outcome, it's aimed to minimize the loss of properties that fermentation imparts to the product, alongside these advantages. Simit is a widely consumed and a large export market product. Shipping this product frozen and preparing it at sales points without the need for fermentation increases its value. In a good simit, the main quality parameters are volume, crispness of the crust, distinct spiral patterns, and a homogeneous crumb structure. In this study, additives suitable for FtO applications without fermentation in simit production were examined, along with the effects of the components in these additives. The impacts of inputs on dough rheology were analyzed in the laboratory using extensograph and farinograph. Combinations were applied in practice following a standard simit process, preparing, and freezing the dough without fermentation. Baking tests were conducted directly from frozen and after 24- and 48-hours storage at +4°C. The most crucial ingredients that are used in the content of the additive that can provide these features are enzymes and emulsifiers. In situations without fermentation, the formation of a good emulsion is the most critical factor for preserving the quality characteristics of simits, for which faster-acting emulsifiers such as DATEM and SSL were used. With the help of these emulsifiers, frozen stability was increased, and pores were improved, resulting in increased volume. In enzyme studies, phospholipase enzymes were initially tested to support emulsion. The phospholipase enzyme not only affects the existing emulsion but also supports the continuity of the effect in long-term processes. For color, volume, and crust improvement, fungal alpha-amylase and glucoamylase enzymes were tested. These enzymes led to improvements in crust color and an increase in volume in the first stage of baking with high thermal stability amylase enzymes.

Keywords: Frozen bakery, simit, enzymes, emulsifiers.

Enhancing Gluten-Free Muffins with Milk Thistle Seed Proteins: Evaluation of Physicochemical, Rheological, Textural, and Sensory Characteristics

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The study investigated the potential utilization of milk thistle seed protein isolates (MTP) in gluten-free muffins to enhance their nutritional and technological attributes. MTP was employed to partially substitute a blend of rice flour and corn starch (RCS) at varying ratios of 3%, 6%, 9%, and 12%. MTP-fortified muffins were compared against muffins produced with wheat flour (C1) and RCS flour (C2). The study encompassed rheological assessment of muffin batters, as well as physicochemical, textural, and sensory analyses of the muffins. The consistency coefficient (K) of muffin batters exhibited an increase with the incorporation of MTP, with all batters demonstrating shear-thinning behavior ($n < 1$). The dough samples exhibited solid-like characteristics attributed to G'>G", indicative of their viscoelastic nature. Storage modulus (G') and loss modulus (G") escalated with higher levels of MTP, suggesting an overall enhancement in dough viscoelasticity. Muffin containing wheat flour displayed the lowest hardness value followed by MTP-added muffins at the ratios of 12% and 9%, respectively. Additionally, MTP-added muffins exhibited greater springiness values than those with RCS flour (C2). Protein content in muffins increased with MTP addition, reaching parity with wheat flour muffins at 6% MTP replacement. Notably, sensory analysis revealed that substituting RCS with up to 6% MTP did not significantly alter overall quality, whereas higher MTP levels (9% and 12%) led to a decline in sensory attributes. Incorporating MTP up to 6% yielded protein-enriched muffins with sensory characteristics comparable to wheat flour muffins (C1). Furthermore, higher MTP additions (9% and 12%) conferred more favorable textural properties than C2 muffin. The study illustrated that enriching gluten-free muffins with MTP resulted in improvements; nevertheless, distinct strategies are required to attain the quality comparable to muffins made with wheat flour.

Keywords: Milk thistle seed, seed protein, batter rheology, texture, muffins.

Lactic Acid Bacteria Profiles of Bee Products, Food and Beekeeping Applications

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Bee bread, bee pollen, honey, royal jelly and propolis are products of honey bees that, when consumed by humans, exert many therapeutic effects such as probiotic, prebiotic, anti-inflammatory, antioxidant and antimicrobial. Some of these bee products are produced directly or indirectly by the microbial fermentation of lactic acid bacteria in the honey bee gastrointestinal tract. Although bee bread has similar biochemical content to pollen as it is formed by the fermentation of pollen, it is reported in the literature that its nutrients are more bioaccessible than pollen. However, it cannot be produced and consumed sufficiently because it is costly and laborious to harvest from the hive. The idea is that this fermentation can be carried out in vitro with LABs and yeasts isolated from bees and thus this bioactive product can be produced in higher quantities as standard. Another use of LABs isolated from bees and bee products is in beekeeping. It is stated in the literature that lactic acid bacteria, which are currently found in the gastrointestinal tract of honey bees, are effective against pests such as varroa and nosema, which cause colony losses in honey bees and loss of yield in bee products. It is promising to use appropriate forms of LAB in the natural microflora of bees instead of chemical drugs that leave residues when applied to honey bees and cause damage to bees. In this study, the microbial flora of bee products will be examined, and the lactic acid bacteria profile will be compiled. Methodologies that can be used for the production of bee bread in the laboratory by simulating natural fermentation and applications of LABs in the beehive will be presented.

Keywords: Honey bee, lactic acid bacteria, fermentation, bee bread, varroa.

Extraction of Phenolic Compounds from Pomegranate by-Products Using Green Processes

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The processing of the pomegranate (*Punica granatum*), renowned for its pleasant taste and health-promoting properties, into products such as pomegranate juice, jelly, jam and colouring, results in the generation of a considerable quantity of by-products. These by-products, which contain important bioactive compounds (such as flavonoids, tannins and phenolic acids), constitute approximately 40-50% of the total weight of the fruit. The fact that the phenolic compounds found in high quantities in pomegranate by-products are bound to the plant matrix and/or have a large molecular structure makes them difficult to extract using solvents. Additionally, using traditional extraction methods presents various disadvantages in terms of time, effect, economy and environment. Consequently, in the study, enzymatic and homogenizer-assisted extraction methods were employed, as they are innovative, sustainable, time and energy-saving, simple, economical and effective in obtaining extracts from pomegranate juice by-products with the highest yield and containing antioxidant-rich phenolic components. These methods were used separately and in combination (ES, TS, ESH) as solvent (S), homogenizer assisted (H), enzymatic (E) and total liquefaction (T) extractions. The yields of extracts obtained by different extraction methods exhibited a range of values, with the lowest yield (S) being 36.92% and the highest yield (TS) being 64.17%. The highest total phenolic content (938.81 mg GAE/g) and total flavonoid content (684.40 mg RE/g) were found in the ESH extract, and the highest hydrolyzable tannin content (3628.00 mg TAE/g) was obtained in the ES. The total phenolic and total flavonoid contents of the ESH extract increased by 4.4 and 4.8 times, respectively, while the hydrolyzable tannin content of the ES extract showed a 4.8 times increase, in comparison to the S extract. The highest DPPH radical scavenging activity, FRAP and CUPRAC were determined in ES extract (4317.09 mg TE/g), ESH extract (5715.23 mg TE/g), and TS extract (6299.57 mg TE/g), respectively. The DPPH activity of the ES extract, the FRAP activity of the ESH extract and the CUPRAC activity of the TS extract demonstrated a 5.4-fold, 13.3-fold and 6.7-fold increase, respectively, in comparison to the S sample. The findings of this study indicate that the enzymatic treatment is a more effective method than solvent and homogenization processes for enhancing the yield, bioactive contents and antioxidant activities of the extracts.

Keywords: Pomegranate by-products, enzymatic extraction, homogenization, phenolic compounds, sustainability.

Electrospun Fibers Reinforced with Nanoparticles and Their Use in Extending the Shelf Life of Foods

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More than 40% of post-harvest losses in fruits occur during transportation and storage. Active and smart packaging designed with electrospun fibers can play a crucial role in minimizing food loss by maintaining the quality, safety and shelf life of food products. Electrospun fibers provide functionalities such as controlled release, enhanced barrier properties, sensing and monitoring capabilities that help maintain the quality and safety of food products and reduce the risk of product spoilage and waste. Therefore, the aim of this study was to develop the active composite films based on polylactic acid (PLA) nanofibers and zeolitic imidazolate framework (ZIF-67) nanoparticles using the electrospinning process. ZIF-67 nanoparticles and composite films were characterized by scanning electron microscope, Fourier transform infrared spectroscopy (FTIR), and antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli*. The efficacy of the composite films for active packaging was investigated through their application on oranges. The oranges were covered with composite films, and monitored by measuring changes in appearance, texture and chemical properties during 20-days at 4°C and 25°C. The average diameter of the nanofibers increased with ZIF-67 nanoparticles. FTIR spectrum of nanocomposite nanofibers confirmed that the structure of ZIF-67 nanoparticles was not degraded during the electrospinning process. The antimicrobial properties of ZIF-67 loaded PLA nanofibers were more effective on *E. coli* compared to *S. aureus*. The composite film effectively preserved the quality of oranges up to 20 days of storage at 25°C, maintaining their textural properties and appearance without deterioration. ZIF-67 nanoparticles loaded PLA nanocomposite nanofibers show promising potential as an effective material for active packaging.

Keywords: ZIF-67, PLA, electrospinning method, active packaging, citrus.

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High Hydrostatic Pressure Applications of Foods

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High hydrostatic pressure (HHP) is a non-thermal processing technique for foods based on the application of high levels of pressure (300 to 600 MPa) transmitted by water. HHP has been used for especially pasteurization purposes since the 1990s and it has become reality in the food industry since it brings multiple advantages for food and beverage companies. It may be possible to find HHP-treated foods in market shelves of various countries such as the United States, Australia, Germany, Spain, Italy etc. It seems that meat products, fruit juices, seafoods, and ready-to-eat products are the most commonly processed foods by HHP. However, pet foods, pharma and cosmetic products are also treated by HHP in recent times. In this communication we will give information on pressure, different high-pressure techniques (high pressure carbon dioxide and high-pressure homogenization) other than HHP, brief history of HHP, properties of HHP, HHP technology and equipment (processors, design and engineering aspects) as well as advantages and disadvantages of HHP.

Keywords: Non-thermal, megaPascal, microbial inactivation, shelf life.

Use of Different Raw Materials in Production of Tarhana and Evaluation of Their Sensory Properties

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Tarhana is a traditional fermented food obtained by drying and grinding the dough prepared by adding wheat flour, yoghurt, various vegetables, and spices, after fermenting it with both alcohol and lactic acid fermentation. Studies on tarhana produced using different grain and legume flours as alternatives to wheat flour are increasing day by day. These flours can be preferred for different reasons such as different functional properties compared to wheat flour (pumpkin, kumquat, beetroot, carob, hazelnut, tomato seed, wheat germ), high in nutrition (whole wheat, einkorn, einkorn, oats) or gluten-free (lentils, chickpeas, buckwheat, wheat germ, corn, quinoa, lupine, rice). In this study, flours of various raw materials such as wheat flour, chickpea flour, purple potato flour and einkorn flour were used. Tarhana dough prepared from different raw materials was fermented with the baker's yeast and/or sourdough. In this context, sensory properties of tarhana samples were determined and the usability of these raw materials in tarhana production was investigated.

Keywords: Tarhana, sourdough, purple potato, einkorn, chickpea

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Calculation of the Carbon Footprint of Restaurant Menus

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Tourism and the food and beverage sector are some of the areas with the highest food consumption. While the tourism sector is responsible for about 10% of the global carbon footprint, food and beverage production and consumption are thought to have the highest carbon footprint after transportation. It is estimated that tourists consume approximately 75 billion meals and more than 40 million tons of food annually. Since this situation necessitates solutions to reduce the high carbon footprint caused by the tourism and food and beverage sectors, this study aims to reveal the carbon footprint of restaurant services, which are one of the important actors of the food and beverage sector, by calculating and comparing a restaurant's different menu courses' carbon emissions. The findings of the study reveal that among the different courses on the menus, bread/pasties are the lowest CO2e emitters, due to having mostly flour and water in them, which are included in the category of very low carbon level food products. Soups containing vegetables are also low CO2e emitters. However, when they are made of beef and comparatively higher CO2e vegetables such as peas, their carbon emission levels increase. Another important finding demonstrates that main courses are responsible for the highest CO2e emissions, due to having beef, seafood, and poultry as the main source of protein in them. However, carbon emissions resulting from the use of beef are nearly 9 times higher than seafood and poultry. Desserts in which chocolate and eggs are used as the main ingredients are nearly two times higher in the amount of CO2e they release than the ones having fruit, such as apple as the main ingredient. The outcomes of the study provide guiding data to the related literature, the sector stakeholders, and consumers in terms of measures to be taken and food preferences to reduce the sector's carbon footprint.

Keywords: Carbon footprint, food and beverage sector, restaurant services

Innovative Approaches for Sustainable and Healthy Grain-Based Foods

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Sustainability is a concept that aims to protect and maintain the resources, ecosystems and social balance of the world we live in, without harming life resources of future generations. In the last few decades, awareness on sustainability has been expanding especially due to the increasing rate of population growth, depletion of natural resources, the obvious effects of climate change on the environment, which are all harming the ecosystems. According to the reports of the United Nations, major issues will arise in the upcoming years if appropriate actions are not taken in the agricultural production sectors. Hence, implementing sustainable food production is necessary to guarantee future food security. Sustainable food production plays a critical role in environmental sustainability. Traditional agriculture and animal husbandry methods lead to overuse of natural resources, depleting water resources, increasing soil erosion and threatening biodiversity. Excessive use of chemical fertilizers and pesticides leads to soil and water pollution, which can threaten the food safety and lead to unhealthy products. Sustainable food production aims to minimize these negative effects. Organic farming protects soil health and minimizes harmful environmental impacts by reducing the use of chemical fertilizers and pesticides. Additionally, it protects and uses water resources sustainably. Factors affecting sustainable food production can be classified as climate change and weather conditions, soil health, water resources, food waste, energy use, social factors, technology, innovation and biodiversity. As the main strategy in ensuring food sustainability, production and consumption of local products, minimizing waste in food processing and directing it to recycling, organic agriculture, and efficient use of water and energy are important. In this presentation innovative approaches for sustainable and healthy grain-based foods will be discussed. Perennial plants have been suggested as more sustainable alternatives to annual plants since they have longer growing seasons and continuous ground cover than annual plants. As such, they can potentially open doors to a new era of agriculture that is more resilient to climate change, capable of soil carbon sequestration, and environmentally friendly. Intermediate wheatgrass (*Thinopyrum intermedium*) is one of the wild perennial relatives of wheat. It has great potential to be incorporated as an ingredient in bread, due to its higher protein and dietary fiber content when compared to bread wheat. The colored wheats also give a novel twist of targeting the malnutrition by enhancing the antioxidants such as carotenoids, and phenolic compounds. Owing to the presence of these compounds, and dietary fibers, colored wheats exhibit antioxidant properties that basically help in protecting against degenerative diseases. The ionomics studies on staple cereal grains such as wheat can be the first step in drawing the attention of industry and research community to the important topic of grain nutritional value and biofortification. There is a wealth of data and diversity of germplasm with which to initiate modern biofortification breeding programs using phenotyping and genomic tools.

Keywords: Sustainability, food supply chain, sustainable food production, grain-based industry

Future of Food Engineering in the View of Sustainable Processing and Industrial Expectations

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`Engineering` is the application of science and math to solve problems and prediction. The background in math is a must for prediction. For example, without knowing the derivative of the function of tan(x) or without the knowledge of certain base of trigonometry, it is not possible to solve for the following integral: The definition of `engineer` is combined with the presence of designing by the physicist `Freeman Dyson`. With the major disciplines of engineering, mechanical, electrical, civil, and chemical engineering, the concept of food engineering is more like an evolved discipline requiring the combination/application of some engineering disciplines with chemistry and biology. For example, designing an electro-thermal process for thawing of food products seems to be a focus of food engineering, but manufacturing the required system needs additional knowledge of electrical, mechanical, and even software engineering disciplines while the quality of the thawed food product is complied with chemistry and biology fundamentals. As demonstrated by this example, as an evolved discipline, food engineering has still been evolving. Earlier applications of food engineering focused on chemistry-oriented studies with emphasis on physical – chemical properties in the area of (food) science and technology while the recent trends are towards process design, manufacturing and even molecular biology and nanoscale science. This brings out the requirement of in-depth knowledge of math, physics and computer applications such as simulations and computer-aided design. On the other hand, this discipline is yet to be involved in the possible engineering applications of the future, e.g., drone designing, robot creation, space engineering, etc. All these highlight the future of food engineering with that the food industry needs to achieve quality and safety thorough using sustainable processing by overcoming the challenges of environmental-friendly food processing under the umbrella of the European Green Deal. In the view of sustainable food processing and food science/technology concept, improved food safety and quality assurance with productivity and applied simulation, artificial intelligence and machine learning approaches (in addition to the use if IoT and big data usage) are expected now to be used. With the introduction of Industry x.0, combining the digitalization, IoT and cloud for improved smarter processes, the on-going evolution will be more significant, and it should reserve a seat in the future engineering applications. For this expectation, the engineering background should be in a solid state to prepare the young generation for digitalization and integration of engineering science with food science and technology.

Keywords: Sustainability, food engineering education, industry x.0

Improvement the Stability and Biological Activity of *Eryngium Billardieri* Extract by Encapsulation with Nanoliposomes for Nutritional Therapy

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Nutritional therapy is an interesting method that is based on the application of dietary therapeutics or nutraceuticals as complementary drugs. *Eryngium billardieri* L. is a native medicinal plant from Asia that widely grows in Iran. Several bioactive compounds have been isolated from *E. billardieri* which include phenolic compounds, flavonoids, coumarins, acetylenes, and triterpenoid saponins. The high content of these bioactive compounds especially phenolic compounds in the *E. billardieri* extract (EBE) provides biological activities such as antimicrobial, anti-inflammatory, anti-lipid peroxidation, and anti-hyperglycemic properties. Despite all the mentioned benefits, the application of EBE and other phenolic plant extracts is limited due to their low stability and low bioavailability. This study aims to encapsulate EBE by nanoliposomes (NLPs) and investigate the characteristics and biological activity of the developed NLPs. Firstly, the powdered EBE was blended with ethanol, extracted using an ultrasonic bath, and finally, lyophilized. The EBE was successfully encapsulated with the thin-film hydration method and resulted in NLPs with 80.12±3.79% encapsulation efficiency. The particle size of EBE-loaded NLPs was 73.36±9.32 nm, as well as scanning electron microscopy showed that the NLPs have a spherical morphology with nano-metric particle size. The zeta potential of NLPs was significantly increased by the loading of EBE, indicating the entrapping of the EBE phenolic compounds on the liposome surface. Moreover, the formation of interactions between EBE and liposome was characterized by FT-IR analysis. After 30 days' storage, the DPPH scavenging activity of EBE-loaded NLPs (74.06 ± 3.87 %) was significantly higher than its value in free EBE (45.89 ± 2.59 %). Also, the EBE-loaded NLPs exhibited a highly improving effect on the viability of human prostate cancer cells (PC3) and inhibition activity against H_2O_2-induced ROS production in the PC3 cells. Generally, the obtained results indicated that NLPs are an efficient nano-carrier for the encapsulation of EBE to improve its stability and biological activity to apply in the food and pharmaceutical fields.

Keywords: Encapsulation efficiency, phenolic compounds, oxidative stress, stability, cell cytotoxicity.

Carnauba Wax Oleogel as a Shortening Replacer in Filling Cream

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Filling creams (FC) consist of a high content of saturated and, in some cases, trans fatty acids. The physical and sensory performance of creams is strictly related to the presence of a large amount of saturated fat, whose consumption should be reduced since excessive consumption is associated with the occurrence of cardiovascular diseases, obesity, diabetes, and other health implications. With regards to reducing fat consumption, oleogels have attracted increasing attention to transforming liquid oil into a 'gel-like' structure due to their unique properties. This research aimed to structure sunflower oil with 6% carnauba wax and investigate its potential application as a healthier lipid replacement in filling cream in various ratios (25 and 50%). The oil binding capacity, overrun, peroxide value, and sensory properties were compared. Results showed that higher levels of oleogel in formulation significantly increased the oil binding capacity and oxidative stability of filling creams. Creams containing 50% oleogels could improve oxidative stability by structuring the oil through carnauba wax, resulting in oil entrapment within the solid-like structure which protects the oil against oxidation and oil leakage. Moreover, the addition of oleogel at a 25% ratio had no significant effect on specific gravity and overrun but displayed a decreasing trend with increasing replacement levels. The sensory profile of the samples was not affected by the substitution of oleogel up to 25% of oleogel. Consequently, carnauba-based oleogel can provide suitable alternatives to develop confectionary fillings with lower saturated and trans-fatty acids.

Keywords: Fat replacer, oleogels, filling cream, carnauba wax.

Determination of Some Physicochemical and Prebiotic Properties of Persimmon (*Diospyros Kaki*) and Kiwi (*Actinidia Deliciosa*) Fruit Peel Powders

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Fruits are essential to human nutrition and health since they are high in vitamins and minerals. However, a large amount of fruit by-products are generated both during processing and fresh consumption. Fruit peel makes up the majority of the waste by-products produced by the fruit industry. Most fruits contain approximately 10–20% peel, which is discarded as waste during post-harvest processing and industrial processing. Fruit peels can be altered into a promising source of functional compounds due to their positive nutritional and functional properties as well as being a potential source of prebiotics. In this regard, in the present study, persimmon (*Diospyros kaki*) and kiwi (*Actinidia deliciosa*) fruit peel powders obtained by freeze-drying treatment were examined in terms of some physicochemical properties and prebiotic effects. According to the results, the proximate analysis of the functional ingredients' properties, fruit peel powders showed good water and oil holding capacity thanks to their high fiber content, confirming that they can be used as thickening agents and for texture improvement. Considering the total phenolic content analysis, it was determined that persimmon peel powder (41.99 mg GAE/g) was higher than kiwi peel powder (14.62 mg GAE/g) ($p<0.05$). The DPPH radical scavenging activity of the extracts was found to be 22.34 mg AAE/g dry weight in persimmon peel powder and 4.68 mg AAE/g dry weight in kiwi peel powder. In addition, 5 different potential probiotic strains (*L. brevis* T27, *L. plantarum* T21, *L. plantarum* T24, *E. faecium* T23, and *L. rhamnosus* GG (commercial one)) were used to determine the prebiotic effect of fruit peel powders. In the analysis, each probiotic culture was added to media that did not contain fruit peel powders (control) and that contained 5% fruit peel powders separately. The results revealed that the tested fruit peel powders significantly ($p<0.05$) increased the probiotic viable counts (except *E. faecium* T23), which reached > 9.5 log after 24 hours of incubation. However, there was no significant difference between the effects of fruit peel powders on the viability of the strains except *E. faecium* T23 ($p>0.05$). This investigation showed that 5% persimmon and kiwi fruit peel powders can be successfully used as a prebiotic to increase the growth of lactic acid bacteria (LAB). According to all these results, it can be stated that powders obtained from persimmon and kiwi fruit peels have a high potential to be used as functional ingredients in the food industry for various purposes.

Keywords: Sustainability, fruit peel powder, prebiotics, probiotics, processing by-products.

Aronia Fruit and Obtaining Coffee from Aronia

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Aronia berry, commonly known as black chokeberry, is well-known among health-conscious shoppers. However, it is rarely consumed as a fresh fruit due to its bitter and astringent taste. Conversely, it reaches the market in different forms, like juice, jam, herbal tea, purée, soft spreads, food colorants, or ornamental plants. This berry has been appreciated by consumers primarily for its nutritional benefits, such as its high content of dietary fiber, vitamins, and essential minerals. Furthermore, many studies have demonstrated that choke berry contains high levels of bioactive phenolic compounds like anthocyanins, phenolic acids, flavonoids, and procyonids. The studies about the aronia fruit were brought into various versions (syrup, extract, juice, dried fruit) and content analyses were made and compared. Especially because of its anthocyanin content and phenolic constituents, it was compared with other red fruits. The anthocyanin, flavonoids, chlorogenic acid, etc. contents were analyzed and compared qualitatively and quantitatively. Additionally, aronia has been extracted, heat treated, and stability tested. In this study, it is aimed to analyze each part of the aronia fruit separately (seed, fruit part, whole) and turn it into powder with freeze drying technology, and to make the final product, decaffeinated coffee, by making use of the rich content and aromatic components of this product.

Keywords: Innovation, sustainability, healthy, new product, technology.

Evaluation of Sustainable and Healthy Eating Behaviors of University Students Using Social Media

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This research was conducted to evaluate the sustainable and healthy eating behaviors of university students between the ages of 18 and 30 who live in Istanbul and use social media. 350 participants who participated in the research through online platforms were included. The socio-demographic information form, the Sustainable and Healthy Eating Behaviors Scale, and the Mediterranean Diet Adherence Scale (MEDAS) were applied to the participants in the study. Women constitute 62.3% of the participants. It was determined that the mean age of the participants was 23.29±2.87 years, and the mean BMI was 24.19±14.28 kg/m^2. When the MEDAS compliance of the participants was examined, it was determined that 53.4% had low compliance, 18.9% had acceptable compliance, and 27.7% had tight compliance. There was no statistically significant difference between the Sustainable and Healthy Eating Behaviors Scale factors according to the gender of the participants ($p>0.05$). There is a statistically significant difference between the genders of the participants and the MEDAS scale ($p<0.05$). There was no statistically significant difference between the diets of the participants and the Sustainable and Healthy Eating Behaviors scale ($p>0.05$). There is a statistically significant difference between the participants' duration of social media use and the healthy and balanced nutrition sub-factor of the Sustainable and Healthy Eating Behaviors Scale ($p<0.05$). In order to increase the knowledge and awareness of sustainable nutrition in society, health professionals need to conduct more research and develop effective strategies.

Keywords: MEDAS, nutrition, social media, sustainable diet.

Impacts of Visible Light Treatment on Shelf Life and Quality Parameter of Post Harvest Broccoli

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This study examines the efficacy of visible light treatments on post-harvest broccoli. We hypothesize that green-light dominance, white-light dominance, and an equal white-green cycle will positively influence quality parameters and extend shelf life. Additionally, the research explores the dominance or equality of different light colors within the photoperiodic cycle. LED lights were employed as the light source for broccoli samples, exposed to three distinct photoperiodic light treatments at two different wavelengths and distances. The samples underwent storage at +4 degrees Celsius and 95% relative humidity for 14 days. The three photoperiodic applications consisted of a green-light dominant cycle, a white-light dominant cycle, and an equal-duration cycle of white and green light. In the statistical analysis phase, ANOVA (Analysis of Variance) and subsequent post-hoc multiple comparison tests were conducted. These tests were instrumental in assessing A and C vitamin levels, chlorophyll content, antioxidant activity, weight loss, and sensory evaluation, enhancing the robustness and precision of our findings. The green-weighted and equal-duration photoperiodic treatments yielded substantial positive effects on crucial chemical parameters, including heightened chlorophyll content, elevated levels of vitamins A and C, and enhanced antioxidant activity. Notably, the light-exposed samples exhibited a noteworthy increase in weight loss attributed to activated photosynthetic mechanisms and heightened stomatal opening, indicating dynamic metabolic processes. Sensory evaluations conducted at the conclusion of the 14-day storage period presented a compelling narrative. The control group samples had reached the culmination of their shelf life, displaying signs of spoilage and degradation. In stark contrast, the light-treated samples remained not only visually appealing but also maintained their sensory attributes, highlighting a significant extension in shelf life. Throughout the storage duration, color parameters consistently demonstrated unfavorable trends for the control group samples, indicating a progressive decline in quality. In contrast, the light-treated samples showcased resilience in color retention, further emphasizing the protective role of visible light treatment in mitigating deterioration during post-harvest storage. These findings collectively underscore the tangible benefits of visible light applications in preserving the quality and extending the shelf life of post-harvest broccoli. In summary, this research highlights the potential positive impact of visible light treatment on post-harvest broccoli, contributing valuable insights into quality parameters and extended shelf life. The findings emphasize the practical applications of visible light in enhancing food safety during post-harvest storage.

Keywords: Light treatment, chlorophyll, broccoli, shelf life.

Effects of Ultrasound Treatment on Functional Properties of Rice Protein Isolates

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Currently, there is a growing interest in healthy nutrition and alternative protein sources due to the rapidly increasing population and consumption worldwide. Plant proteins are a popular substitute for animal proteins in various food formulations because of their high nutritional value and low cost. Rice protein isolates, in particular, demonstrate significant potential in this regard. Rice protein is highly nutritious due to its essential amino acids, including lysine, methionine, and phenylalanine. However, the functional properties of vegetable proteins are weaker than those of animal proteins, which limits their use as raw materials in various food products. Improving the functional properties of rice protein isolates is believed to enable more effective use in industrial applications. Ultrasound technology has become increasingly popular in recent years for enhancing the functional properties of plant protein isolates. This study investigates the impact of ultrasound on the functional properties of rice protein isolates by varying the duration and intensity of ultrasound application. Rice protein isolates were exposed to ultrasound at 300, 400, and 500 W for 10 and 15 minutes using a general full factorial design. The study's results were statistically analyzed. Rice protein isolates were tested for their water and oil holding capacity, emulsion forming activity, and stability, as well as their foaming capacity and stability. The application of high-intensity ultrasound increased oil holding capacity, foaming capacity, and stability values. However, it led to a decrease in water holding capacity, emulsion activity, and emulsion stability. Rice protein isolates, whose certain functional properties were improved by ultrasound application, are believed to be suitable for producing sports drinks, vegetarian and vegan ice cream, dairy-based desserts and coffee products, and enriching various vegan products, particularly with improved foaming properties.

Keywords: Ultrasound, rice protein, functional properties.

Curd Standardization with Cheddaring Table

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Pasta filata-type cheeses are based on acidifying the curd and then stretching. After the milk standardization, the starter culture is added to the milk to acidify, and the rennet enzyme is added to coagulate the milk. Coagulated milk is cut to separate the whey from the curd and to have the target dry matter of curd. After cutting, the curd is heated to the optimum temperature for cultures to produce lactic acid and provide acidification. When the determined acidity level is achieved, the curd and whey are separated by discharging curd and draining whey. As a classical method, drums and/or carts with sieves are used during draining. By keeping curd under its weight or by additionally placing metal plates on curd in carts, whey continues to drain. After this step, the curd that reaches the target acidity is cut and manually transferred to a stretching machine and stretched into the molten mass. In this study, the benefit of using a cheddaring table with an automatic stirring system, instead of the drum separation method used as the classical method in separating curd from whey and weights used in carts to press curd and remove whey, is mentioned. This system, in addition to a stirrer that has an adjustable working time and mixing speed, also includes automatic transportation of curds to the stretching machine. Curd sizes are reduced by mechanical effects. In this way, whey is more easily removed from curd with increased surface area, and the dry matter of curd is increased. Adjusting dry matter of curd is easier in cheddaring tables than in cheese-making vats. Another advantage of this situation is whey loss is reduced. The process of separating the whey is done with sieves at the bottom of the cheddaring table, the separated whey is transferred to the tanks through pipes. Since the transfer process is not done intermittently as in manual systems, there is no risk of whey spilling on the ground. When the mixing process is completed, the curd is automatically transferred to the stretching machine by using a PLC system controlled and followed on screen. In this way, there would be no curd loss during the transferring process. In the old system, when the surface of curd was in contact with air and reached the ambient temperature; inside the cart, the curd which was in the middle and lower parts of carts remained warmer and therefore, there were high standard deviations in terms of both demineralization and dry matter. With the new system, while whey is separating, the risk of whey spilling on the ground is eliminated, which is an advantage of the automatic transfer line system. In this way, fat and protein losses come from whey spilling and the risk of phage is prevented. Since the surface area is increased by the continuous stirring process, the cooling of curd is more standardized, and therefore, the curd is acidified more properly, which makes the stretching process easier and acquires a better standardized dry matter, protein, and fat values on the final product.

Keywords: Standardization, curd, cheddaring, demineralization.

Determination of Powder Flow Properties of Some Selected Model Food Powders with a Powder Flow Tester (PFT)

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Powders are used widely in food processes, including blending, dosage, tableting, transfer, storage, feeding, compaction, fluidization, and reconstitution. Powder flowability is an essential behavior in these processes and, therefore, needs to be characterized to predict the process efficiency and design powder handling equipment. Powder Flow Tester (PFT) has recently emerged, and its methodology is based on measuring the yield strength of the powder sample as a result of rotational movement under varying consolidation stresses. This study evaluated six different powders (three protein-based and three carbohydrate-based powders) for a range of consolidation stresses. Furthermore, it has been tried to find a correlation with Carr Index (CI) and Hausner Ratio (HR) values. The results indicate that the stickiest powder samples were found as soy flour and casein powder, while pea protein powder and lactose powder were the easiest to flow. The data obtained from PFT agrees with the calculated CI and HR values. In addition, the change in bulk density, under varying consolidation stresses applied, surface friction angle, and critical hopper outlet diameter parameters were also obtained for the powder samples studied. Based on the data obtained, it can be stated that the PFT is a reliable, easy, and relatively rapid testing method to determine essential powder properties.

Keywords: Food powders, powder technology, powder flow, PFT.

Assessment of the *in Vitro* Starch Digestibility and Estimated Glycemic Index of White Bread Fortified with Black Pine Bark Extract

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Pinus nigra Ten (also known as black pine) obtained following industrial wood processing is a secondary product of the forestry sector, often utilized in inefficient manners and regarded as natural refuse. Presently, studies emphasize that the bark from diverse woody plants could serve as a significant reservoir of numerous bioactive compounds, offering various advantageous biological properties with health benefits. Consuming carbohydrate-rich diets with a low glycemic index is linked to a reduced risk of type 2 diabetes because of the advantageous glycemic response. The objective of this research was to investigate the impact of varying proportions (0.00, 0.25, 0.50, and 1.00% (w:w) of black pine bark extract incorporated into white bread on their estimated glycemic index (pGI) and hydrolysis index (HI) levels. To achieve this, in vitro gastrointestinal digestion of the bread samples was conducted through a 3-step process involving sequential oral, gastric, and pancreatic digestion utilizing alpha-amylase, pepsin, and pancreatin, respectively. The levels of reducing sugars released during the in vitro digestion phases were assessed using the modified dinitrosalicylic acid (DNS) colorimetric method at 530 nm at 25°C. The ratio of digested starch to total starch content was computed, and the percentage of glycemic index was recorded. The hydrolysis index (HI) of the samples was determined by comparing the area under the hydrolysis curve (0 to 180 min) of the sample to that of white bread (used as the reference sample). The findings showed that the glycemic index (pGI) ranged from 59.29 to 101.34, with corresponding HI values ranging from 56.73 to 98.21. This represented a percentage reduction in GI ranging from 16.86% to 41.49%. Additionally, there was a statistically significant decrease in pGI values with each increase in pine bark extract concentrations. The bread samples with 0.50% and 1% (w:w) of PBE had glycemic index values that were categorized as medium, as per the classification system (low pGI: ≤ 55, medium pGI: 56–69, and high pGI: ≥ 70). Overall, the reduced glycemic index of bread enriched with black pine bark compared to reference samples suggests that these extracts may be a useful functional ingredient for controlling blood glucose levels.

Keywords: Sustainability, food waste, *Pinus nigra* Ten. bark extract, white bread, *in vitro* starch digestibility, estimated glycemic index.

Investigation of the Effects of Chitosan-Based Coating Combined with Pomegranate and Lemon Peel Phenolic Extracts on the Shelf Life of Fresh-Cut Apples

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The perishability of fruits due to rapid ripening and softening limits their storage and transport. Edible coatings, when combined with cold storage, offer a promising solution to extend shelf life, maintain quality, and prevent post-harvest diseases. Furthermore, often discarded vegetable and fruit peels are suitable additives for coating formulations as they contain valuable antifungal and antimicrobial properties. This study aimed to evaluate how various coatings, including chitosan alone and chitosan combined with extracts from fresh pomegranate (*Punica granatum* L.) and lemon (*Citrus limon* Burm.), compared to untreated samples, affected the shelf-life extension of apple (*Pyrus malus* L.) slices over a 21-day storage period at 8 °C. For this aim, a blend of lemon peel and pomegranate peel in a 1:3 ratio, amounting to 900 g of ground peels, was mixed with water and subjected to freeze-drying. To create a chitosan-based coating solution, chitosan was dissolved in diluted acetic acid (1%) with Tween 80 at a concentration of 2%, and the pH was adjusted to 5.6. Lemon peel extract and pomegranate peel extract were incorporated into the chitosan solution at a ratio of 1%. The fruit slices were dipped in the coating solution for 2-3 min at room temperature, then dried at temperatures between 20-35°C. Finally, the coated fruits were stored at 8°C for 0-21 days. The findings revealed that throughout the storage period, apple slices exhibited an increase in dry matter content when solely treated with chitosan coating or when coated with a blend of phenolic extracts and chitosan, in comparison to the untreated samples. Chitosan alone had a minor impact on the pH of apple slices, while the addition of phenolic extracts decreased pH, indicating chitosan's role in pH control. CS-coated apple slices displayed a similar effect on browning rate as uncoated slices. Uncoated apples experienced weight loss, whereas coated apples gained weight. Mold formation was not visually observed in any tested sample. Sensory attributes showed a slight decline with prolonged storage. In conclusion, the utilization of chitosan in combination with extracts from pomegranate and lemon presents a promising approach for enhancing the preservation and quality of perishable food products.

Keywords: Sustainability, food waste, apple slices, pomegranate and lemon extracts, edible coating.

Electrospun Food Packaging Applications for Fruit Preservation

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The demand for sustainable and functional food packaging materials has grown significantly in recent years due to concerns about food waste and environmental impact. Electrospinning technology has emerged as a promising solution to address these issues by creating nanofiber-based materials that offer improved barrier properties and biodegradability. In the context of fruit preservation, electrospun food packaging can extend the shelf life of fresh produce by controlling factors such as oxygen and moisture permeability. This review aims to explore the potential of electrospun materials for fruit packaging applications, considering factors such as antioxidant incorporation, mechanical properties, and biocompatibility. By leveraging the unique properties of electrospun nanofibers, this study seeks to contribute to the development of more sustainable and effective food packaging solutions for the future. Electrospun food packaging offers significant benefits for fruit preservation. By utilizing electrospun nanofibers, these packaging materials can provide enhanced mechanical strength, barrier properties, and antimicrobial effects, thus extending the shelf life of fruits. The nanofibrous structure of these materials allows for the controlled release of bioactive compounds or gases, which can help inhibit microbial growth and enzymatic browning in fruits. Additionally, the high surface area-to-volume ratio of electrospun nanofibers enables efficient scavenging of ethylene gas, a ripening agent produced by fruits, further delaying their senescence. Moreover, the flexibility of electrospun materials allows for customization based on specific fruit types and storage conditions, making them a versatile solution for fruit preservation challenges. Overall, electrospun food packaging holds great promise in revolutionizing the way fruits are packaged and preserved in the food industry.

Keywords: Electrospinning, food packaging, preservation, shelf life, nanofibers.

Investigation of the Effects of Different Coatings, Dough and Fillings on the Nutritional Value of Wafer Rolls

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Roll wafers are a popular confectionery item due to their crisp, multi-layered structure, which is produced from a continuous, thin wafer band. This text highlights the need for further research to enhance the nutritional value of roll wafers, as existing studies have focused primarily on production systems and filling options. This research aims to develop new functional roll wafer products by exploring various filling types, dough mixture types, and outer coating alternatives, with a focus on improving nutritional profiles. The incorporation of functional ingredients into roll wafers is made possible by experimenting with different filling types, dough mixtures, and outer coating alternatives. The ingredients in these formulations offer health benefits beyond basic nutrition, aligning with the trend towards functional foods. Our study successfully developed formulations with significant differences in moisture, protein, and fat contents compared to traditional roll wafers. These formulations are lower in calories and fats, and enriched with proteins, making them appealing to health-conscious consumers and those with specific dietary needs. The study confidently utilized various analytical methods to accurately measure the nutritional composition of the wafer samples. AOAC methods were employed to evaluate the moisture, ash, fat, free fatty acid, and protein content, while carbohydrate and energy values were calculated using standard formulas. Furthermore, sensory and statistical analyses were conducted to analyze physical properties such as color, texture, diameter, thickness, and spreading rate. The moisture content of the samples varied significantly (16.20-26.48%) compared to the reference wafer (2.35%, $p<0.05$). Similarly, the protein content showed significant variation (6.59-8.28%) relative to the reference (4.37%, $p<0.05$). However, the ash content, ranging from 0.41-1.04%, did not significantly differ from the reference (1.03%, $p>0.05$). The fat content demonstrated a significant difference (5.29-10.80%) compared to the reference (18.78%, $p<0.05$). The free fatty acid content did not vary significantly from the reference (0.66%, $p>0.05$), ranging from 0.52% to 1.21%. Similarly, the carbohydrate content did not differ significantly from the reference (73.47%, $p>0.05$), ranging from 57.06% to 67.47%. However, the energy content was significantly lower (328.63-383.65 kcal/100g) than the reference (480.37 kcal/100g, $p<0.05$). The study has successfully developed functional roll wafers with varied nutritional profiles. The results highlight significant differences in moisture, protein, and fat content compared to reference wafers. The development of roll wafer samples with significantly lower fat and energy contents, and varying protein levels, demonstrates the feasibility of enhancing the nutritional profile of these snacks without compromising their sensory attributes. The findings suggest clear pathways for enhancing the nutritional value of roll wafers, making healthier snacking options more accessible and appealing to the wider public. These insights are valuable for food scientists and the confectionery industry in developing healthier snack options. This research is highly significant due to its substantial contribution to the development of healthier snack options, potential market impact, and pivotal role in encouraging further academic and industrial research aimed at improving the nutritional quality of snack foods.

Keywords: Functional; Roll; Wafer; Nutritional value

Effects of Encapsulated Raspberry Powder as a Natural Additive and Phosphate on the Microbiological Quality and Shelf Life of Modified Atmosphere Packaged Chicken Nuggets During Chilled Storage

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In recent years, natural additives obtained from various plant or fruits in lyophilized or powder form have begun to be used frequently in meat and meat products due to their contribution to improving the quality and extending the shelf life. Although raspberry powder, which has strong antimicrobial properties, is one of these naturally sourced additives, it has not been used in poultry products until now. In the current study, the usability of chicken nuggets without phosphate and/or with phosphate (0.0% and 0.3%) and encapsulated raspberry powder (RP; 0.0%, 0.5%, and 1.0%) and its effects on microbial quality and shelf life were examined. Raspberry powders were encapsulated using maltodextrin (12-16 DE; 40.0%, m/m) with a lab-scale spray-dryer. The nugget dough prepared in each phosphate group was divided into three groups and raspberry powder was added at the 0.0%, 0.5%, and 1.0% levels. Six groups of chicken nuggets, produced in two replicates, were packaged in a modified atmosphere using a gas composition of 40% CO_2 + 60% N_2, and stored at 2.0±0.5 ºC for 120 days. The total aerobic mesophilic bacteria, yeast-mold, *Salmonella* ssp., *Listeria monocytogenes*, and *Enterobacteriaceae* counts were determined on the 0th, 15th,30th, 45th, 60th, 75th, 90th, 105th, and 120th days of the storage period. The addition of phosphate and raspberry powder had a significant effect on the total aerobic mesophilic bacteria ($P<0.01$) and yeast-mold counts ($P<0.01$) of the nugget. Both the mean total aerobic mesophilic bacteria and the mean yeast-mold counts of the nugget samples with added raspberry powder were found to be 1 logarithmic unit lower than the control samples. The counts of total aerobic mesophilic bacteria decreased depending on the level of raspberry powder added to the nugget composition, and the count exceeded 6 log CFU/g only in the control samples on the 120th day of storage. *Salmonella* spp. and *Listeria monocytogenes* were negative (-) in all nugget samples during storage. The count of *Enterobacteriaceae* was determined to be below the detectable limit (<2.0 log CFU/g) during storage. The incorporation of raspberry powder into chicken nuggets contributed substantially to the prevention of microbial spoilage and extended shelf life.

Keywords: Encapsulated raspberry powder; Chicken nugget; Microbial quality; MAP; Shelf-life

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Evaluation of Antioxidant Potential of Unique Postbiotics Obtained from Different Lactic Acid Bacteria

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Recent consumer expectations have accelerated studies on the production of foodstuffs, expressed as clean label, that do not contain any unnatural additives as much as possible. Although existing additives used within legal limits are an indispensable part of the food industry, it is very important to develop original, alternative, effective and sustainable new additives in order to meet consumer expectations. At this point, Lactic Acid Bacteria (LAB) and their metabolites, which attract attention with their GRAS status, have come to the fore as unique resources that can be used for different purposes. Especially in the last few years, postbiotics, defined as extracellular metabolites produced by LABs, have come into the interest of the industry as a unique additive alternative with their very different technological and functional aspects. Studies conducted so far have revealed that postbiotics can be effective as antibacterial and antifungal agents, immune-regulating components for human health, and importantly, antioxidants. Postbiotics also have important technological advantages, such as being able to be produced in large quantities, stored in powder form, and eliminating the need for living cells. Based on these points, in this study, lyophilized postbiotics of 5 different LAB strains were produced and the antioxidant capacities of the produced postbiotics were characterized by ABTS and DPPH tests. The results obtained are important as they show that postbiotics have very strong antioxidant capacities.

Keywords: Postbiotic, antioxidant, lactic acid bacteria.

Physicochemical Properties of Boza Obtained Using Starter Cultures

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Lactic acid bacteria (LAB) and yeasts are the major microorganisms involved in the fermentation of grain-based fermented foods. Boza, a traditional fermented beverage, is produced from the lactic acid and yeast fermentation of several grain flours, including wheat, rice, millet, and maize, and is heavily consumed in Turkey and Bulgaria. In this study, seven different boza samples were obtained by fermentation using different combinations of three different LABs (*Lactococcus lactis*, *Lactiplantibacillus plantarum*, *Weisella confusa*) and one yeast (*Pichia membranifaciens*) starter culture isolated from commercial boza sold in Turkey. The control sample was fermented with one commercial boza. The obtained boza was stored at 4 °C for 14 days, and the pH, titratable acidity, brix, and dry matter contents of the boza samples were analyzed. The pH values of boza on the 0th, 7th, and 14th days of storage varied between 3.88 - 4.17, 3.67 - 3.88, and 3.31 - 3.63, respectively. The pH values of boza samples decreased during the storage period. The control sample had the lowest pH value, while the B1-coded sample had the highest pH value. The titratable acidity values of boza samples were found to be between 0.16 - 0.44% during the storage period. In parallel with the pH values, the BK-coded isolate had the highest acidity, while the B1-coded isolate had the lowest acidity. The brix values of boza samples showed a slight decrease during the storage and were influenced by starter types. While the dry matter values of most of the samples increased on the 7th day, a decrease was observed on the 14th day. In conclusion, it was found that the physicochemical properties of the boza sample were affected by the starter cultures at different combinations and storage periods.

Keywords: Lactic acid bacteria, yeast, boza, physicochemical properties.

The Functional and Technological Roles of Modified Aquafaba in Food Systems

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Legumes constitute an important source of protein, especially for segments of the world population that cannot consume animal protein or prefer not to due to religious or cultural reasons. With their high protein and fiber content, gluten-free nature, low glycemic index, and antioxidant potential, legumes have a high potential to improve the nutritional quality of foods. The compositional properties of legumes, such as their potassium, magnesium, soluble fiber, and absence of cholesterol, contribute to their positive effects on health. Awareness and demand for legumes are increasing, leading to the development of new products containing legumes that are low in glycemic index and rich in fiber. Additionally, the growing interest in gluten-free, vegan, and vegetarian diets is driving an increase in legume consumption. In food formulations, the technological and functional properties of legume proteins, such as water and fat absorption, solubility, gel formation, emulsifying activity, foaming capacity, and foam stability, stand out. Particularly in innovative food processing processes at the industrial level and in food formulation preparation, their usability is high. Egg protein is responsible for the second most serious of all food allergens, primarily affecting children. Therefore, a new type of vegan ingredient called "aquafaba," which is the leftover water from cooked chickpeas, has begun to be recognized as a plant-based emulsifier in many baked goods. It emerged as an alternative to traditionally used egg white. Aquafaba is obtained by soaking and cooking chickpeas or commercially in liquid form in canned chickpeas. This study aims to modify chickpea aquafaba using a pre-fermentation process and to investigate the physicochemical and techno-functional properties of modified aquafaba samples. Additionally, alternative uses in food production have been evaluated.

Keywords: Aquafaba, egg, gluten free, cake, chickpea juice, alternative protein source.

Marine Bacterial Pigment

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People have always been interested in colors, but the effects of different colorants have led to health and environmental concerns. From an environmental perspective, the unethical dumping of untreated industrial paint waste produces toxins and its negative impact continues for years. The disadvantages of synthetic color increase the global demand for natural pigments. As the demand for greener products increases, more sustainable alternatives are attracting the attention of many industries. To address these environmental challenges, biotechnology can offer new design tools that make it possible to work with living organisms as a source of new color and material alternatives. Plant-based colorants are often costly and unstable; Therefore, researchers are seeing increasing interest in microbial pigments as they are more stable and easier to produce than plant-based pigments. Marine microorganisms provide an important resource for biological discovery due to their rich biodiversity and genetic capabilities. The availability of bacterial-derived pigments that can be used as natural colorants with protective activity in the marine system in the food, textile, and pharmaceutical industries is of great importance in terms of cost-effective and rapid production of alternative natural pigments. In addition to serving as food colorants, environmentally friendly microbial pigments have various pharmacological activities such as anti-microbial, anti-cancer, antioxidant, anti-inflammatory, and anti-allergic. The main purpose of the study is to reveal this natural pigment produced by bacteria and its usability. Thus, a valuable product that is environmentally friendly, natural, and inexpensive can be evaluated.

Keywords: Pigment, natural, bacteria, food.

Immobilization of Pectinase Onto Polysaccharide-Based Aerogels By Physical Adsorption

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In the food industry, the pectinase enzyme serves to eliminate pectin from fruit juice by breaking the α–1-4 glycosidic bonds within pectin molecules, thus reducing the turbidity associated with pectin in fruit juices. However, despite their high catalytic properties, free enzymes are costly due to their inability to be reused and are often not preferred due to their instability. Enzyme immobilization provides a solution by enabling enzyme recovery and reuse, while also enhancing reaction control through increased enzyme stability. This study investigated the physical immobilization of pectinase onto polysaccharide-based aerogels made from chitosan and alginate. These aerogels are sustainable, renewable, and non-toxic, and have unique adsorption properties, characterized by their extensive pore structure and significant specific surface area. Enzyme activity and effects of temperature and pH were investigated with free and immobilized enzymes in the temperature range of 30 – 60 °C and pH in the range of 4 – 8. Immobilized enzyme kinetics were studied at optimum pH and temperature, at different substrate ratios (0.2% - 1% (w/v)). The relative activity of an enzyme immobilized onto chitosan, alginate, and chitosan/alginate (hybrid) aerogels was compared, revealing the most stable and strong performance in the hybrid aerogel. Optimal enzyme activity was achieved within 20 minutes at pH 5 and 40 ℃. The kinetic parameters K_m and V_{max} for the free enzyme were found to be 8.92 g/L and 2.06 mmol/L.min, respectively, while the enzyme immobilized onto hybrid aerogel was 3.63 g/L and 1.38 mmol/L.min, respectively. Furthermore, the enzyme immobilized on the hybrid aerogel demonstrated notable reusability, retaining 65% of its activity even after the third cycle of reuse.

Keywords: Enzyme immobilization, pectinase, aerogels, chitosan, alginate.

Enhancing Dispersion Properties of Natural Colourant Powders Through Micronization

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The dispersion properties of colorant powders play a significant role in various applications, with particle size being a key determinant. This study investigates the impact of micronization on the dispersion properties of natural coloring powders, including color malt extract powder, safflower extract powder, red radish powder, and spirulina powder. Before and after micronization, color strength and particle analysis, specifically focusing on Dv(97) (the size of particle below which 97% of the sample lies) and D[4:3] (volume weighted mean) values, were done. The study reveals that while color strength remained consistent pre- and post-micronization, particle size distribution exhibited significant improvement, with post-micronization samples demonstrating finer particle sizes falling within the target range of 8.0 µm-20.0 µm for Dv(97) and <10 µm for D[4:3]. Application of powder in sugar (1 g/100 g) indicated that the dispersion of micronized powders enhanced compared to their pre-micronization powders. This research underscores the effectiveness of micronization in enhancing the dispersion properties of natural coloring powders, thereby offering insights for industries reliant on color dispersion in various applications.

Keywords: Micronization, dispersion, color, powder

Potential of Lactic Acid Bacteria from Moroccan Goat's Milk for Starter Culture Development

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Goat milk, a highly nutritious product, is widely used in cheese making. To properly select suitable milk samples for production, fifty-five samples of raw goat's milk were collected from eight farms in the north-west of Morocco to analyze their counts of various mesophilic bacteria and determine the physicochemical characteristics during different seasons of the year. Lactic acid bacteria (LAB) were isolated, identified, and screened for several technological properties. Overall mean values for mesophilic aerobic flora were above 7.10 log cfu/mL in spring and 5.80 log cfu/mL during winter with a statistically significant difference found between all the microorganisms except for coagulase-positive staphylococci. The physical and chemical composition tests showed higher values for fat (4.9±1.01%), dry matter (13.98±0.95%), ash (1.3±0.12%), lactose (3.1±0.65 g/L), and protein (4.6±1.03 g/L) during the winter season which could be of great interest for cheese production. Fatty acid (FA) composition mainly consisted of saturated fatty acids (SFA) in both seasons. Lactococci isolates were the most acidifying (pH6h=4.35 – pH24h=4.08), while *Lactobacillus paracasei* produced the highest proteolytic activity (66.93±2.63 mgTyr.L-1) and diacetyl-acetoin (54.83±0.46 mg diacetyl/L). None of the tested isolates were lipolytic; however, several lactobacilli and lactococci exhibited high salt tolerance and exopolysaccharide (EPS) production. *Lactobacillus plantarum* exhibited the highest lysis rate (67.34±1.76%) while the antibacterial profile ranged between 10.5±0.137 and 22.9±0.23 mm. The obtained results highlight the importance of Moroccan goat milk as a valuable component for cheese making due to its rich fat and protein contents alongside its abundance in LABs with biotechnological properties.

Keywords: Goat's milk, microbiological counts, lactic acid bacteria, physical and chemical composition, technological properties

Evaluation of Alternative Protein Sources in the Food Industry: Edible Insects

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Due to the increasing global population, which will exceed 9 billion by 2050, and thus the demand for food and protein, new ways are beginning to be explored in the food industry. Previous studies have shown that insects, as a possible food source, have great potential to be called the "food of the future" as they are rich in proteins, fiber, fatty acids, minerals, and vitamins. The Food and Agriculture Organization (FAO) has acknowledged its potential use as an alternative to protein derived from the meat of edible insects for food and feed. On the other hand, the European Food Safety Authority (EFSA) has authorized four edible insects as novel foods, as detailed in Regulation (EU) 2015/2283. Among these, it is possible to list the following: '*Tenebrio molitor*' larva (mealworm, as frozen, dried, and powder forms), '*Locusta migratoria'* (migratory locust, grasshopper), '*Alphitobius diaperinus*' larva (frozen, freeze-dried formulations), and '*Acheta domesticus*' (dried, ground, frozen, and partially defatted whole house cricket). Edible insects contain bioactive compounds that could provide health-beneficial effects such as antioxidant, antihypertensive, anti-inflammatory, antimicrobial, and immunomodulatory properties. Despite all the benefits, most of the population suffers from neophobia, which is the fear or aversion to new food items and, as such, a decreased willingness to eat. Therefore, to increase the general acceptability of edible insects, both thermal and non-thermal food processing technologies are being applied. In this context, insects are typically processed by methods such as roasting, freezing, extrusion, and blanching, among others. Additionally, non-thermal applications such as high hydrostatic pressure (HHP), pulsed electric field (PEF), ultrasound (US), and cold atmospheric plasma (CAPP) technologies are currently being used while representing promising green and eco-friendly strategies to obtain insect-based products with improved quality and safety. In this review, nutritional profiles, health-beneficial effects, various applications, and processing technologies of trending edible insects to better explain and disseminate their potential usage in the food industry were discussed in detail.

Keywords: Edible insects, alternative proteins, meat replacements, novel formulations.

Comparative Analysis of Antioxidant Levels by Obtaining Tripeptides from Fish Skin

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In the field of nutrition and health, bioactive compounds stand out as powerful factors that can significantly affect human well-being. They exert specific physiological effects on the body, such as antioxidant, anti-inflammatory, antimicrobial, and immune-modulatory activities. With the increasing emphasis on healthy nutrition globally and in our country, the rapid growth of the promising functional food market is anticipated. In recent years, there has been an observed increase in the consumption of foods with high collagen peptide content in the human daily diet. Collagen is a protein that forms connective tissue in the body and is found in the skin, bones, joints, and tendons. Collagen protein undergoes enzymatic or chemical hydrolysis processes to obtain collagen peptides and tripeptides. Collagen peptides possess bioactive properties and offer numerous health benefits, including antioxidant, anti-inflammatory, antihypertensive, anti-osteoporotic, and anticancer properties (León-López et al., 2019). There are too many studies on the extraction of collagen using different animal tissues like skin, bone, or scales. To generate a circular model in the production of collagen peptides, using aquaculture processing waste has higher potential because of many reasons. Furthermore, using different raw materials in the creation of innovative supplements and the development of functional foods is gradually increasing. Studies are continuing the development of food supplements by using collagen peptides which are obtained from aquaculture processing wastes as raw materials. Reusing wastes such as fish skin, scales, and bones to obtain tripeptides is an environmentally friendly process in terms of sustainability and environmental impact. Thus, while contributing to waste management, it also contributes to the circular economy and reduction of carbon footprint. Antioxidants play a crucial role in protecting the human body against oxidative stress associated with various health issues. The presented study aimed to present a comparative analysis of the extraction of tripeptides from fish skin and their antioxidant levels. After the hydrolyzation process with endoprotease and exoprotease enzyme types, purification steps were applied and then characterization tests and analyses were carried out. The results of the characterization analysis of collagen peptide and tripeptide extractions revealed that the samples had an average molecular weight of 950-1200 Da and a tripeptide content of 45-55%. All samples met the targeted values such as ash content <2%, moisture content <7%, protein content >90%, viscosity <4.0 mPa.s, pH 5.0-7.0, and conductivity <1 mS/cm. Microbiological analyses, including E. coli, Salmonella spp., Mold and Yeast, and Aerobic Colony Count, indicated values within the appropriate ranges set by standards. According to the DPPH analysis results, the samples exhibited inhibition rates of 40-55%, higher than the levels observed in commercial samples which were in the range of 30-40%. In conclusion, tripeptides were obtained from fish skin with the method developed within the scope of the study, and their antioxidant properties were examined and characterized through various analyses. The findings suggest that the antioxidant potential of the tripeptides obtained was higher than that of commercial samples. This study highlights the potential for the reevaluation of fish industry waste and the development of functional foods in a sustainable approach.

Keywords: Waste valorization, collagen**,** supplement**,** bioactive peptides, antioxidant properties

Functional Beverages: Flavoured Waters

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Nowadays, food and beverage products are not consumed only to satisfy hunger and meet daily nutritional needs. Consumers have now begun to consume food and beverage products that provide extra benefits beyond daily nutrition for a healthier life. In this case, functional foods play an important role. Functional foods are defined as foods or food components that provide additional benefits on human physiology and metabolism beyond meeting the human body's basic nutritional elements and thus being effective in protecting against diseases and achieving a healthier life. Functional foods should be in food form and not in pill or capsule form.
Functional food ingredients can be classified as probiotics, prebiotics, symbiotics, dietary fibers, essential fatty acids, conjugated linoleic acid, carotenoids, phenolic acids and flavonoids, phytoestrogens, phytosterols and phytostanols, vitamins and minerals. For instance, fermented dairy products (kefir, etc.) are among the most frequently consumed probiotic sources in daily nutrition and probiotics reduce the pH value of the intestinal biota, preventing the proliferation of pathogenic bacteria and providing to maintain intestinal health. Prebiotics are used as alternative therapeutic agents in various disorders such as cancer, metabolic syndrome and type 2 diabetes. Prebiotics are also found in various vegetables and fruits such as onion, garlic, leek, wheat, banana, peas and endive. The most common functional foods are probiotic yoghurts, prebiotic drinks, various herbal teas, products with high dietary fiber content, energy-reduced foods (low-fat milk and dairy products, sugar-free beverages etc.), foods containing omega-3 fatty acids (eggs), gluten-free bread, sports beverages, fortified food and beverages (calcium-rich milk, folic acid and iron-rich bread), non alcoholic beverages with high vitamin and mineral contents, functional fruit and vegetable juices and functional waters. Flavoured and vitamin added water drinks offer consumers more than just “water”. They can be in different categories such as "Detox", "Relax", "Beauty" "Energy" and "Immune". It is made by enriching with vitamins and it makes drinking more enjoyable with natural fruit flavors. They support the lifestyles of consumers with different varieties tailored to their needs. The products are designed to be low-calorie, healthier, without sugar and preservatives and they are supported by vitamins, minerals and functional ingredients. In recent years, people have become more aware of healthy nutrition and thus the food industry has made efforts to produce more healthy and innovative types of foods. As a result, interest in functional foods and beverages is rapidly increasing and a new products are introduced to the market every day. Thanks to these growing interest; studies about functional flavoured waters. Because of that food manufacturers are offering more functional food and beverage products to the market.

Keywords: Beverage industry, functional waters, innovation, nutrition and health.

Production of Fruit-Based Cocolin-Like Tablet Product

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Chocolate and chocolate-like products are defined as food items that have been widely consumed by people of all ages and social segments throughout the universe since their discovery and are consumed with pleasure due to their unique taste and aroma. Although there is a high demand for chocolate and its products, the different economic conditions of consumers and the high cost of raw materials such as cocoa and cocoa butter used in chocolate production in the market have led industrial chocolate producers to use cheaper raw materials. In addition, the cost of cocoa and cocoa butter, the difficulty in supplying raw materials because the cocoa tree (*Theobroma cacao*) grows in a limited region such as the tropics, and the need for tempering have led manufacturers to use vegetable oils. In the chocolate industry, these products, which are chocolate derivatives produced by manufacturers using vegetable oil as an alternative to cocoa butter to reduce costs, are called 'coccoline'. This study aims to investigate the substitution possibilities of cocoa raw material in cocolin formulation with various freeze-dried fruit powders (strawberry, fig, peach, blackberry, raspberry, blackberry, blackberry, lime lemon, etc.) which are easier to obtain today due to the increasingly high costs of cocoa raw material and the difficulty of raw material supply. In this study, strawberry, lime lemon, and blackberry fruit powders were used in concentrations of 5%, 7.5%, and 10%. The particle sizes of strawberry, lime lemon, and blackberry cocolin samples were measured as 0.023-0.024 µm, 0.021-0.022 µm, 0.021-0.022 µm, respectively, and values close to each other were obtained. The average hardness (N) and brittleness (mm) values of strawberry cocolin samples at different concentrations varied between 19.45-27.58 N and 0.54-0.66 mm, respectively, while lime lemon cocolin samples varied between 24.23- 28.71 N and 0.53-0.90 mm, and similar results were obtained for blackberry cocolin samples. It was observed that as the concentration increased, the hardness value decreased. The water activity of chocolate is generally between 0.40-0.50, and this value can be affected by the raw materials used in the formulation, the surface area of the raw materials, the temperature, humidity, and time applied during thinning and conching. Water activity values at different concentrations in strawberry, lime lemon, and blackberry cocolin samples varied between 0.20-0.23, 0.19-0.22, and 0.20-030 respectively. Which gives the developed product a longer shelf life. L* values of strawberry, lemon, and blackberry cocolin samples at different concentrations vary between 56.41-62.06, 73.12-79.14, and 41.2-47.03, respectively. a* values were measured in the range of 16.23-18.23, 41.2-47.03, and -5.01, -3.99, respectively. b* values vary between 16.78-19.46, 26.34-29.96, and 1.60-5.02. With this study, by using freeze-dried different fruit powders at rates of 5%, 7.5%, and 10% instead of cocoa powder in traditional cocoa products, the production cost will be reduced, the high-calorie content that causes health problems will be reduced, and the increase in fiber content and antioxidant activities will improve functionality.

Keywords: Cocoa substitute, cocolin, freeze-dried fruit powder, functional chocolate

Characterization of a Glucansucrase from *Leuconostoc Mesenteroides* AP-40 and Production of Different Oligosaccharides with Acceptor Reactions

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Glucansucrases (GS) are enzymes produced by different genera of lactic acid bacteria (*Lactobacillus, Leuconostoc, Streptococcus and Weissella*) and are responsible for the production of glucans and oligosaccharides in reactions using sucrose as a substrate. Glucan production is the basic reaction of GSs, and glucans with different structures (dextran, alternan, mutan and reuteran) are produced depending on the amount of α-(1,6), α-(1,4) and α-(1,3) bonds in the structure. Dextran is a type of glucan containing α-1-6 glycosidic bonds in its basic structure and its production was first demonstrated in *Leuconostoc* strains. *L. mesenteroides* strains are also well-known dextran producers and they are used in commercial dextran production. Another reaction catalyzed by these enzymes is acceptor reactions, in which sucrose is used as donor and different sugars are used as acceptors, resulting in the production of oligosaccharides. These oligosaccharides act as prebiotics, supporting the beneficial microbiota in the gut and increasing the functions of foods. In addition, it has been demonstrated that both the produced glucans and oligosaccharides act as immunomudolatory agents and have a stimulating effect through the induction of molecules that regulate the immune system. In this study, the glucansucrase gene was investigated in *L. mesenteroides* AP-40, was cloned and expressed in *E. coli* BL21. Then, the ability of this enzyme to produce glucans and different oligosaccharides in vitro was demonstrated by using sucrose as the main substrate and different acceptor sugars. Results demonstrated that the glucansucrase AP-40 successfully produced an α-glucan containing α-(1,6) and α-(1,3) glycosidic linkages. Their ability to modulate the immune system was determined by measuring pro-inflammatory TNF-α, IL-12 and anti-inflammatory IL-10 and IL-4 cytokine levels in the Caco-2 cell line (human colon adenocarcinoma, ATCC HTB-37). The data obtained in this study may help demonstrate the functional and biological effects of glucan and oligosaccharides that can be produced in vitro using glucansucrases.

Keywords: Glucansucrase, glucan, oligosaccharides, immune-modulation.

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Development of Innovative Vegan Bar Enriched with Functional Ingredients

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Nowadays, the trend towards gluten-free, vegan and sugar-free diets is increasing. At the same time, foods that are functionally beneficial to health are also highly preferred. In this context, foods containing vitamins are preferred. Another way to obtain functional richness naturally is to use the seeds and pulp of fruits found in nature. In this study, sugar-free bars were produced using raw materials with high nutritional and functional properties (grape seeds, oats, roasted chickpeas), vitamins (Biotin, Vitamin D) and different sugar substitutes (date, stevia, agave, maltitol, erythrol). (Samples containing blank and granulated sugar were produced as control samples) Grape seeds, oats and roasted chickpeas were ground with a double blade blender at certain weights and turned into a flour mixture. Each sweetener was weighed in a separate bowl, raw cocoa powder and coconut oil were added to it, and the dough was mixed in the mix machine for the first 5 minutes at a low setting to become homogeneous. Biotin, vitamin D and natural hazelnut flavor were added and mixed for 9 minutes at medium setting. It was poured into molds, ventilated for 1 minute and kept in a cold cabin (+4±1°C) to freeze. After waiting for 20 minutes at room temperature, it was removed from the molds. The effects on the quality characteristics of the produced bars were investigated. In this context, fat, protein, moisture, ash, water activity, color and texture properties of the bars were examined. As a result of the studies, the total fat value (g) in all varieties was determined to be between 18.7-18.9. A large difference in protein values (%) was detected between the blank (16.31) and the samples containing sugar/sweetener (between 11-12). Ash values were found to be between 1.8-2.4% in all samples. Water activity values increased to 0.2%. It was determined that the moisture values of agave were 6.93% and date were 8.59%, higher than other varieties (blank 4.96%, granulated sugar 4.3%, maltitol 4.47% and erythrol 4.68%) When the textural profile analysis was evaluated, according to the analysis results of day 0 and day 3, it was determined that the hardness and brittleness values of the bar containing date and agave were higher than other varieties. In this context, it was determined that the moisture content in the samples significantly affected the texture. In the color values of the bars, it was determined that the brightness (L*) values varied between 26.29-37.67, the redness (a*) values varied between 4.51-7.44, and the yellowness (b*) values varied between (-)1.71-4.51. When the bars were compared, it was determined that the bar containing agave was the lightest color and the blank sample was the darkest.

Keywords: Functional food, vegan, natural sweetener, vitamin.

The Use of Clinoptilolite Zeolite in the Food Industry

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Zeolites are porous mineral complexes known for their ability to absorb, adsorb, and exchange ions due to their crystalline structures. Türkiye possesses significant natural zeolite reserves that contribute to approximately 6% of the global natural zeolite supply. Zeolites called 'magic rocks,' are widely used in many industrial and technological fields due to their porous and crystalline structures. Clinoptilolite form, one of these complex minerals, is an economical and multifunctional zeolite widely found in nature. One of these complex minerals, clinoptilolite, is an economically versatile zeolite commonly found in nature. Highlighted by its high purity, biocompatibility, and adsorption capacity, clinoptilolite can be applied for separating chemicals, food and feed additives, water treatment, gas and odor absorption, and ion exchange. These features make zeolites suitable for a wide range of applications in the food industry. Due to its approval by the FDA and Codex Alimentarius, clinoptilolite has begun to be utilized as a food additive in products such as bread, dairy, meat, and fish. Its high purity and absence of fibers and quartz ensure its safety as a food additive for humans and animals. In animal feed, it serves as a moisture regulator and toxin binder. Clinoptilolite is effective in reducing contamination in food due to its ability to adsorb harmful heavy metal ions, radionuclides, and other toxic compounds such as aflatoxins. Additionally, its application in food packaging aids in the adsorption of ethylene gas, enhancing the shelf life and quality of fresh produce and thus supporting food safety. Moreover, its biocompatible nature and positive effects on human and animal health position clinoptilolite as a functional food component. Traditionally used in nutritional and dietary supplements, clinoptilolite has demonstrated capabilities to absorb and remove harmful substances like heavy metals and ammonia from the digestive systems of humans. Its usage in water purification systems further enhances its potential within the food industry. The use of clinoptilolite in the food industry supports food safety and quality and promotes sustainability through waste reduction and improving food production processes. The increasing applications of clinoptilolite underscore its preference as a versatile option in a wide range of applications, particularly in environments where safety and efficacy are paramount, such as environmental management, agriculture, and especially the food industry. Turkey's abundance of zeolite deposits, particularly high-purity clinoptilolite deposits, provides a valuable resource for enhancing research and development efforts and applications in this field. Further proliferation of clinoptilolite's use in the food industry and developing new applications will enhance Turkey's competitiveness in this sector.

Keywords: Clinoptilolite, detoxification, food additives, food industry, zeolites.

Investigation of Technological and Functional Changes of Starch and Its Derivatives Modified by 4,6 Glucantransferase

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The 4,6 glucanotransferase (Gtfb) enzyme, which belongs to the Glycosyl Hydrolase 70 family (GH70), exhibits differences in the II. and IV. gene regions compared to Glucansucrases (Gtfa) with the ability to produce α-glucans from the same family. Gtfb, unlike Gtfa, cleaves α-1→4 bonds and creates α-1→6 glucan chains attached to the non-reducing ends of starch and its derivatives via α-1→6 glycosidic linkages of single glucose molecules, thus producing resistant starch and isomaltooligosaccharides in the form of dietary fiber. The produced branched substrates can be used as effective coating agents in micro-particle production using spray dryer methods. It is thought to be successful in the encapsulation of postbiotics with antimicrobial properties. Recent studies have shown that oligosaccharides exhibit dietary fiber properties. Dietary fibers pass to the large intestine without being digested in the small intestine and are fermented by the large intestine. Probiotic microorganisms, which are very important for intestinal health, require nutrients called prebiotics for their survival. They produce short-chain fatty acids (acetate, propionate, and butyrate) that are beneficial for the body by using dietary fibers that have a prebiotic effect. As a result, in this study, it is thought that modified starch-based products can be produced using the Gtfb enzyme, which is beneficial for both health and can be used in foods for various purposes.

Keywords: 4,6 glucanotransferase, isomaltooligosaccharide, starch.

The Effects of Deep-Frying, Air Fryer and Oven in Ready to Cook Whole Grain Chicken Product

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Nowadays, the growing trend of ready-to-eat meals has led to various service suggestions, with deep-frying, oven, and air fry cooking methods gaining popularity. Deep-frying in oil is the most common secondary cooking method, known for its characteristic crispy texture and taste. However, research has shown that deep-frying can cause the formation of acrylamide and 5-hydroxymethylfurfural (HMF), which are undesirable compounds. Air frying can be a healthier alternative to deep frying due to its lower fat, preservation of nutrients, calorie content, and reduced acrylamide formation. Thus, alternative healthy cooking methods are becoming more common in recent years. In our scientific research, we compared the characteristics of chicken filet samples cooked using three secondary cooking methods: oven, deep-fry, and air fry. The samples were cooked at different temperatures and times. Moreover, their texture, color, chemical composition, and sensory analysis were evaluated. The results showed that there was a statistically significant difference in texture. The brightest color was found in the samples with the brightest color, while the darkest color was found in the samples with the darkest color. In the study, it was found that there is a statistically significant difference in color when different cooking methods are evaluated based on temperature, time, and type ($P<0.05$). Specifically, air fry at 200 degrees for 8-12 minutes and fritter at 180 degrees for 3-4 minutes have been observed to have the brightest results. However, there is no statistically significant difference in crispiness between deep-fry and air fry, but a significant difference was observed in oven methods. In terms of moisture content, the order from highest to lowest is deep-fry, air fry, and oven. When cooking temperatures were evaluated among themselves, products cooked for the longest duration at higher temperatures had lower moisture content. The cooking method with the highest fat content was also found to be deep-fry, air fry, and oven respectively. The protein content was highest in the cooking methods with high heat and low time. In conclusion, alternative methods to frying that are considered healthier and acceptable in terms of sensory evaluation have been observed.

Keywords: Poultry, Service recommendation, oven, deep fry, air fry.

Effects of Infrared Treatment on Functional Properties of Chia Seed

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In recent years, there has been a growing trend in the consumption of chia seeds. Chia has high nutritional value and positive impact on health. The rich composition of chia makes it a unique seed and has an effect on reducing the risk of coronary heart disease, type 2 diabetes mellitus, and several types of cancer. Infrared treatment (IR) has become increasingly popular in food industry due to its advantages over conventional heating, such as improved energy efficiency, high heat transfer coefficient, short processing time, and uniform temperature distribution. IR has been applied in various processes such as roasting, drying (grains, fruits, vegetables, etc.), extraction (polyphenols, flavonoids, etc.), cooking, baking, enzyme inactivation (lipoxygenase, lipase, polyphenoloxidase, etc.), thawing, pasteurization, and sterilization. In literature, microwave, roasting, and autoclaving have been applied to chia seeds to enhance the extraction efficiency, improve the extraction of health beneficial components, functional properties, and organoleptic properties. In literature, infrared was used only in one research about chia but only effects of infrared treatment on chia seed oil composition were studied. To the best of our knowledge, in the literature there is no study about the effects of infrared treatment on functional properties of chia seed. Therefore, in this study, effects of infrared treatment on functional properties (water holding capacity, oil holding capacity, emulsion activity and stability), protein, and total dietary fiber contents of chia samples were investigated. Chia seeds were infrared treated at different powers (700-1100W) and times (25 and 50min). The protein content of the control and infrared treated chia samples was between 21.33-22.42% and the ash content was between 4.72-4.80%. The total dietary fiber content of the chia sample was found to be 36.61%. Infrared treatment (except 1100W) caused a significant increase in total dietary fiber content. The water holding and oil holding capacities of infrared treated chia samples were found to be lower as compared to those of control chia sample. Infrared treatment at 700W caused a significant increase in emulsion activity and stability values. However, higher infrared powers caused a significant decrease in emulsion activity (except 900W-25 min) and emulsion stability values. FT-IR spectrums for the infrared treated chia samples include all the specific peaks reported in literature for chia but slight changes were observed in the intensity of some of the peaks. The changes in the peaks related to protein might be one of the reasons for the changes in functional properties of the infrared treated chia samples.

Keywords: Chia, infrared treatment, functional properties, FT-IR, total dietary fiber

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In Silico Investigation of the Antifungal Activity of Some Organic Acids from Lactic Acid Bacteria Metabolites by Molecular Docking Analysis

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Molecular Docking, in other words, molecular docking analysis, is an in-silico method used in in-silico modeling analyzes in many fields in recent years. Molecular docking analysis is a software tool that allows calculating the receptor-ligand interactions of two or more substances, molecules or structures on each other through their chemical structures in kcal/mol. In this study, organic acids, which are metabolites of some lactic acid bacteria, were selected as ligands, molds in foods. Molecular docking simulations were performed to investigate its interaction with some growth receptor target proteins and its potential as an antifungal agent. In the preparation of proteins, structures were downloaded from the Protein Data Bank and ligands were downloaded from the Pubchem database and prepared using Chimera and AutoDock Vina software. For visualization studies, protein-ligand interactions were examined using Biovia Studio Discovery software. ID numbers determined to be effective in mold hypha growth as receptors; Four target proteins were selected, namely 2AIB, 7T69, 3T69, and 1WLF. After calculating the Grid coordinates and Grid Box sizes of the four selected proteins, Lactic acid bacterial metabolite: Lactic acid, Phenyllactic acid, Acetic acid, Malic acid was selected as the ligand and Natamycin was selected as the positive control group, docking was done and their energy loads were calculated. According to the results of the molecular docking simulations, the most important Lactic acid metabolite was found to be Phenyllactic acid with an energy value of -6.3 kcal/mol. Phenyllactic acid was followed by Malic acid, reaching energy values of -4.9 kcal/mol. Lactic acid was next with values of -4.2 kcal/mol. Acetic acid, on the other hand, has a weaker antifungal activity with values around -3.1 kcal/mol. However, negative values above -5 kcal/mol can be considered as successful binding in in silico analysis and have effective activity for the food industry. Natamycin, which was chosen as the control group and is used as an anti-mould additive in the food industry, has a good effect with a value of -7.7 kcal/mol. The fact that phenyllactic acid can bind with energy around -6.3 kcal/mol is promising for its use as a substitute for Natamycin. As a result, these simulations allowed us to evaluate the binding energy between the organic acids selected as ligands and each mold growth receptor proteins and provided information about their potential interactions in terms of usage possibilities in the food industry as antifungal agents. This study aims to compare and evaluate in-silico modeling with in-vitro studies and to guide future studies. However, more research is needed to fully understand the mechanism and effectiveness of Phenyllactic acid (PLA) as an antifungal agent.

Keywords: Lactic acid bacteria, antifungal activity, molecular docking, organic acid, phenyllactic acid.

Investigating the Cytotoxic Effects of Dextran Produced by *Liquorilactobacillus Hordei* Originating from Water Kefir

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Water kefir is a fermented beverage that hosts a rich microbial community and is associated with numerous health benefits. Lactic acid bacteria (LAB), crucial in the fermentation process of this beverage, can produce various extracellular polysaccharides (EPS). As naturally derived microbial polymers, EPS offer a broad spectrum of potential health benefits ranging from immune modulation to supporting gut health. Specifically, types of EPS such as dextran, produced by LAB, are utilized as stabilizers and viscosity enhancers in the pharmaceutical and food industries. However, the cellular-level effects of these components, especially regarding cytotoxicity, have not been fully understood. Our research focuses on identifying LAB strains isolated from water kefir, determining their capacities to produce EPS and dextran, and examining their cytotoxic effects. In this respect, two dextrans with various concentrations were subjected to a cytotoxic activity test using the human colon adenocarcinoma cell line, HCT116. Our findings revealed the potential of dextrans as cytotoxic agents as GRAS components.

Keywords: Water kefir, exopolysaccharides, dextran, cytotoxicity.

The Effects of Different Roasting Types on the Quality Characteristics of Turkish Coffee

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Coffee production can be made in a specific region of the world, which is located between 25°C North and 30°C South latitude. This region called the Coffee Belt covers 3/4 of the world's coffee production. In the world, there are more than a hundred coffee species, which belong to the *Rubiaceae family*. Moreover, the most preferred coffee beans are *Coffea arabica* L. (also known as Arabica) and *Coffea canephora* P. (known as Robusta). There are some discrepancies between these two coffee beans. While the caffeine content in Arabica varies between 0.8% and 1.5%, the value is between 1.7% and 3.5% for Robusta. They have different numbers of chromosomes. The Arabica bean fruit has a soft taste and an oval appearance, whereas, the other has a woody and hard taste and a flat appearance. This study examines how these two bean types and their roasting degrees affect the coffee-drinking experience and the changes observed in their physicochemical properties. The beans, originating from Brazil and India, are used and several analyses are conducted. With color analysis, the effect of roasting on the color of the beans is determined. When the *L** results, which provide us with data on the darkness-lightness value in color analysis, are taken into account the Arabica and Robusta coffees with the same roasting degree are similar. For lightly roasted Arabica has *L**=45.586, whereas, this value drops to 32.614 for heavily roasted Arabica. In contrast, lightly roasted Robusta takes 46.816, and the value decreases to 33.084 as the roasting rate increases. That is, when the roasting degree increases, the darkness increases. Among the samples, the water activity takes place between 0.162 (medium roasted beans) and 0.274 (heavily roasted arabica), which provides that all values are within the safe range in terms of microbial spoilage. Sensory analysis is performed to examine its effect on consumer taste. For this, panelists aged 20-30, are selected and these panelists make evaluations on a hedonic scale from 1 to 9. The most liked sample in terms of taste belongs to medium roasted arabica with an average score of 6.7. Besides, pH analysis, which provides data on acidity, it is observed that while all samples are at acidic values, as the roasting degree increases, the acidity of the coffee tends to decrease and approach neutral values. The pH of Arabica beans is generally lower than Robusta beans. The former has 5.683-5.835 and 6.138, respectively, from less roasted to more roasted, whereas, 6.051-6.132 and 6.394 are measured for the latter, respectively. In the texture analysis, the hardness and fracturability levels decrease inversely proportional to the increase in the roasting degree. While the hardness values of lightly roasted arabica and robusta are 6.47 kg and 5.81 kg, respectively, this value decreases with the increase in roasting. Hardness values of deep-roasted arabica and robusta are found to be 2.56 kg and 3 kg respectively. To sum up, it is seen that coffees with different roasting degrees affect the color, aroma, smell, and taste of the coffee.

Keywords: Coffee, roasting degree, arabica; robusta.

Electrospinning as a Method for Preparation of Dry Chickpea Yeast

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Chickpea yeast is a traditional type of yeast with its unique smell, taste and aroma. It is a foamy liquid obtained by fermenting some ground chickpeas and water at a certain temperature and time. The large-scale application of chickpea yeast is limited due to the need to re-prepare yeast before each use, which can be both time-consuming and labor-intensive. As a result, the readiness of chickpea yeast for use is vital for facilitating its easy and widespread application. Additionally, it is crucial to maintain viability of the microbial flora in chickpea yeast throughout processing and storage stages. Electrospinning is a simple and inexpensive method that does not require high temperatures. Therefore, the aim of this study was to adopt the electrospinning method for the transformation of fermented black chickpea liquid starter into dry product using pullulan and psyllium (Plantago psyllium L.). Black chickpea yeast was produced by adding 400 mL of water to coarsely ground black chickpeas and the mixture was left for spontaneous fermentation at 37 °C for 18 h. The pH and the lactic acid bacteria of chickpea liquid starter were determined. Pullulan and psyllium (Plantago psyllium L.) were used as polymers in the electrospinning of black chickpea starter. The solution concentration was kept constant at 20% (w/v). The electrospinning unit was set up horizontally, and processing parameters were maintained constant at a voltage of 15 kV, a distance of 24 cm between collector and needle and a solution flow rate of 1 mL/h. The morphology and chemical structures of dry electrospun chickpea yeast products were evaluated by scanning electron microscopy (FE-SEM) and Fourier transform infrared spectroscopy (FTIR). The viability of lactic acid bacteria within dry electrospun products was determined using plate count on de Man, Rogosa, and Sharpe (MRS) agar. The pH value and lactic acid bacteria count of black chickpea starter were 4.86-5.20 and 8.15 log cfu/mL after fermentation at 37 °C for 18 h. After fermenting at 37°C for 18 hours, the pH of the black chickpea starter varied between 4.86 and 5.20, while the lactic acid bacteria count was measured as 8.15 log cfu/mL. FE-SEM images indicate the presence of lactic acid bacteria within dry electrospun products. The lactic acid bacteria count within the dry electrospun product with/without psyllium was 8.23 and 8.30 log cfu/g, respectively. Electrospinning has been demonstrated as a novel technique for producing dry chickpea yeast while preserving lactic acid bacteria in black chickpea yeast starter. This allows for quick and convenient use prior to application.

Keywords: Electrospinning, black chickpea yeast, lactic acid bacteria.

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Investigation of Pickering Emulsion Stabilized with Whey Protein Isolate and Xanthan Gum by TD-NMR

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Time-Domain Nuclear Magnetic Resonance (TD-NMR) relaxometry is a powerful, non-invasive method to investigate the molecular interactions in food systems. Food systems usually show a multi-component relaxation behavior. Thus, generating a relaxation spectrum from a T_2 decay curve can be a great tool to examine the components by providing various information including the physical state of the water, interaction between the macromolecules, and water/oil contents. A relaxation spectrum can provide valuable information for analyzing digestion processes of complex food systems. A Pickering particle is a solid particle that stabilizes emulsions by adsorbing to the interface between two immiscible liquid phases, preventing them from coalescing. They are produced by various methods which involves the polymerization of monomers of different macromolecules leading to formation of new polymer particles. In this study, Pickering particles were produced by using whey protein isolate and xanthan gum with the aid of thermal treatment and high-pressure homogenization. Then, Pickering particles produced with different polysaccharide:protein (PS:PR) ratios (0.01, 0.02, 0.05, 0.10) were used in w/o emulsions containing 20% oil to investigate their stabilization properties. TD-NMR Relaxation measurement and particle size were used to characterize the emulsions, while T_2 relaxation spectra and confocal laser scanning microscopy (CLSM) were used to infer the presence of newly produced particles. Results of T_2 spectra confirm that new Pickering particles shows different relaxation time which proves that new particles were produced with these polymer protein combinations. It has been observed that emulsions stabilized by particles with PS:PR ratio of 0.01&0.02 cannot protect the stability over 28 days of storage. T_2 relaxation curve were fit to biexponential model to examine stability behavior of Pickering particles. Long and short components were interpreted to understand water-oil binding tendency of particles. These results are consistent with particle size measurements that increase during storage.

Keywords: Pickering emulsion, TD-NMR, T_2 relaxation spectra, stability mechanism.

Reduction of Microbial Load in Whey Using UV Raslysation Method and Sustainability Emphasis

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Sustainability is a crucial consideration in the food industry, necessitating the optimization of energy and resource utilization, waste reduction, and mitigation of environmental impacts. In line with these objectives, this study investigates the efficacy of the UV raslysation method as an alternative to conventional pasteurization techniques for reducing microbial load in whey, a by-product of cheese production. Whey and permeate serve as primary raw materials in this research. The UV raslysation process is proposed as a means of diminishing microbial contamination in whey. Parameters such as varying UV intensities, flow rates, and coil diameters are systematically explored in experimental setups. Subsequently, data from prototype trials are meticulously analyzed, focusing particularly on sustainability metrics. Experimental findings demonstrate the efficacy of the UV raslysation method in substantially reducing microbial load in whey. Moreover, comparative assessments reveal lower energy and water consumption vis-à-vis traditional pasteurization methods. The UV process exhibits a notable reduction in environmental footprints, thereby offering potential cost savings and operational efficiencies. The adoption of UV raslysation presents multifaceted sustainability benefits. By curbing energy and water usage and minimizing waste generation, this method aligns with broader industry goals of eco-efficiency. Furthermore, its reduced environmental impact underscores its potential as a sustainable solution within the dairy sector. Moving forward, efforts should be directed towards scaling up this technology for industrial deployment, considering factors such as equipment robustness and economic feasibility. Additionally, further research is warranted to optimize UV radiation parameters and elucidate their effects on microbial inactivation and product quality.

Keywords: Whey, UV raslysation, microbial load, sustainability, industrial application.

Development of Chickpea Milk and Citrus Fiber-Based Ice Cream: A Comparative Study with Cow Milk Ice Cream

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Ice cream is a nutritious food consumed by people of all ages worldwide. However, individuals who avoid animal products due to various health issues or different ethical values, such as vegans/vegetarians, cannot consume standard ice creams. In this context, milk and milk derivatives obtained from different plant sources can be used to produce many vegan products as well as ice cream and offer a wide variety of products to their consumers. This study aimed to develop a plant-based and nutritious ice cream alternative for the segment of the population who refrains from consuming ice cream due to various concerns. In addition, chickpeas, which are relatively low in cost and high in protein and fiber, were combined with citrus peel, rich in antioxidants and phenolic compounds, to give functional properties to the final product. To compare the quality characteristics of ice cream samples produced from chickpea milk and cow's milk, different dilution rates for chickpea milk and different emulsifier-stabilizer rates were applied for ice cream production. Boiled chickpeas were diluted with drinking water at ratios of 1:3 and 1:4, and the obtained chickpea milk was used as a base for ice cream production. The citrus fiber was added to ice cream samples (both cow milk and chickpea milk) at different ratios to increase the fiber content and improve melting properties. Changes in the bioactive characteristics of ice cream samples due to chickpea milk and citrus fiber were examined through DDPH and ABST antioxidant capacity analyses and total phenolic content (TPC) analyses. Some quality parameters such as overrun rate and melting properties were also analyzed in ice cream samples. The addition of citrus fiber to ice cream samples produced from chickpea milk positively affected their overrun. When sample groups were compared internally, the highest complete melting times for all groups were observed in samples containing citrus fiber; this shows that citrus fiber can be used to improve melting properties in ice cream production. It was observed that the increase in citrus fiber content in ice creams produced from both cow's milk and chickpea milk was directly proportional to the enhancement in antioxidant capacity and TPC. The higher antioxidant capacity and phenolic compound content in ice cream samples diluted at a ratio of 1:3 was obtained when compared to those diluted at a ratio of 1:4. Additionally, sensory evaluation results showed that the ice cream samples produced using chickpea milk were liked by the panellists and received similar scores as the control (cow milk) ice cream sample.

Keywords: Vegan ice cream, melting properties, overrun, antioxidant capacity, sensory evaluation.

Evaluation of the Relationship between Food Literacy and Eating Behaviors

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Food literacy is defined as an individual's capacity to acquire, interpret, and understand basic food and nutrition information and services, and to use this information and services in ways that enhance health maintenance. Individuals with adequate food and nutrition literacy levels are expected to possess fundamental knowledge about food and nutrition, comprehend information about food groups, read food labels, and demonstrate behavioral control over portion sizes. This study aimed to assess the importance that consumers place on food literacy and to determine how it influences their packaged food choices, considering their eating behaviors. The study involved 127 participants aged between 18 and 65. The questionnaire was conducted to collect data on whether participants read nutrition labels, the frequency of reading, which food groups they paid more attention to on the labels and their knowledge of certain nutritional information, attitudes towards label information, and knowledge about common ingredients in processed packaged foods. Statistical evaluation was carried out using the SPSS 27.0 statistical program. There was no statistically significant difference between label reading habits between gender or educational level ($p>0.05$), but significant differences were observed among BMI groups ($p<0.05$). Individuals who have bachelor's degrees were more likely to read labels compared to individuals with lower educational levels ($p<0.05$). Most of those who did not read labels cited "relying on past positive experiences, thus no need to read labels" (59%) as their reason. In contrast, those who read labels reported that it helped them make better food choices (40.9%). The study concluded that there is a need to educate the public on proper label reading and conscious consumption behaviors, develop policies that enable consumers to make healthier choices during shopping, and introduce innovations in labeling regulations based on identified dissatisfactions.

Keywords: Food label, food literacy, nutrition.

Preparation and Characterization of Film Based on Avocado Seed Starch and Chokeberry Pomace Extract

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In recent years, with the increasing environmental concerns caused by plastic packaging waste, interest in alternative bio-based materials instead of synthetic polymers has increased. Biodegradable films and coatings are considered promising alternatives to enhance the shelf life and eliminate quality losses of foods. Various compounds such as protein, cellulose, starch and lipid obtained from food industry by-products and wastes create sustainable opportunities for packaging films. Moreover, intelligent packaging is used to monitor the freshness of food during storage. Anthocyanin-rich extracts are pH sensitive and their addition to packaging films allows monitoring of the instantaneous condition and quality of packaged foods during storage. Despite its rich nutritional content, chokeberry (*Aronia melanocarpa*) cannot generally be consumed fresh due to its bitter taste and is processed into products. The fruit pomace remaining from the process is suitable for use in obtaining anthocyanin-rich extract. The study aims to prepare and characterize the pH-sensitive film based on avocado seed starch incorporating anthocyanin-rich chokeberry pomace extract. Avocado seed starch was isolated using sodium metabisulphite solution (0.2%, w: v). Ultrasonic extraction of the anthocyanin-rich extract was carried out from freeze-dried pomace using ethanol: water (50:50, v/v) as a solvent in 15 min. To obtain a film solution, avocado seed starch (5 g) was gelatinized in 100 mL distilled water at 90 °C and glycerol (25% of starch mass) was added. Chokeberry pomace extract was incorporated into the film solution at a ratio of 2.5%. Various physical, barrier, mechanical and nutritional properties of the produced films were analyzed. Films containing extract were thicker and denser. The addition of the extract increased the water solubility and water vapor permeability of the films and also changed their mechanical and optical properties. It was observed that films enriched with anthocyanin extract showed a color change between pink and blue when exposed to pH changes under acid, base and neutral conditions. With these results, it can be said that films containing avocado seed starch and *Aronia* pomace extract are suitable candidates for use in the packaging of perishable foods.

Keywords: Sustainability, avocado seed starch, chokeberry pomace, active film.

Effect of Thyme Essential Oil on Biofilm and Motility in Meat *Pseudomonas*

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Pseudomonas species are aerobic Gram-negative bacteria that cause spoilage of various foods stored at refrigeration temperatures, such as raw meat due to their proteolytic and lipolytic activity, resulting in bad taste, odor, and pigment secretion. Bacterial biofilm formation and bacterial motility play important roles in the spoilage-related activities of *Pseudomonas* species, one of the most important spoilage-causing bacteria in chilled raw meat. In this study, we aimed to determine the effect of thyme (*Thymus vulgaris*) essential oil on the motility and biofilm production abilities of meat-spoiling *Pseudomonas* species. For this purpose, meat-originated *Pseudomonas* isolates (n=100) were used. Quantitative biofilm formation of the isolates was measured using the crystal violet (CV) method in microtiter plates. Isolates producing high amounts of biofilm (YK8, YK50, YK107, YB43, YB91) were selected and the minimum inhibition concentration (MIC) of the isolates was determined using the agar dilution method. Then, to determine the effect of thyme essential oil on the spoilage activities of *Pseudomonas* isolates, biofilm production and bacterial motility tests of the isolates were performed using thyme oil with sub-MIC values of 1/2, 1/4, and 1/8. For the bacterial motility test of the isolates, twitching, swarming, and swimming motility were tested and the diameters of the formed zones were measured. The results showed that thyme essential oil significantly inhibited the motility and biofilm production of meat spoilage *Pseudomonas* bacteria.

Keywords: Meat spoilage, P*seudomonas*, biofilm, essential oil, motility.

Production of Fermentation Powders with Natural Antimicrobial Properties

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In recent years, lactic acid bacteria and their metabolites, which are commonly found in nature, have gained significant importance. They are of great importance for biopreservation as they produce a range of antimicrobial compounds such as hydrogen peroxide, lactic acid, acetic acid, low molecular weight compounds (diacetyl, fatty acids, reuterin), and bacteriocins. Studies have reported that metabolites produced by lactic acid bacteria inhibit various pathogens and biofilm formation. This study aimed to produce fermentation powders with a wide spectrum of antimicrobial activity ready for use in food systems. Milk powder was used as the carbon source, deactivated yeast as the nitrogen source, and glucose syrup as the sugar source for the fermentation medium. In the production of antimicrobial metabolites using food by-products, the PSC 15 strain was used, and the PSC 1 strain was used as an indicator microorganism. Optimization trials of fermentation conditions were carried out at the bioreactor scale. The variable parameters for optimizing fermentation conditions were the concentration of milk powder in the medium (3%-5%-7%), deactivated yeast concentration (1%-3%-5%), and glucose syrup concentration (1%-3%-5%). For the optimization of these experimental parameters, a total of 20 experimental runs were designed using the Central Composite Design method with the repetition of the center point 6 times, utilizing the Minitab program. All fermentations were carried out for 24 hours. Throughout the experiments, initial pH value, temperature, and stirring speed were kept constant. Antimicrobial activity results obtained from the 24th hour of each experiment in the design were used as the response, and using these results, optimum conditions were determined using the Minitab program. It was determined that antimicrobial activity varied between 289-1785 IU in the 20 different conditions tested in 24-hour fermentation experiments. Among the experiments conducted, the trial with the highest antimicrobial activity was identified as the one with 5% milk powder, 1% deactivated yeast, and 3% glucose syrup in the medium. As a result, the optimum conditions determined from the experiments were milk powder (6.803%), deactivated yeast (1.121%), and glucose syrup (1.119%).

Keywords: Antimicrobial activity, bacteriocin, fermentation, sustainability.

Establishment and Implementation of HACCP System in a Sample Chocolate Manufacturing Facility

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The chocolate industry is a continuously growing and evolving sector, with consumers' demands and expectations increasing every day. However, the secret to success in this industry lies not only in taste but also in ensuring food safety. With the rising awareness among consumers, food safety has become a top priority at all stages of the "farm-to-fork" food chain. Food safety is one of the fundamental priorities for chocolate production facilities, and effective management systems are necessary to ensure this priority. In this context, the Hazard Analysis and Critical Control Points (HACCP) system implemented in chocolate production facilities is the result of a scientific study involving steps such as identifying potential hazards, defining critical control points, establishing monitoring procedures, and developing control measures to prevent or control hazards. Through these efforts, it helps ensure the reliability of chocolate production and contributes to providing safe products. The main objective of this thesis is to identify potential hazards and critical control points in the chocolate production process, develop and implement an HACCP plan, and then evaluate the effectiveness of this plan. Additionally, this study will highlight the importance of food safety in the chocolate industry and identify the best practices for control measures in chocolate production facilities.

Keywords: HACCP, chocolate food safety, critical control points (CCP).

Development of a Functional Product with *Vitis Labrusca* (Isabella) Grapes Using 3D Food Printer

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In Turkiye, annual grape production is approximately 4 million tons, while the most abundant number of studies are on the *Vitis vinifera* varieties. In contrast, the composition of the Isabella grape (*Vitis labrusca*), colloquially known as fox grape, exhibits notable phenolic compounds and antioxidant properties and provides significant advantages for human health. Polyphenols represent a fundamental subset of phytochemicals, essential for plant defense mechanisms. Among these, resveratrol emerges as a significant compound, possessing potent antioxidant attributes, predominantly concentrated in the skins and seeds of the aforementioned aromatic grapes. Therefore, the aim of the paper is to determine the high amount of phenolic substances and antioxidant capacity contained in the *Vitus labrusca* grapes and to develop some functional products by using the 3D food printer. *Vitus labrusca* samples subjected to spray drying, and the samples obtained are extracted with 80% ethanol (Et), 80 % methanol (Met), and water (W) systems. Afterwards, the total phenolic content (TPC) and total antioxidant capacity (TAC) were determined, and results were given as gallic acid equivalents (GAE)/100 g and Trolox equivalent antioxidant activity (TEAC)/100 g. Then, the extracts obtained were quantified on an HPLC system with a PDA detector. A Fourier transform infrared (FT-IR) spectrometer was used. Functional snack products resembling pulp were developed utilizing grape pulp and raw materials in a 3D Food Printer. Data analysis entailed a One-Way Analysis of Variance (ANOVA) and Duncan at a significance level of $p < 0.05$ to present any differences among different techniques. According to the results, TPC of the Met, Et, and W extract of grapes skin and pomace was 4591.7± 123.8, 1526.8± 80.4, and 1685.1 ±79.1 GAE/100 g ($p<0.05$), respectively. On the other hand, the TAC for Met, Et, and W of the samples were 14271.6±1208.7, 17267.6 ±1139.3 and 1472.2±171.0 TEAC/100 g respectively ($p<0.05$). FT-IR reveals the chemical composition of the samples, which indicates 3306.47 cm^{-1} as O-H stretching, 2921.87 and 2852.98 cm^{-1} corresponding subsequently to C-H junctions and bonding, respectively. The IR bands observed at 1739.34 and 1607.31 cm^{-1} may be the C-O and C=O tension characteristics of carboxylic group of organic acids (tartaric, malic, and citric acids) in grapes. HPLC results revealed that Met extract contained, gallic acid, procethechuic acid, (-)-epicatechin, gentrinsic acid, rosmarinic acid, quercetin-3-O-galactoside, rutin and trans-resveratrol as the significant bioactives among with cyanidin-3,5-O-diglucoside and delphinidin-3-O-glucoside.

Keywords: *Vitis labrusca* grapes, grape pulp and skin, 3D food printer.

Role of Bioengineered Glucans for Physicochemical Characteristics of Cakes

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Recent interests in food science and technology together with consumer demands have increased the attention to finding novel carbohydrate structures to be used as biotickener as well as functional ingredients. One of the main carbohydrate sources for food technology is exopolysaccharides (EPS) produced by Lactic Acid Bacteria (LAB). Structurally, two types of EPSs are produced by LAB species as homopolysaccharides and heteropolysaccharides formed by only one type of sugar and two or more types of sugars, respectively. Homopolymeric EPSs have become popular in comparison to heteropolymeric ones for food technology due to their high yields and formation by only sucrose as substrate and glucans are the main homopolymeric EPSs. LAB species produce four types of glucans with their glucansucrase activities using cheap substrate sucrose and these glucans are dextran, alternan, reuteran, and mutan. The level of (α1→6)/ (α1→3)/ (α1→4)/(α1→2) linkages in glucan structure results in the formation of these glucans, and with the activity of glucansucrases distinct glucans with a variety of linkages, molecular sizes as well as physicochemical properties can be produced. Recently modification of glucans with the mutation in specific regions of glucansucrases has become a method of choice. In this study novel glucans were produced, structurally characterized, and importantly novel glucans were tested for their physicochemical characteristics of cakes.

Keywords: Glucan, glucansucrase, carbohydrate engineering, EPS.

Determination of Physicochemical Properties of Cocoa Fiber Obtained from Cocoa Processing by-Product

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Cocoa beans (*Theobroma cacao* L.) are the main raw material used in chocolate production. During the processing of cocoa beans, many by-products are produced. One of these is the cocoa bean membrane. The cocoa bean membrane can undergo many processes to obtain cocoa fiber.Two samples of cocoa fiber to be used within the scope of the study were obtained in two different specifications (alkaline/natural), and the other two samples, alkaline and natural, were obtained from brands commonly used in Turkey. In the study, the characterization of cocoa fibers and cocoa powders obtained from post-processing by-products was carried out with several physical analyses. In pH analysis, alkalized cocoa fiber 6,30, alkalized cocoa powder 6,40, natural cocoa fiber 5,36, and natural cocoa powder 5,44, and a correlation was observed between alkalized and natural. In color analysis, the L* value of alkalized cocoa fiber was 43.04 a* value 8.56 b* value 14.23, the L* value of natural cocoa fiber was 43.72 a* value 11.63 b* value 19.13, the L* value of alkalized cocoa powder was 32.79 a* value 13.20 b* value 15, 14 The L* value of natural cocoa powder was 44.75, a* value was 12.07, b* value was 20.47 and the highest L* (lightness) value was observed in natural cocoa powder and a big difference was observed between it and alkalized cocoa powder. In moisture determination, the average moisture content of alkalized cocoa fiber was 7.825%, 7.268% in natural cocoa fiber, 5.337% in alkalized cocoa powder, and 7.213% in natural cocoa powder. The moisture content of alkalized/natural cocoa fiber and natural cocoa powder were parallel. According to protein determination, alkalized cocoa fiber was 16.53%, natural cocoa fiber was 16.36%, alkalized cocoa powder was 26.95%, and natural cocoa powder was 28.78%. Protein ratios were grouped between cocoa powder and fiber. Water holding capacities were 4.17 g /water dw for alkalized cocoa fiber and 5.10 g water/g dw for natural cocoa fiber. 2.88 g water/g dw for alkalized cocoa powder and 3.14 g water/g dw or natural cocoa powder. Natural cocoa fiber/powder has a higher hush-holding ability than alkalized cocoa powder/fiber. Fat ratios were 5.89% for alkalized cocoa fiber, 4.6% for natural cocoa fiber, 12.77% for alkalized cocoa powder, and 16.00% for natural cocoa powder. Fat ratios showed a significant difference between cocoa powder and fiber.Significant similarities were obtained between cocoa powder and fiber in the analysis results. This result reveals that cocoa fiber, which enters our country depending on foreign currency and where cocoa production areas are shrinking in the world, may show substitution potential for cocoa powder in the present and near future.As a result of the results of the study, the use of cocoa fiber substitutes at certain ratios to cocoa powder in products such as cakes, biscuits, and spreadable chocolate, where cocoa powder is frequently used, should be investigated.

Keywords: Cocoa, sustainability, fiber, substitution, waste.

Effect of Cross-Linking on the Resistant Starch Content and Morphology of Rice Starch

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Starch can be divided into three major fractions based on enzymatic digestion in the gastrointestinal tract: (i) rapidly digestible starch (RDS), (ii) slowly digestible starch (SDS), and (iii) resistant starch (RS). The RS has been defined by EURESTA (European Food-Linked Agro-Industrial Research–Concerted Action on Resistant Starch) as the sum of starch and starch degradation products not absorbed in small intestine of healthy individuals. The RS is generally considered as a constituent of dietary fiber due to its similar physiological properties. The RS has positive health effects such as increasing laxative effect, reducing digestive tract cancers, lowering postprandial glucose response, preventing gall stone formation, lowering blood lipid levels, and increasing minerals absorption. There are five types of RS: physically inaccessible starch locked within cell walls and food matrixes (RS1), native granular starch (RS2), retrograded or crystalline non-granular starch (RS3), chemically modified starch (RS4) and amylose-lipid complex (RS5). Cross-linking represents a chemical modification method utilized to enhance the functional properties and stability of starch pastes during freeze-thaw cycles and cold storage. Moreover, research indicates that cross-linking starches using agents like STMP (sodium trimetaphosphate) or STMP-STPP (sodium tripolyphosphate) blend makes them resistant to digestion, thereby categorizing these modified starches as RS4. In this study, it was aimed to investigate the impact of cross-linking reaction using STMP-STPP on RS formation of rice starch. The relationship between digestibility and the structural and morphological changes occurs after cross-linking was also investigated.

Keywords: Dietary fiber, functional ingredient, resistant starch, rice starch, morphology.

Effects of Pretreatments on the Bioactivity and Functional Properties of Lupin Protein

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The rise in health concerns associated with meat consumption, including obesity, cardiovascular diseases, cancer, and Type-2 diabetes, has led to increased consumer demand for plant-based protein products. Legumes/pulses have gained research interest due to their nutritional/functional properties, offering benefits like dietary fiber, micronutrients, phytochemicals, and low-fat content. Lupin is an important legume crop for its protein-rich seeds (up to 44%) and can be used as an alternative protein source. Besides, lupins are considered highly sustainable crops due to their ability to be integrated into crop rotation systems with wheat, effectively replenishing nitrogen levels in the soil naturally. Lupin protein extraction relies on wet fractionation methods, and modification of protein using physical, chemical, or enzymatic methods can enhance their techno-functional characteristics, such as emulsification, foaming, and gelling. In this study, we aim to assess the effects of some pretreatments such as ultrasound, germination and fermentation on the bioactivity and functional properties of lupin protein isolates. Protein isolate (LPI) was obtained from pretreated lupin seed flour and the characteristics of the LPI samples were evaluated in terms of total phenolic content and antioxidant properties (TEAC), solubility, emulsifying activity index and emulsifying stability index, foaming capacity and foam stability. The LPI of fermented lupin seeds had significantly ($p<0.05$) the highest total phenolic content and TEAC value among the samples. Ultrasound treatment prior to protein isolation seems to be the most effective pretreatment for the enhancement of the emulsifying activity index of LPI samples. All pretreatments had significant ($p<0.05$) effects on the foaming properties of LPI samples. The findings of this study show that the techno-functional properties of lupin protein, as an alternative protein source, can be modified by carefully controlled pretreatments, resulting in desired end products.

Keywords: Lupin, protein isolate, fermentation, germination, ultrasound.

Expanding Bread Variety in Albania: Enriching Nutrient Content and Flavour with *Nigella Sativa L.*

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In recent years, there has been an increasing demand for healthier and more nutritious food options. Bread, being a staple in Albanian diets, is a prime candidate for diversification and enrichment with various ingredients that can enhance its nutritional value and taste profile. One such ingredient that shows promise in this regard is nigella sativa. Nigella sativa, also known as black seed or black cumin, has been used for centuries in traditional medicine and cuisine. It is known for its potent antioxidant and anti-inflammatory properties, as well as its high content of essential fatty acids, vitamins, and minerals. In this study, we aimed to explore the potential of nigella sativa in improving the nutrient and taste profiles of bread. In our experiments, we tested various concentrations of nigella sativa ground seeds, specifically at 1%, 2%, and 3% by weight of the flour used, to determine the optimal amount for enhancing the bread's nutrient profile and sensory attributes without compromising its structural and textural quality. To assess the impact of Nigella sativa incorporation on the rheological characteristics of dough, we performed a series of tests, including extensograph and alveograph measurements, sedimentation tests, and falling number determinations. The measurements of water absorption, dough development time, stability, and softening degree on the Farinograph device revealed no statistically significant variance between the flour containing ground nigella sativa seeds and the control. However, the energy value and extensibility determined on the Extensograph device decreased with higher proportions of nigella sativa seeds in the flour. Moreover, the protein and crude fiber content in the bread saw an increase with rising levels of ground nigella sativa seeds.

Keywords: Sustainable nutrition, enriching bread nutrient, nigella sativa.

The Impact of UV-C Light Application during Fermentation: Investigating the Synthesis of Vitamin D And Physical Quality Parameters in Bread Dough

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The food industry is continually researching and applying various technologies to enhance safety, improve quality, and enrich the nutritional content of food products. In recent years, the use of ultraviolet (UV) lights has particularly garnered attention for achieving these goals. In the food industry, UV-C lights are utilized on food surfaces, packaging materials, and production lines for various purposes, especially in reducing or preventing microbial contamination. UV-C light technology is also employed to increase the vitamin D content of specific food products. Yeasts and fungi contain a sterol called ergosterol in both fresh and processed forms. Under UV light, ergosterol converts into ergocalciferol, known as vitamin D2. This capability allows for the enhancement of vitamin D content in yeast and fungi. Several key factors affect vitamin D conversion, such as UV light exposure dosage, duration, distance of the applied surface from the light source, moisture content, and temperature. In this study, the effects of UV-C light exposure during fermentation on vitamin D synthesis and the physical quality parameters of bread dough fermented by yeast, which can be a source of ergosterol to be converted to vitamin D, were investigated. Four different UV doses (0.30, 0.60, 2.05, and 4.10 kJ/m^2) and two different temperature conditions (25 °C and 40 °C) were applied during fermentation using a UV lamp placed inside a built-in oven. Statistical analysis was conducted using a general linear model to optimize the UV-C exposure dose and temperature conditions (R^2= *0.9602*). It was observed that the vitamin D content in bread dough samples treated with UV-C varied significantly depending on the exposure dose and fermentation temperature ($p < 0.05$). While no vitamin D was detected in bread dough samples without UV-C exposure, varying amounts of vitamin D content were determined in bread dough samples exposed to UV-C, depending on the applied dose and fermentation temperature. The optimal exposure dose for UV-C treatment was determined to be 2.05 kJ/m^2 at a temperature of 25 °C. The determined optimal conditions were examined for the physical qualities of the dough samples, including color, moisture, and textural attributes, while their sensory qualities were evaluated based on visual characteristics and aroma profiles. As a result, no adverse changes were observed in the physical and sensory quality attributes when applying the UV-C dose of 2.05 kJ/m^2 at a temperature of 25 °C to the bread dough samples. Thus, an increase in the content of vitamin D2 was achieved in the bread dough without causing detrimental alterations in quality attributes based on the UV-C exposure conditions.

Keywords: Ultraviolet light, vitamin D, ergosterol, yeast, bread dough.

Extraction of Protein Concentrate from Sunflower Meal: Comparative Analysis of Enzymatic, Ultrasound Assisted and Combined Methods

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The rising global population, coupled with concerns about food security, veganism, and sustainable practices, has propelled alternative proteins into the spotlight as a popular and critical topic. Research on this subject involves the identification of alternative sources (such as plants, microalgae, or insect proteins), the development of new extraction procedures, or the improvement of existing methods. Alkaline and enzymatic extraction are the most commonly used methods to obtain protein concentrate. However, innovative extraction methods such as ultrasound and microwave combined with alkaline and enzymatic methods need further investigation. Besides, raw material-specific optimization studies are also needed to obtain satisfactory results in terms of both cost and high yield. This study aims to investigate how alkaline and enzymatic extraction and innovative and combined extraction methods affect the extraction of protein concentrates from sunflower meal. To fulfill this aim, four different extraction methods were used: enzymatic (EE), enzyme-assisted alkaline (EAAE), ultrasound-assisted enzymatic (UAEE), and ultrasound-assisted alkaline (UAAE) extraction. In addition, the enzyme effect was also investigated by using two different enzymes (Viscozyme® and Alcalase®) in enzyme-containing extraction methods. After extraction by individual methods, protein concentrates were obtained by isoelectric precipitation. Then, the protein yields obtained by each extraction method were analysed. Accordingly, 22-26% extraction yields were obtained in all extractions, while values between 23-75% were obtained in terms of precipitation yield. The highest protein extraction yield was observed in the extraction with EAAE method using alkalase enzyme with 26.4%, while the precipitation yield of this batch was low (31.9%). The best precipitation efficiency was observed in UAAE method with 75%. When the results of the study were analysed, it was observed that although good results were obtained in terms of extraction efficiency, the precipitation efficiency was low and the proteins at the supernatant in soluble form could not be precipitated. It is considered that this may be due to the presence of enzyme. However, further research is needed to explain this phenomenon. In conclusion, the results of this study highlight the significant impact of extraction methods and enzymes on the yield and quality of protein concentrates from sunflower meal. Additionally, the study revealed variations in the isoelectric point, color, and purity of the protein concentrates across different extraction methods, underscoring the importance of method selection in achieving desired product characteristics. These findings contribute to the ongoing efforts in optimizing protein extraction processes for sustainable and efficient utilization of alternative protein sources.

Keywords: Protein extraction, alternative proteins, enzymatic extraction, ultrasound-assisted extraction, protein concentrate.

Gummy Confectionery Drying Optimization

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Some issues related to jelly and gummy candies can be associated with errors or problems occurring in starch mogul processes. The main variables for this process include the properties of the starch used, as well as temperature and time. This process is critical for the final product quality and stability. For instance, gummy and jelly candies exhibit a wide range of textural properties, ranging from soft and easily bitten to hard and difficult to chew. Primarily, the characteristic textural properties of these candies are associated with the hydrocolloid used and the moisture content in the composition. The final product's moisture and texture can be directly influenced by mogul conditions. The type of hydrocolloid used for confectionery should also be considered in determining temperature and time. In this study, the changes over time (24, 28, 30, 32, and 36 hours) in some physicochemical (water activity, total solids, and pH), color (L*, a*, b*, chroma, hue angle), and texture (hardness, springiness, cohesiveness, gumminess, chewiness, and resilience) properties during the mogul process were investigated in samples prepared using different hydrocolloids (gelatin-starch mixture and gelatin). No significant changes over time were determined in surface gloss (L*), pH, and water activity properties for both sample groups. The critical values for characterization of gummy and jelly candies, hardness, and total dry matter, increased ($P>0.05$). The changes in springiness and gumminess properties were found to vary depending on the hydrocolloid used. Linear and/or polynomial models with high R^2 (>0.900) values of 0th, 1st, and 2nd degree were determined particularly for springiness, hardness, and total dry matter properties in the kinetic modeling of these parameters. The models obtained from the study can be used in the production of jelly and gummy candies with different hardness and total dry matter amounts. Moreover, production efficiency can be increased by utilizing these models for optimization.

Keywords: Confectionery, gummy, drying, optimization.

A Perfect Integrated Option According to the Zero-Waste Approach: Spent Coffee Grounds

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Coffee is one of the most consumed food products in the world. Some by-products and/or waste products are formed during coffee production. When examined quantitatively and qualitatively, one of the most striking among these waste products is spent coffee grounds. Spent coffee grounds are defined as the residue produced after the coffee brewing process. Approximately 6 million tons of spent coffee grounds are released annually worldwide. Spent coffee grounds are rich in polysaccharides, proteins, phenolic compounds and dietary fibers. In recent years, due to its rich composition, coffee industry waste has attracted great attention from the food and chemical industries, both for economic reasons (due to the desire of businesses to utilize spent coffee grounds, which are waste products) and within the scope of the zero waste project. Interest in transforming coffee grounds into a product with high added value is rapidly increasing. These by-products are advantageous due to their dry and powder form along with their strong physiochemical properties, making them an excellent integrated biorefinery option according to the "zero waste approach". Spent coffee grounds consist of neutral detergent fiber (45.2%), formed as a compound related to hemicellulose, cellulose and lignin, and acid detergent fiber (29.8%), composed of cellulose and lignin. Another of the most valuable properties of used coffee grounds is their high content of antioxidants and phenolic compounds such as chlorogenic acid, caffeine and flavonoids. Therefore, considering these parameters, the recovery of coffee processing by-products is compiled as being of great importance for the circular economy and serving the trends of modern society in the reuse, recycling and appropriate waste management of an economically efficient material.

Keywords: Spent coffee grounds, green transformation, zero waste, economic gain.

Quality Propertieso Artisanal Hibiscus Kombucha Beverages

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Kombucha is a fermented beverage with a slightly acidic taste, flavor, and natural fizziness. Kombucha has gained acceptance from consumers due to its health benefits such as antioxidant, anti-microbial, anti-carcinogenic, and antidiabetic properties. The beverage is made from sweetened tea which is added to a culture of symbiotic combination of yeasts and bacteria (Scoby), and common fermentation takes place several days depending on the initial culture. Traditional kombucha is made with black tea and sucrose is generally added to sweeten the beverage and to serve as a sugar source for the microorganisms. Today, kombucha products do not have a standard composition due to the variation in ingredients and fermentation conditions, hence there is an innovation opportunity in the development of these beverages. Since there is a growing consumption demand in the food market it is valuable to try different ingredients in the formulations and to investigate the quality parameters for the standardization. Therefore, it was aimed to examine the quality properties of artisanal kombucha beverages prepared with hibiscus tea sweetened with sucrose and apple juice concentrate. Brix, color, pH, and sensory parameters were analyzed as the quality characteristics of kombucha samples during fermentation. Appearance, smell, carbonation, mouthfeel, and overall taste were evaluated in the sensory evaluation. A decrease in pH and brix was observed after fermentation of 3 days at 20-23°C. Colour L, a, and b values of kombucha samples were measured as 1.65, 0.07, and 0.17 for the sample with sucrose and 1.27, 0.16, and 0.08 for the sample with apple juice concentrate. The beverage fermented with apple juice concentrate had higher smell, carbonation, mouthfeel, and overall taste scores with respect to the kombucha formulated with sucrose whereas both samples had similar scores in terms of appearance. According to the results, hibiscus tea in combination with apple juice concentrate can be recommended for an innovative kombucha formulation in terms of quality and sensory properties.

Keywords: Kombucha, quality, fermented beverage, hibiscus, product development.

Encapsulation and Diffusion Characterization of Eucalyptus Oil Using Low and High Methoxyl Pectin

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Eucalyptus, an essential oil, has an unstable structure and is highly susceptible to degradation when exposed to environmental stresses such as oxygen, temperature, and light. Encapsulation of eucalyptus oil can be highly effective in overcoming these problems (such as heat, moisture, light, and pH) and providing controlled release of the components. For this reason, eucalyptus oil, which has strong antiviral, anti-inflammatory, antimicrobial, antibacterial, and antifungal effects, was used as a core material in the production of microcapsules. While 10% eucalyptus oil is used in all productions, the wall material is designated as 2% alginate, 2% alginate + 1% low methoxyl pectin (LMP), 2% alginate + 1% high methoxyl pectin (HMP), 2% alginate + 2% LMP, and 2% alginate + 2% HMP. The encapsulation process was carried out by dripping the prepared core and wall material mixture into a 2% (w/v) calcium chloride ($CaCl_2$) solution. Encapsulation efficiency, loading capacity, diffusion rate and kinetics, FTIR, particle size, and color analysis of the capsules prepared within the scope of the study were determined. Encapsulation efficiency varied between 77.63% and 87.48%. The highest encapsulation efficiency was achieved with 2% LM + 2% alginate wall material. Furthermore, the results revealed that the capsule with the highest loading capacity (30.71%) was the 2% alginate sample, whereas the 1% LM + 2% alginate sample had the lowest loading capacity (27.35%). Based on the FTIR analysis results, it was determined that the eucalyptus oil sample used had three peaks in each sample with an average wavelength of 526 cm^{-1}, 552 cm^{-1}, and 1098 cm^{-1}. Additionally, it was observed that the diameters of eucalyptus microcapsules varied between 1.38±0.16 mm and 1.49±0.12 mm. Based on release diffusion data, 1% LM + 2% alginate wall material was found to be more effective in terms of microencapsulation stability at two different temperatures (25 and 35°C). At both temperatures, samples encapsulated with 1% HM + 2% alginate wall material achieved the highest level of release. The capacity to gel over a wider pH range and form ionic linkages with carboxyl groups explains the superior effectiveness of LM pectin as a wall material. In the eucalyptus oil encapsulation process using the ionic gelation method, it was found that LM pectin produced excellent wall material formation with its synergistic interaction with alginate.

Keywords: Encapsulation, innovation, microcapsules, eucalyptus, pectin.

Separation of Anthocyanin Compounds Using Ultrafiltration from Black Carrot Juice

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Black carrot (*Daucus carota*) juice is a significant source of anthocyanin and exhibits high antioxidant activity. Furthermore, black carrot juices have a high acylated anthocyanin content (40% on average), making it one of the most important natural colorants in the food industry. This study aimed to determine the effect of fractionation by ultrafiltration on the chemical properties of black carrot juice. Three different black carrot juice fractions [permeate of 50 kDa membrane (F50P), permeate of 5 kDa membrane (F5P), and retentate of 50 kDa membrane (F5R)] were obtained using ultrafiltration membranes at different molecular weight cut-off ranges (50 and 5 kDa). These fractions were then heat treated at different temperatures (80, 90, and 100°C), and the degradation kinetics of total monomeric anthocyanin, color, and antioxidant activity (DPPH, FRAP, and CUPRAC) were calculated. As a result of these analyses, the most effective fraction in providing anthocyanin, color, and antioxidant stabilization was determined. Results showed that the decrease in the total monomeric anthocyanin content, antioxidant activity and colour values (L*, a* and b*) of all fractions followed second-order kinetics. The anthocyanin degradation rate constant (k) of different fractions was determined in the range of 0.00018-0.00264 $mg/L^{-1}.min^{-1}$, and the k value of the F50P sample was found to be higher. The colour degradation rates of the fractions were observed in the range of 0.00015-0.00035 for the L* value, 0.00003-0.00117 for the a* value and 0.00356-0.01048 for the b* value. The degradation of L* and a* values was the fastest in the F5R sample, and the degradation of the b* value was the fastest in the F50P sample. The degradation ranges of the antioxidant activities of the samples were calculated as 0.00032-0.00192 mg $TE/L^{-1}.min^{-1}$ for DPPH, 0.00005-0.00051 mg $TE/L^{-1}.min^{-1}$ for CUPRAC and 0.00019-0.00204 mg $TE/L^{-1}.min^{-1}$ for FRAP. The antioxidant degradation rate of the F5P sample was higher in comparison to other samples. The activation energy for anthocyanin degradation of samples was the lowest (7089.21 kcal/mol) in the F5P sample and the highest (15075.84 kcal/mol) in the F5R sample. The activation energy for the degradation of L*, a* and b* values of different fractions was calculated in the range of 1206.21-8323.26 kcal/mol, 5957.87-9862.15 kcal/mol and 375.44-5489.61 kcal/mol, respectively. The activation energy required for the degradation of the color in the F5R sample was determined to be the lowest compared to other samples. The activation energy for the degradation of the antioxidant activities of the samples was calculated in the range of 3943.16-7245.68 kcal/mol for DPPH, 5800.76-17608.47 kcal/mol for CUPRAC and 6205.43-12877.09 kcal/mol for FRAP. It was found that the DPPH antioxidant activities of the F5R sample and the CUPRAC and FRAP antioxidant activities of the F50P sample were more sensitive to temperature changes. It has been determined that activation energy increases with increasing temperature.

Keywords: Black carrot juice, anthocyanin, ultrafiltration, thermal stability, sustainability.

In Vitro Glycemic Index, Antioxidant Capacity, and Sensorial Properties of Breads Enriched with Broccoli Sprouts

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Germination is a concept that has become popular in recent years and can contribute to sustainable nutrition. It is a cheap and easy method to increase the nutritional value of plants. Plant sprouts, in particular, attract the attention of consumers as they are healthy ready-made foods in many countries. Broccoli (Brassica oleracea) sprouts are popular cabbage vegetables that exhibit anti-microbial, anti-cancer, anti-inflammatory and also anti-obesity activities. However, it has a specific odor and taste due to its glucosinolate content, which affects its consumability. Bread is considered safe not only in Turkish society but also all over the world. Despite the high antioxidant content and possible health benefits of broccoli sprouts, their consumption can be increased by adding them to bread, considering that their consumption is low due to their pungent smell and taste. The aim of this study is to investigate the glycemic index, total phenolic, flavonoid contents, antioxidant capacity and sensory properties of the breads enriched with fresh and freeze-dried broccoli sprouts. Broccoli was sprouted using a home germination system. Some of the sprouted broccoli was freeze dried. The bread was made with organic wheat flour consisting of fresh and freeze-dried broccoli sprouts. Total phenolic and flavonoid contents, *in vitro* glycemic index and antioxidant capacity of the bread samples were determined. Sensory analyzes of the breads were also performed. Enrichment of organic bread with fresh broccoli and freeze-dried broccoli sprouts significantly increased the total phenolic and flavonoid contents and antioxidant capacities (ABTS, DPPH and FRAP assays) of the breads, especially organic bread enriched with freeze-dried broccoli sprouts ($p<0.05$). Glycemic index values of the bread samples vary between 69.8 and 73.4. Broccoli-containing breads showed an increased green hue and a higher crust and crumb color intensity ($p < 0.05$). The overall acceptance and appearance of the breads were not affected by the addition of fresh broccoli and freeze-dried broccoli sprouts ($p>0.05$). Our results show that sprouting increases the antioxidant capacity and decreases the glycemic index, and freeze-dried sprouted broccoli further enhances these effects. The results obtained here may open new opportunities for food processors and sustainable nutrition.

Keywords: Sustainability, germination, broccoli, freeze-drying, bread.

Potential Probiotic Characterization of NBC- Lacticaseibacillus Casei CK9193 and Lactobacillus Strains Isolated from Fermented Turkish Traditional Beverage Shalgam

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Probiotics are live and non-pathogenic members of the healthy gastrointestinal microbiota that, when taken in adequate amounts, have health benefits such as regulating the immune system, reducing hypertension, lowering cholesterol and preventing diarrhea. Lactobacillus is the most common lactic acid bacteria that is gram-positive, facultatively anaerobic or microaerophilic, road-shape and non-spore-forming. Recently, there has been an increased interest in the consumption of foods and beverages containing probiotic bacteria, which are known to be beneficial to health. Shalgam is a traditional Turkish beverage with probiotic-rich content produced by lactic acid fermentation. This study was conducted to determine the potential probiotic properties of lactic acid bacterial strains isolated from shalgam through characterization analysis. In this study, lactic acid bacteria strains were analyzed for catalase test, beta galactosidase activity, hemolytic activity, low pH tolerance, bile salt resistance and adhesion to intestinal epithelial cells. All bacterial strains were found to be tolerant to pH 2 and pH 3. *Lacticaseibacillus casei* strain CK9193 was determined to be the most resistant strain at pH 2 and pH 3 conditions. The bacterium showing the highest resistance to bile salt at 0.3% and 2% concentrations was *Lacticaseibacillus casei* strain CK9193, while the bacterium showing the lowest resistance to bile salt at 0.3% concentration was *Lactobacillus fermentum* strain NUV568 and the strain showing the lowest resistance to bile salt at 2% concentration was *Lactobacillus buchneri* strain NUV667. It has been observed that the adhesion rate of bacteria to Caco-2 intestinal epithelial cells varies between 75% and 95%. As a result, it was observed that the lactic acid bacterial strains found in this study had high probiotic potential.

Keywords: Probiotic, *Lactobacillus*, shalgam, NBC, Caco-2 cells.

Use of Taguchi Method in Optimization of Food Production

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In industrial applications, it is important to use optimization methods such as the Taguchi method in order to reduce time, money and quality losses. The Taguchi method suggests that quality losses begin with deviation from the target, and that preventing this loss and producing products at the desired target value is only possible with a good design. The Taguchi method is a statistical technique that has recently been applied in the fields of engineering, marketing, advertising and biotechnology. In this review, the Taguchi method and the applications and research on the use of the Taguchi method in the food production process are summarized. Areas of use of the Taguchi method in the food industry include reducing costs, increasing product quality, product development, saving time in production, extending the shelf life of the product, ensuring process stability and flavor profile optimization. Examples of studies where the application of the Taguchi method in the food industry has been successful include creating the optimal gluten-free spaghetti product, minimizing the processing time in the sugar-coating process, determining the production factors of dried strawberries and optimizing in kefir grain production. As can be seen, the Taguchi method can be applied in many different areas in industry. These research results reveal that the Taguchi method is an effective method that can be used for process optimization of industry. However, it has been concluded that research on the applications of the Taguchi method in food engineering is limited, and as a result of further studies on the more effective use of this method, more accurate evaluations of its usability in food production processes can be made.

Keywords: Taguchi method, optimization, experimental design, food applications.

Assessment of Herbal Extracts Against Drug-Resistant Bacteria: Minimal Antimicrobial Concentrations and Formulation of Effective Mixtures

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Antibiotic resistance is on the rise among bacteria, posing significant challenges in treating infections and increasing the development of bacterial resistance with each new antibiotic introduced. Pathogens such as methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococci*, carbapenem-resistant *Acinetobacter baumannii*, cephalosporin-resistant *Klebsiella pneumoniae*, *Escherichia coli*, and *Proteus mirabilis* can lead to severe infections, including sepsis. This study aims to assess the minimal antimicrobial concentrations of aqueous extracts from various plants—*Salvia officinalis* L., *Myrtus communis* L., *Laurus nobilis* L. (Berry), *Laurus nobilis* L. (Leaf), *Hypericum perforatum* L., *Origanum onites* L., *Origanum* sp., *Origanum vulgare* L., *Sideritis*, and resveratrol extracted from *Polygonum cuspidatum*—against drug-resistant bacteria and to formulate the most effective mixtures. Aqueous extracts were obtained from these plants, and their minimal inhibition concentrations (MIC) against drug-resistant bacteria were determined. The optimal mixture of plant extracts was identified using the response surface method (RSM), and its inhibition effectiveness against drug-resistant bacteria was tested on glass surfaces. The study demonstrated that plant extracts exhibited inhibitory effects on bacteria at varying concentrations (ranging from 0.05% to 6%). Methicillin-resistant *Staphylococcus aureus* showed sensitivity to herbal extracts among drug-resistant bacteria, while only resveratrol displayed inhibitory effects on *Escherichia coli*, *Acinetobacter baumannii*, and *Klebsiella pneumoniae ssp pneumoniae*. Notably, *Myrtus communis* L., *Salvia officinalis* L., and resveratrol exhibited the highest inhibition effects among the herbal extracts. Utilizing the RSM, an effective mixture comprising 0.05% *Myrtus communis* L., 0.5% *Salvia officinalis* L., and 0.5% resveratro*l* was identified against drug-resistant bacteria, completely inhibiting bacterial concentrations of 5 log CFU/mL on glass surfaces. These findings suggest that herbal extracts can be utilized to inhibit drug-resistant bacteria causing serious infections, with the *Myrtus communis* L., *Salvia officinalis* L., and resveratrol mixture serving as a natural antimicrobial blend for surface disinfection.

Keywords: Antibiotic resistant microorganisms, medicinal plants, antimicrobial activity.

Production of Plum Snack Enriched with Chaste Tree (*Vitex Agnus Castus*) Extract by Vacuum Impregnation Technology

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Nowadays, there has been an increase in studies focused on the investigation of the effects of phenolic compounds, due to their powerful antioxidant properties and various health benefits. Vacuum impregnation (VI) is a technique that can be used to enhance the nutritional content of fruits by infusing bioactive components into the impregnating solution. This innovative method helps to produce fortified food products with advanced quality, extended shelf life, improved sensory attributes, and enhanced nutritional value. Plums, scientifically known as *Prunus domestica*, are a rich source of pectins, carotenoids, phenolic compounds, and organic acids. Plum has gained significant popularity as a healthy snack. Research on plums has consistently reported promising findings regarding their anti-inflammatory, antioxidant, and memory-enhancing properties. The growing interest in plum research can be primarily attributed to their abundant phenolic content, which is well known for their natural antioxidant properties. *Vitex agnus-castus*, commonly referred to as chaste tree, contains various bioactive compounds, including iridoids, diterpenoids, flavonoids, and phenolic compounds. These compounds give Vitex extract anti-inflammatory, antibacterial, antifungal, antimicrobial, antioxidant, and anticancer properties. As a result, Vitex has become a subject of interest in scientific research. The present study investigated the enrichment of plums with Vitex extract using VI technology. The optimization of process parameters, including vacuum level, temperature, and time, was performed using Response Surface Methodology (RSM). Based on the findings, functional plum snacks were produced under optimal conditions, with a vacuum level of 280 mbar, temperature of 40 °C, and process time of 1 hour. These findings have significant practical implications for producing functional food products with desirable nutritional and health benefits. Quality analyses such as total soluble solids, color, pH, titratable acidity, moisture content, water activity, total phenolic content and antioxidant activity, total viable count, and yeast and mold counts of functional plum snacks were determined after production. As a result, plum snacks enriched with Vitex extract have a total phenolic content of 695.8 mg GAE/g, an antioxidant capacity of 70.9% (ABTS), and 36.5% (DPPH). Following national regulations, the microbiological findings were determined to be within acceptable parameters. Panelists provided high acceptability scores for the plum snacks, indicating their potential as innovative fruit snacks in the food industry.

Keywords: Plum snack, *Vitex agnus castus* extract, vacuum impregnation, quality characteristics

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Evaluation of Black Cumin Seed (Nigella Sativa L.) Supercritical CO_2 Extracts for Thymoquinone and Fatty Acid Composition

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Black cumin seed (*Nigella sativa* L.) was evaluated for its thymoquinone content and fatty acid composition through supercritical CO2 (SCO_2) extraction. The SCO_2 extraction parameters included three different temperatures (45°C, 55°C, 65°C) and two different pressures (300 bar and 500 bar). The thymoquinone content in the extracts obtained from SCO_2 extraction ranged from 30.60 to 90.17 mg/g. The extract with the highest thymoquinone content (90.17 mg/g) was obtained with 300 bar at 45°C, while the lowest thymoquinone content (30.60 mg/g) was observed with 500 bar at 65°C. When evaluating the fatty acid composition, palmitic acid and linoleic acid were detected in all samples, but their amounts varied. The palmitic acid (C16:0) content in the extracts ranged from 11.68% to 26.01%, with the highest level observed in extracts obtained at 300 bar and 45°C. Linoleic acid (C18:2n6c) content varied between 34.51% and 58.08%. The oleic acid content ranged from 19.14% to 24.62%, but it was not detected in the sample with 300 bar and 55°C. Palmitoleic acid (C16:1 Δ9) was found in three samples (parameters: 300 bar-55°C, 300 bar-65°C, and 500 bar-65°C), with the highest value of 11.77% in the extract obtained at 300 bar-55°C. Tridecanoic acid (C13:0) was found at 13.16% with 300 bar-55°C and 0.51% with 300 bar-65°C but was not detected in other samples. Pentadecenoic acid (C15:1 cis-10) ranged from 0.30% to 1.12% but wasn't detected with 300 bar-55°C and 65°C. Heptadecanoic acid (C17:0) was 12.29% and 0.54% at 300 bar with 55°C and 65°C, respectively, but wasn't found in other samples. Heptadecenoic acid (C17:1 cis-10) was detected only at 300 bar and 65°C (0.57%). Stearic acid (C18:0) was between 3.21% and 3.46%, except for at 300 bar-55°C, where it was not detected. Elaidic acid (C18:1n9t) was found at 0.32% in 500 bar-45°C and 500 bar-55°C but wasn't detected in other samples. Vaccenic acid (C18:1n7) was 1.21% at 300 bar-45°C and 16.59% at 300 bar-55°C. Arachidic acid (C20:0) was 0.56% at 500 bar-55°C, and eicosenoic acid (C20:1n9) was 0.60% at 500 bar-65°C, but these were not found in other samples. In conclusion, the results showed that changes in the SCO_2 extraction parameters significantly affected both the thymoquinone content and the fatty acid composition of the extracts. The variability in these compositions was attributed to changes in solvent polarity due to the different SCO_2 extraction conditions.

Keywords: Black cumin, fatty acid composition, *Nigella sativa* L., supercritical CO_2 extraction, thymoquinone.

Production of Low-Fat Mayonnaise with the Interaction between Citrus Fiber and Hydrocolloid Gums

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This study investigates the potential utilization of citrus fiber (CF) as a stabilizer to enhance the microstructural, emulsion, and oxidative stability of low-fat mayonnaise. The investigation focused on analyzing the rheological parameters, flow behavior, viscoelastic properties, and 3-ITT characteristics of the mayonnaise samples to evaluate their rheological properties. All samples exhibited shear thinning, solid-like behavior with viscoelastic properties and recoverable characteristics. The flow behavior index (n value) and consistency index parameter (K value) of the Power Law model varied from 0.115 to 0.763 and 0.056 to 363.277 Pa.sn, respectively. The samples prepared from the interaction of fiber and gums (Arabic gum (AG), guar gum (GG), and xanthan gum (XG)) showed lower n and higher K values, meaning that using citrus fiber improved shear-thinning properties of low-fat mayonnaise. The K value of samples of low-fat mayonnaise exhibited a positive correlation with the increasing concentration of citrus fiber. The low-fat mayonnaise samples created with 1% AG-3% CF, 0.5% GG-2% CF, and 0.35% XG-2% CF exhibited higher K′ and K″ values compared to the low-fat control sample. This increase can be attributed to the synergistic impact of CF with AG, GG, and XG. When the oxidative stability of the mayonnaise samples was assessed using the OXITEST method, it was shown that the samples created with CF exhibited higher IP values compared to the samples made with low-fat and high-fat control. The findings of this study demonstrated that the rheological properties, emulsion and oxidative stability, and microstructural characteristics of mayonnaise samples can be notably affected by the interaction between CF and AG, GG, and XG.

Keywords: Citrus fiber, mayonnaise, gum, emulsion and oxidative stability, microstructural properties.

Metal-Organic Frameworks-Based Biosensors for Food Safety

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Metal-organic frameworks (MOFs) possess unique physical and chemical properties due to their crystalline structure and internal pores. In recent years, there has been great interest in MOFs owing to their characteristics such as large surface area, tunable functionality, and excellent stability. MOFs are composed of metal ions and organic ligands, offering versatility in combining various metal ions and ligands to form a wide range of combinations. They can be synthesized through various methods including electrochemical, hydro/solvothermal, mechanochemical, microwave-assisted heating, and sonochemical processes. MOFs find applications as fillers in food packaging, sensors for pollutants, controlled release systems for active compounds, and in designing complex nanocomposite materials. The ease of modification and large surface area of MOFs make them a good nanocarrier for receptors and signal transduction elements. The high catalytic activity, electrochemical activity, and stable luminescence of MOFs enhance the design and facilitate the application of biosensors. Biosensors are analytical tools or devices capable of converting specific biological responses into quantifiable signals. Biosensors consist of a receptor and a transducer that specifically recognize the biomarker of interest. The analyte interacts with the bioreceptor, generating a signal. The transducer then converts this signal into a measurable form. Biosensors have a wide range of applications in the fields of forensic medicine, environment, diagnostics, food, and health sciences. Sensitivity and selectivity are critical for biosensor applications. Biosensors use specific molecular recognition elements to detect analytes within complex matrices. Enzymes, aptamers, peptides, bacteriophages, and antibodies are among the various biomolecular sensing elements used in food safety analysis. The literature review revealed that biosensors have been developed for detecting heavy metals, pesticides, pathogenic bacteria, patulin, and lactose in foods using different metal-organic frameworks (MOFs). The study highlights that MOFs are promising support materials for these biosensors, suggesting opportunities for further development and application. Additionally, the incorporation of nanocarriers enhances the selectivity and sensitivity of biosensors, suggesting that metal-organic framework-based biosensors may offer more accurate and reliable results in food analysis.

Keywords: Metal-organic framework, biosensor, food safety.

Effect of Different Salt Concentrations on the Metagenomic Profile of Brined Cabbage

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The fermentation process allows fruits and vegetables to be preserved and increases their biological value. Cabbage is one of the products consumed by fermentation. In this study, the bacterial composition of brined cabbage prepared with different salt concentrations was examined using the 16S rRNA next-generation gene sequencing method. At the same time, some physicochemical changes that occurred during the fermentation process were also followed. The brine salt concentration was prepared as 2%, 5%, and 8%, and the fermentation of the cabbage was monitored at regular intervals for 21 days. During the fermentation process, pH value, % Total Acidity, % Salt Content and L*, a*, b* color values were measured. While the pH value of the medium in cabbage fermentation was in the range of 8.89-8.65 in the first days, the average pH value was found to be 3.84 on the 21st day. Bacterial composition was determined by sensory analysis and metagenomic methods on the 21st day of fermentation. It was observed that the bacterial composition was dominated by *Proteobacteria* phylum with a rate of 49.64% at low (2%) salt concentration. It was determined that the *Firmicutes* phylum dominated in the samples where the salt concentration was optimum (5%) and high (8%). The observed microorganism genera are *Yersiniaceae, Leuconostoc, Lactiplantibacillus, Weissella,* and *Levilactobacillus*. While *Yersiniaceae* (44.70%), *Leuconostoc* (44.28%) microorganism genus were dominant at optimum salt concentration, *Yersiniaceae* (48.54%), *Lactiplantibacillus* (30.55%) microorganism genus were dominant at low salt concentration. At high salt concentration, it was determined that *Yersiniaceae, Weissella,* and *Levilactobacillus* microorganism genus were dominant, while the development of *Leuconostoc* and *Lactiplantibacillus* microorganism genus was suppressed. In terms of bacterial composition, it was determined that samples with low salt concentrations contained some pathogenic microorganisms. Higher salt concentrations make the fermentation environment safer. However, considering the sensory evaluations, samples with a 5% salt concentration were accepted by the consumer. Investigating the bacterial composition of pickled cabbage is also important to improve food quality and sustainability.

Keywords: Bacterial composition, cabbage, metagenomic profile, brine, salt concentration.

Expanding Bread Variety in Albania: Enriching Nutrient Content and Flavour with *Nigella Sativa L.*

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In recent years, there has been an increasing demand for healthier and more nutritious food options. Bread, being a staple in Albanian diets, is a prime candidate for diversification and enrichment with various ingredients that can enhance its nutritional value and taste profile. One such ingredient that shows promise in this regard is nigella sativa. Nigella sativa, also known as black seed or black cumin, has been used for centuries in traditional medicine and cuisine. It is known for its potent antioxidant and anti-inflammatory properties, as well as its high content of essential fatty acids, vitamins, and minerals. In this study, we aimed to explore the potential of nigella sativa in improving the nutrient and taste profiles of bread. In our experiments, we tested various concentrations of nigella sativa ground seeds, specifically at 1%, 2%, and 3% by weight of the flour used, to determine the optimal amount for enhancing the bread's nutrient profile and sensory attributes without compromising its structural and textural quality. To assess the impact of Nigella sativa incorporation on the rheological characteristics of dough, we performed a series of tests, including extensograph and alveograph measurements, sedimentation tests, and falling number determinations. The measurements of water absorption, dough development time, stability, and softening degree on the Farinograph device revealed no statistically significant variance between the flour containing ground nigella sativa seeds and the control. However, the energy value and extensibility determined on the Extensograph device decreased with higher proportions of nigella sativa seeds in the flour. Moreover, the protein and crude fiber content in the bread saw an increase with rising levels of ground nigella sativa seeds.

Keywords: Sustainable nutrition, enriching bread nutrient, nigella sativa.

The Effect of Fermentation Process on Free and Insoluble-Bound Phenolics of Apple Pomace

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Apple pomace, the by-product generated by apple processing industries, is a favorable resource that possesses the characteristics of high nutritional components, which are of great interest in its utilization. Vinegar is one of the most extensively used condiments around the world. With the development of the food industry and the improvement of people's living standards, fruit vinegar, which is generally made from pomace rather than juice or pulp, has attracted increasing attention in the market. The vinegar was made from apples and apple pomace. Following the fermentation of acetic acid and ethyl alcohol, the pulps were filtered and oven-dried. As a control, the juice of the apple was removed and the pulp was dried. The aim of this study was to investigate the effect of fermentation on free and insoluble-bound phenolics and the antioxidant capacities (ABTS, CUPRAC, DPPH, and FRAP assays) of dried apple pomace (DAP), dried pomace of vinegar obtained from apple (DPAV), and dried waste of vinegar obtained from apple pomace (DWAPV). The total phenolic content (TPC) of the DPAV sample (568.53±7.92 mg GAE/100 g dw) was higher than that of the DWAPV sample (321.60±4.84 mg GAE/100 g dw) and the DAP (control) sample (310.56±1.49 mg GAE/100 g dw). A similar trend was observed for total flavonoid content (TFC) and antioxidant capacities, and the DPAV samples provided the highest value, whereas DAP (control) had the lowest contents, and the results were statistically significant ($p < 0.05$). This study showed that the fermentation significantly improved the free and insoluble-bound phenolics and antioxidant potentials and compared with the PAJ sample, TPC, TFC, and antioxidant capacities of the DPAV and DWAPV samples were significantly higher. This could be mainly associated with the species of microorganisms involved in the fermentation process. Insoluble-bound phenolics were higher than free phenolics in all samples. Free and bound phenolics in all samples had the highest antioxidant capacity as determined by ABTS and CUPRAC assays. The results obtained here can open new opportunities for food processors and sustainable nutrition.

Keywords: Sustainability, fermentation, free and insoluble-bound phenolics, antioxidant capacity.

Developing a Co-Culture System for Propionic Acid and Pediocin Production by Lactic Acid Bacteria

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In recent years, the growth of microbial food spoilage has led to a reduction in available food sources and posed challenges in ensuring food safety. While some preservatives have been effective in controlling and slowing down microbial growth in food systems, there is a growing demand for natural and clean-label food products. Organic acids and bacteriocins are emerging as natural alternatives to address these challenges. Among organic acids, propionic acid salts are known to inhibit surface mold growth, and bacteriocins like pediocin, produced by *Pediococcus*, exhibit inhibitory effects against various foodborne pathogens, including *Listeria*. Therefore, developing an innovative co-culture fermentation system capable of producing propionic acid (PA) and pediocin (PED) simultaneously can lead to a synergistic antimicrobial effect, offering green protection for food systems. This study focuses on constructing a co-culture system by screening different lactic acid bacteria that exhibit internal interactions to produce PA and PED simultaneously in the same fermentation broth. The results demonstrate that strains like *Lactobacillus buchneri* PFC 29 and *Pediococcus acidilactici* PFC 2 can successfully produce PA and PED in significant amounts within 48 hours at 30°C in the same fermentation media. This co-culture system shows promise as a natural preservative against gram-positive bacteria and molds, which are common causes of food spoilage and food safety risks.

Keywords: Food safety, co-culture, lactic acid bacteria, propionic acid, pediocins.

Essential Elements in Promoting Healthy Nutrition: Probiotics and Phenolic Compounds

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Recently consumer landscape, there has been a changing profile in the expectations regarding food. Within this context, two popular concepts that have emerged recently are "holistic well-being" and "preventive health." The expectation from a food product taken off the shelf is no longer solely to fulfill nutritional needs or provide essential nutrients. It now also encompasses the aim of disease prevention, improving and enhancing physical and mental well-being. This situation has led to the development of new foods targeted for specific health uses, termed as "functional foods." Among these, foods containing probiotic strains and various phenolic compounds represent the fastest-growing area of functional food development. Probiotic cultures can be successfully applied to various food matrices such as dairy, meat, bakery, beverages, fruits, and vegetables, serving as carriers for probiotics' distribution. Factors such as the viability of probiotic bacteria, the food matrix used, added components, pH, the presence of hydrogen peroxide and dissolved oxygen, the concentration of metabolites like lactic and acetic acids, the buffering capacity of the environment, storage temperature, and the nature of the product can influence probiotics' efficacy in foods. The selection of appropriate strains and the encouragement of their growth are crucial for probiotic survival and metabolic activity during milk fermentation. For instance, Bifidobacterium species are important probiotics and struggle to survive and grow in milk fermentation due to their obligatory anaerobic nature and inherently lower proteolytic activity. However, it has been reported that when Bifidobacterium strains work together with *Lactococcus lactis ssp. lactis*, the latter protects reactive oxygen species, reducing oxygen damage and increasing survival rates in fermented milk. While the popularity of foods containing probiotic strains and high antioxidant phenolic compounds has risen, questions about the reliability of these products concerning viability and bioefficacy have been raised. The relationship between lactic acid bacteria (LAB) and phenolics focuses on how phenolic compounds influences bacterial growth. LAB can either reduce phenolics into simpler metabolites or promote/inhibit bacterial growth depending on phenolic concentration. The concentration of phenolic compounds plays a critical role in this interaction; low concentrations may promote bacterial growth, whereas high concentrations may inhibit it. For example, it has been observed that gallic acid and catechin stimulate the growth of *Lactobacillus hilgardii*. However, some phenolic compounds have been reported to negatively affect LAB growth. It has also been reported that fruit pomace (e.g., blackberry, cranberry, and red grape) increases the survival rate of probiotics during storage in fermented milk. The growing popularity of probiotics and phenolic compounds in foods, coupled with a better understanding of their interactions, encourages the development of health-focused products in the food industry. This trend directs food producers towards the development of functional foods containing components associated with health benefits, such as probiotics and phenolics. Moreover, the synergistic effects obtained from combining probiotics and phenolic compounds can enhance the bioavailability of foods and provide greater health benefits. Therefore, the consumption of foods enriched with a combination of probiotics and phenolic compounds can support a healthy lifestyle and contribute to disease prevention.

Keywords: Disease prevention, health benefits, functional foods, probiotics, phenolic compounds.

A Bioinformatic Approach to Reveal Features of Complex Microbiota

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Analysis can be performed to identify new gene clusters from the large amounts of data produced by next-generation sequencing technologies. In silico-based bioinformatic strategies can be established to identify new gene clusters from these data. Numerous data from complex microbiota contain a lot of information that can be analyzed as a result of DNA sequencing. Additionally, in-depth investigation of complex microbiotas in foods ensures food quality and sustainability. With the genome mining approach, many bacterial species and related genes that have the potential to produce a particular gene can be identified from shotgun metagenome datasets obtained from public genome databases. These genes may be peptides with various antimicrobial properties. One of the most common antimicrobial compounds produced by bacteria is bacteriocins. With genome mining, a wide variety of bacteria that have the potential to produce bacteriocins in the fermentation environment can be identified. Many interpretations can be made about the bacteriocins found in the samples that diversify the microbiota during the development period of the sample. There is a need to investigate complex microbiotas in which bacteriocin genes play a role. In this study, a screening strategy for a specific gene was created from shotgun metagenomic sequences, bioinformatic tools were examined and a review of their combined use was presented.

Keywords: Bacteriocin, fermentation microbiota, genome mining, bioinformatic, sustainability.

The Effect of Black Cumin Pulp Addition on Glycaemic Index and Some Nutritional Properties in Cookie Production

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Oil industry wastes (especially pulps) have the potential to be transformed into high-value-added products due to their high nutritional content. In this study, it has been aimed to investigate the effects of pulp, which is a waste of the black cumin oil industry, on the nutritional value and glycemic index in cookies. Black cumin pulp and product analyses were performed to determine chemical and physical properties. Thymoquinone (0.0763±0.002 mg/g) was detected in black cumin pulp obtained by cold press method. Also, it was observed that the antioxidant capacity and total phenolic substance content of black cumin pulp were higher than that of black cumin oil. It was observed that the glycemic index values of cookies produced with 0.5%, 1%, and 2% pulp content were 120.12%, 112.60%, and 134.63%, respectively. Ash content in cookies with 0.5%, 1%, and 2% pulp content was determined as 1.28%, 1.61% and 1.81%, respectively. With the increase in pulp content in cookies, the moisture content also increased. Changes in the physical and sensory properties of the products were determined by increasing the pulp content. It was observed that the addition of black cumin pulp as a functional supplement to a bakery product with a high glycaemic index such as cookies reduced the glycaemic index value by approximately 15%. Further studies are required to evaluate the potential effects in detail.

Keywords: Black cumin, digestibility, starch, sustainability, thymoquinone.

Sythesis of Chitosan from Lobster Shells

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Chitosan is a biocompatible and non-toxic polysaccharide obtained from chitin found in the shells of crustaceans, insects**,** and fungi. Due to its greater solubility and adsorption capacity, chitosan has a wider range of applications than chitin. In this study, the use of chitin from lobster shells in the synthesis of chitosan was investigated. Throughout the production process consisting of demineralization, deproteinization**,** and deacetylation stages, weight loss-based yield calculations were carried out. In the experiments carried out at +18 mesh particle size, the calculated yield based on weight loss was recorded as 66.70% in the demineralization stage where minerals were removed, 25.29% in the deproteinization stage where protein and color pigments were removed**,** and 14.47% in the deacetylation stage where acetyl groups in chitin were converted to amine groups. The high concentration of calcium-based compounds in lobster shells explains the high mass loss in the demineralization stage. At the end of the whole process, the total weight loss-based yield was calculated as 78.72%.

Keywords: Chitin, chitosan, lobster, seafood, shell.

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Effects of Particle Size on Main Quality Parameters of Compound Chocolates Including Various Palm Kernel Oils

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Oils derived from various plant sources that substitute cocoa butter (CB) are generally referred to as cocoa butter alternatives (CBA). Due to various factors causing a decline in CB supply, there has been a significant increase in demand for CBA. CB alternatives are categorized into three or five groups: cocoa butter equivalents (CBE; containing no lauric oil or oil blends), cocoa butter improvers (CBI), cocoa butter replacers (CBR), and cocoa butter substitutes (CBS). CBS, being a good alternative to cocoa butter, does not require tempering due to triacylglycerol (TAG) profile. Compound chocolate is among the widely used products of CBS. Besides the fat phase, the particle size of chocolate also significantly affects various quality attributes. Therefore, it is important to understand how changes in chocolate particle size affect product quality and to evaluate these results considering fat bloom tendencies. In this study, color (L*, a*, b*, chroma, and hue angle), physicochemical (moisture content, water activity, ash content), and texture (hardness) properties were determined in compound chocolate samples prepared using two different CBS (HPKO; Hydrogenated Palm Kernel Olein, HPKS; Hydrogenated Palm Kernel Stearin) and having different mean particle sizes (20, 25, 30, 35, and 40 μm). For HPKS and HPKO samples, no significant changes were determined in moisture content (1.050-1.545 g/100 g) and water activity (0.257-0.261) as well as major visual properties with an increase in particle size ($P<0.05$). However, the moisture content of samples prepared with HPKO was higher. Nevertheless, significant differences related to CBS changes were not identified in color properties. With an increase in particle size in HPKS samples, hardness values (4558.9-5691.4 g) also increased ($P<0.05$). However, no significant changes were determined for HPKO samples (4239.3-4684.4 g). This study concluded that during the determination of compound chocolate processing conditions, the type of oils should be considered even if there is no change in oil content.

Keywords: Confectionery, compound chocolate, particle size.

Effect of Whole Wheat Usage in Broiler Finish Diet for Performance

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In the poultry industry, it is essential to prepare rations that provide adequate and balanced nutrition while also being cost-effective. The quality and freshness of feed ingredients used in poultry rations are crucial for the digestibility of nutrients and their physical qualities. Poultry require energy for tissue development and activity, and this is primarily obtained from cereal grains (mainly carbohydrates) and oils in their feed. Commonly used grains in poultry rations include wheat, corn, and soy. Wheat, in particular, is known for its high energy content, low cellulose content, and binding effect, which increase the durability of feed pellets. It also contains non-starch polysaccharides (NSP), which can positively impact the growth of broilers on the farm. The form of feed can also affect feed consumption in poultry nutrition, with crumble or pellet feeds being the most effective in terms of both consumption and performance. High levels of fine dust in feed have been shown to have a negative impact on feed consumption, live weight, and feed conversion ratio (FCR). Using whole grains in feed can reduce production and transportation costs, promote a healthier intestinal microflora in poultry, improve digestive system efficiency, and enhance the condition of the litter. The use of wheat in poultry rations has been found to significantly improve the muscular function of the gizzard. In contrast, high-energy, low-cellulose feeds in the form of powder, pellets, or pellet fractures can reduce gizzard function and lead to an increase in the diversity and amount of bacteria in the upper parts of the intestine. This study aimed to reduce raw material costs, increase the gizzard index, and determine the effects on performance by adding whole wheat to the finisher feed at different rates (20%, 30%, and 40%).

Keywords: Poultry, whole wheat, gizzard, raw materials.

Investigation of Using Barley Flour in Frozen Dough Technology

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Barley flour (BF) is known as a good source of soluble and insoluble dietary fibers, especially, β-glucans. However, the usage of BF in bread making is not common because of its negative effects on bread quality. Sourdough and frozen dough technology are some of the widely used processes in the bakery industry. In this study, straight dough and sourdough bread-making methods were used to investigate the effect of BF using frozen dough technology. Wheat flour was replaced with different levels of BF (7.5%, 15%, and 22.5%) for the straight dough method. Type I sourdough was produced by using BF and incorporated into bread formulation at the levels that correspond to 7.5%, 15%, and 22.5% of BF in the final product. Frozen storage of bread doughs was performed at -30 °C for 30 days. The freezable water (FW) content of bread doughs and the quality characteristics of bread (specific volume, texture, and color) were determined. Lower FW content (%) was shown in the dough containing 15% BF and 22.5% BF produced by sourdough and straight-dough bread-making methods, respectively ($p<0.05$). BF addition into bread decreased the specific volume (SV), but SV reduction due to frozen storage was lower (22.6%) in sourdough bread containing 22.5% BF than that of control bread (29.4%). 7.5% addition by the straight dough method and 15% BF addition by the sourdough method caused no significant differences in crumb hardness when compared to control bread ($p>0.05$). The lowest color difference (ΔE) in the crust due to frozen storage was shown in control bread and the bread containing 7.5% BF was produced by both methods. According to the results, 22.5% BF addition into bread by sourdough method exhibited better performance in terms of having lower SV reduction. This study suggested the possibility of using type I BF sourdough in frozen dough technology at a level of 22.5%.

Keywords: Straight dough bread-making method, type I sourdough, bread quality.

Combining Different Methods with Pulsed Electric Field as a Modification Tool for Starch

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Starch consists of two fractions: amylose and amylopectin. Starch affects many properties of the product, such as viscosity, texture, gel formation, moisture retention, product homogeneity and film formation. It is mainly used in sauces, confectionary, soups, baked goods and meat products. Apart from its traditional use, starch is also used in new areas, such as degradable food packaging materials, edible film and thermoplastic materials. Starch modification is carried out using different methods to eliminate the deficiencies of native starch and to increase the effectiveness of starch in industrial applications. These methods can be grouped under the main headings of chemical, physical, genetic and enzymatic. Thanks to starch modification, product aesthetics can also be improved, production costs can be reduced, product consistency can be ensured and the shelf life of the product can be extended. Pulsed electric field is one of the physical methods used in starch modification. The pulsed electric field is a food processing method that uses high-intensity electrical pulses to process pumpable liquid materials. Pulsed electric field application affects the properties of starch such as structure, solubility, viscoelastic properties and thermal stability. Compared to other methods used in starch modification, it has the advantage of changing the properties of starch in a shorter time and with less energy consumption. Pulsed electric field is also used to enhance chemical reactions. For this reason, the use of pulsed electric field process in combination with chemical starch modification methods is being studied by researchers. Examples of chemical methods most commonly combined with pulsed electric field are acetylation, esterification and oxidation. These chemical methods were combined with pulsed electric field and applied to starches such as corn starch, potato starch, cassava starch and maize starch. It has been observed that starch creates modifications in amylase content, morphology, structure, rheological, thermal and pasting properties. Modified starches can then be used in the food industry for purposes such as thickening, stabilizing, texture changing and enriching products. Resistant starch can be obtained as a result of starch modification, and resistant starch can be used as a prebiotic and a functional ingredient in food. The aim of this review is to shed light on potential future studies by compiling the changes in starch properties that will occur as a result of modifying starch with the combination of different methods with pulsed electric field and the potential uses of modified starch in the industry.

Keywords: Starch, modification, pulsed electric field, chemical modification.

Evaluation of the Use of Different Fruits as Alternative Raw Materials in Vinegar Production

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Nowadays, with the "back to nature" movement, the demand for natural foods and natural food production methods is increasing. For this reason, traditional products, and the raw materials from which they are obtained are being replaced by new trends, and components rich in bioactive components rather than traditional ones have begun to be included in the formulations. In this context, one of the most important fermented foods; vinegar has gained importance. Vinegar is a product obtained by subjecting raw materials containing sugar or starch first to alcohol fermentation and then to acetic acid fermentation. It is rich in phenolic compounds and organic acids while including antioxidant and probiotic properties. The functional properties of vinegar vary depending on the used food matrix, and the use of alternative fruits with high bioactive content instead of classical ingredients significantly improves the bioactive composition and sensorial properties of the final product. In this review, the possibilities of using alternative fruits such as Aronia, jujube, cherry, rosehip, persimmon, and okra in vinegar production are discussed in detail, while their potential place in the food industry in terms of sustainability and health-beneficial components is revealed.

Keywords: Fermentation, vinegar, bioactivity, organic acids, phenolics.

Electrospun Fiber-Based Indicator for Monitoring Temperature Variations and Freshness in Cold Chain Transportation of Meat Products

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Ensuring suitable temperature-controlled environments is paramount for preserving quality and reducing losses during the production, storage, transportation, and sale of perishable meat products. This process is commonly known as “cold chain logistics” where the shelf life, safety, and quality of perishable products along the supply chain are greatly affected by environmental conditions, particularly temperature. When temperatures exceed specific threshold in cold chain foods, even a slight increase of a few degrees can encourage microbial growth. This can result in a substantial decline in quality, food spoilage and an increased risk of foodborne illnesses. Maintaining the quality of perishable products and reducing losses during storage and transportation is a critical issue on a global scale. As a result, it is essential to continuously monitor these products for safety and quality at each stage of the supply chain. Hence, the time-temperature indicators are remarkable due to their potential in control systems that ensure quality throughout the life cycle of a product. Nevertheless, these indicators do not provide information about the consumable freshness of the product, as their primary function is to signal when the cold chain of a product has been broken. Therefore, there is need for a novel indicator system capable of monitoring both the integrity of the cold chain and the freshness of meat products. In this study, an electrospun fiber-based indicator was designed to monitor the temperature changes and freshness status in the cold chain for meat products. In the electrospinning process, polylactic acid (PLA) was used as the carrier polymer, while pentacosadiynoic acid (PCDA) and phenol red were used as the active ingredients. The horizontal set up of electrospinning was used with a high voltage power supply generating an electric field of 8.5 kV between the collector and a needle. The flow rate of the polymer solution was kept constant at 2.0 mL/h. PLA-based yellow fibers were produced and then turned into green color through activation with UV light under refrigerator conditions. Green color indicates that the food is fresh and the cold chain integrity is maintained. When the cold chain is disrupted, the color of the indicator changes to a red color. If the food spoils within the cold chain, the indicator turns to a black color, indicating that the food is no longer suitable for consumption. The color change of the indicator is linked to both temperature variations and an increase in total volatile basic nitrogen (TVB-N) content of the product. As a result, the designed electrospun fiber-based indicator can effectively control the cold chain, provide consumers with valuable information on the freshness of meat products, and ultimately contribute to the reduction of foodborne diseases.

Keywords: Freshness, time-temperature, electrospinning, meat products.

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Characterization of Postbiotic Derived from *Lactobacillus Plantarum* and Its Use in the Production of Alternan-Based Edible Film

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The recent concept of postbiotics is associated with various bioactive compounds (short-chain fatty acids, organic acids, bacteriocins, bacteriocins, exopolysaccharides (EPS), and inactivated cell fragments (cell surface proteins, teichoic acids, peptidoglycan-derived muropeptides) derived from probiotic microorganisms. *Lactobacillus, Lactococcus, and Pediococcus* postbiotics are among the most common Lactic acid bacteria (LAB) strains whose functional properties have been evaluated. Due to their various functional properties, studies on edible film production of postbiotics derived from these bacteria have been accelerated. EPSs produced by LAB strains have been frequently used in film production with their absorption potential. Glucan-type alternans produced by LAB strains are a good alternative to produce edible films as they show stabilizing or thickening properties. In this study, the antibacterial and antifungal activity of *Lactobacillus plantarum* postbiotic was determined and bioactive compounds responsible for antimicrobial activity were discussed by volatile compound analysis. At the same time, environmentally friendly biodegradable edible film production was realized by utilizing the film-forming ability of alternan and the antimicrobial activity of the postbiotic.

Keywords: Postbiotic, antimicrobial, alternan, edible film.

Isolation and Characterisation of Nuvita Biosearch Center (NBC) *P. Freudenreichii* from Turkish Traditional Kars Gravyer

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In Turkey, there are many types of homemade cheese produced by spontaneous fermentation and traditional methods without using a specific starter culture. In this study, 9 different *P. freudenreichii* strains were isolated from Kars Gravyer (n = 3) produced by traditional methods in Turkey and identified by sequencing the 16S–23S intergenic region using species-specific primers. Subsequently, these 9 strains were examined in vitro for the presence of the β-galactosidase enzyme, autoaggregation ability, sensitivity against 8 selected antibiotics and survivability under harsh conditions in order to determine their potential probiotic properties. While all strains showed similar resistance (92%–98%) to gastric juice (0.3% pepsin, pH = 3.0) ($p > 0.05$), they showed resistance to intestinal fluid (0.1% pancreatin, 0.3% bile salt, pH = 8.0) between 60% and 92% ($p < 0.05$). It was determined that the viability after 3 and 6 hours of incubation in 0.5% and 1% bile salt differed between strains ($p<0.05$), but when compared to their initial viability, the resistance of the strains NUV771 and NUV774 stood out. At the end of both 3 h and 6 h incubation periods, NUV771 and NUV 774 strains showed a higher tolerance to pH 2 than other strains, while the tolerance of the strains to pH 3 was found to be similar. All isolates exhibited resistance to ciprofloxacin, ampicillin and trimethoprim-sulphamethoxazole, however most were sensitive to ofloxacin. Of the nine *Propionibacterium freudenreichii* strains tested, 67% showed the presence of the β-galactosidase enzyme, indicating their ability to hydrolyze lactose. All strains tested in this study exhibited autoaggregation from the first hour (from 1.30% to 5.85%), and this increased over time, reaching a range of 34.7%–80.4% by the end of 24 hours. Overall, *Propionibacterium freudenreichii* strains isolated from Kars Gravyer showed resistance to the gastrointestinal tract, tolerance to pH 3.0 and high tolerance to bile salts, and thus, as future probiotic strain candidates, they will offer an alternative source to *Lactobacillus*, *Bifidobacterium* and some *Bacillus* spp.

Keywords: Dairy propionibacteria, identification; NBC; *Propionibacterium freudenreichii*, probiotic properties.

Green Composite Films and Their Antimicrobial Food Packaging Applications

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Food packaging plays an important role in maintaining food safety and quality during storage and transportation and extending shelf life by protecting food products from microbial, chemical, physical, and environmental hazards. The use of plastic is increasing day by day depending on population growth and technological developments and its place in human life is constantly expanding. While waste plastics are becoming the world's biggest environmental problem, food safety is becoming an increasing problem due to inappropriate packaging and the migration of health-hazardous packaging material into the food. Previously, the size, integrity, and appearance of the packaging were given importance in the packaging of food, today the presence of environmentally friendly, food barriers and natural materials has gained importance. For this reason, natural antimicrobial green composite films are becoming an important research topic in terms of both keeping food safe and taking care of the environment. The study encompasses various aspects, including the biosynthesis of nanoparticles, the utilization of plant extracts and essential oils, and examining microbial structures and infection mechanisms related to green materials. Moreover, the spotlight of the study is on the application of green-antimicrobial composite films in different food packaging scenarios, specifically in dairy products, meat products, and fruits and vegetables. Green nanotechnology revolves around creating nanoparticles using eco-friendly methods and materials to minimize the reliance on harmful chemicals and solvents. Green synthesis is a method for creating nanomaterials that are harmless to humans and the environment, cheap, and efficient. Substrates for green synthesis of nanomaterials are microorganisms like bacteria, yeast, fungus, algae, and extracts of plant. The green composites are made using biopolymers with natural base materials. Nowadays most of the polymer industries are making their products with sustainability aspects with the help of biopolymers. The antimicrobial properties of food packaging films can prolong the shelf life of foods and ensure their safety by inhibiting/slowing the growth of pathogenic and spoilage microorganisms. Plant extracts, essential oils, and biopolymers are commonly included in film formulations as natural antimicrobial agents. These materials have successfully improved the functional properties of the films, thereby increasing their effectiveness for food applications. The safety of the natural antimicrobial ingredients used to produce ideal packages is also an issue that needs to be taken into account. In addition, nutritional safety and human health should be seriously considered as well as the impact of antimicrobial substances on the microbiological and physico-chemical quality of packaged foods.

Keywords: Composite film, food packaging, green material, antimicrobial film, plant extracts.

Factors Affecting the Stability of Beta-Carotene & Lutein

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Carotenoids represent a family of colorful, lipid-soluble pigments which are found in various kinds of fruits, vegetables, fungi, flowers and some animals. Due to their health benefits, they have been used in many industries such as food and beverage, cosmetics and pharmaceutics. Among the carotenoids, beta carotene and lutein are the mostly used ones in the beverage industry. Most typical beverage end-uses of beta carotene and lutein are citrus flavored still or carbonated drinks. While their primary function is to serve as coloring agents, they have other beneficial functions which make them superior to their artificial alternatives. Beta carotene, which is a precursor of Vitamin A, has been shown to support healthy skin, strong immune system, vision and eye health. Lutein may also contribute to eye health by filtering high-energy wavelengths of blue light, therefore preventing oxidative stresses on the retina. With the increasing demand in the market to use natural ingredients with functionality, beta carotene and lutein have started to replace the artificial colorants of yellow to orange shade. However, because of their structure, they are susceptible to some conditions which negatively affect their chemical stability. When they are exposed to these conditions, they may either lose their color or functionality unless they are properly processed or stored. For a better understanding of their stability parameters and having more effective uses in the beverage end products, much research has been carried out. Findings were gathered to present the reactives responsible for the instability of beta carotene and lutein and the protectives which prevent or retard their degradation. Studies showed that high oxygen content, elevated temperatures, light exposure, low pH and transition metals have degrading effects on beta carotene and lutein. Degradation level depends on the intensity and duration of exposure. On the other hand, it was seen that, the effects of degrading parameters could be prevented or retarded with protective actions which are proper antioxidant use, choosing a packaging material with better barrier properties against oxygen and designing an effective encapsulation matrix instead of direct addition in to the end use.

Keywords: Beta-carotene, lutein, stability.

Obtaining Aquafaba from Sprouted and Fermented Legumes

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Sprouting and fermentation are simple, economical, and effective methods used to enhance the nutritional content of legumes. The reactivated metabolic activities during sprouting and fermentation lead to significant changes in the biochemical, nutritional, and sensory properties of legumes. Aquafaba, a viscous liquid of high nutritional value obtained from the cooking water of chickpeas or other legumes, is a plant-based alternative food additive with various functional and technological properties due to its starch and protein content. These technological properties of aquafaba make aquafaba an alternative ingredient for the food industry. Its functional properties, along with being plant-based and cost-effective, have made aquafaba usage as an egg substitute an intriguing subject. Towards the end of 2019, particularly with the increasing demand for vegan products, the usage of aquafaba witnessed a significant rise. This trend led to a notable increase in the number of products manufactured with aquafaba by the year 2020, suggesting further growth in the aquafaba market. The quality and characteristics of aquafaba stem from the compounds passed from the legume during cooking. Studies indicate that sprouting and fermentation result in differences in the protein and starch content of legumes and the technological properties of proteins. This study aims to determine how sprouted lentil and sprouted-fermented chickpea cooking waters affect their physicochemical and technological properties. For this purpose, after boiling legumes for 15 minutes with a lentil: water ratio of 1:4 and chickpea: water ratio of 1:3, the cooking water was separated and allowed to stand at 4°C for 24 hours. The resulting lentil cooking water exhibited a foaming capacity and stability varied between 716-750% and 94.41-94.6%, whereas chickpea cooking water foaming capacity and stability varied between 566.6-593.3% and 79,7-82,35%, respectively. The emulsion activity index (EAI) values of sprouted lentils and sprouted fermented aquafabas were calculated as 94% and 84%, respectively. As a result, it was determined that sprouted and sprouted-fermented legume cooking waters, developed in accordance with sustainability principles, could be used as plant-based food additives in various food formulations due to their techno-functional properties.

Keywords: Sustainability, aquafaba, sprouting, fermentation.

Potential Valorization of Nut by-Products: Peanut, Hazelnut, Pistachio, Walnut, and Almond Shells

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Nuts are a valuable food group known for their nutritious content and beneficial effects on health. However, the shells of nuts are often considered waste and potentially harbor valuable compounds. This study examines the potential valorization of shells from common nut varieties such as hazelnuts, pistachios, walnuts, almonds, and peanuts. Research indicates that these shells contain phenolic compounds, antioxidants, polyunsaturated fatty acids, and other bioactive substances that may confer health benefits. Additionally, nut shells contain nutritious compounds such as fats and proteins, as well as fiber and minerals. The utilization of wastes generated within the industrial system cycle to minimize the use of natural resources, pollution levels, and energy costs is increasingly gaining attention. Furthermore, the revaluation of these shells could lead to potential applications not only in the food industry but also in pharmaceuticals, cosmetics, and other sectors. The utilization of these by-products promotes resource efficiency and contributes to the establishment of a sustainable cycle. Moreover, the extraction of valuable compounds from nut shells and their integration into various products can create economic opportunities. The potential applications of nut shells extend beyond their direct use as ingredients or additives. Nutshells, from hazelnuts, pistachios, walnuts, almonds, and peanuts, have numerous potential applications in various industries. They can be used to create biocomposite materials for automotive, construction, and packaging due to their lightweight and eco-friendly nature. Nutshell-derived powders or composts serve as effective soil amendments, enhancing soil quality by improving structure, water retention, and nutrient levels while mitigating erosion and weed growth. They can also be utilized as biomass feedstock for bioenergy production, yielding biochar or bio-oil for renewable energy or chemical synthesis. The activated carbon obtained from nut shells stands out for its remarkable adsorption properties, making it valuable for water purification purposes, removing contaminants from both drinking water and industrial wastewater. In cosmetics and personal care products, nutshell extracts feature natural exfoliants, abrasives, or pigments, contributing to skin texture improvement and product aesthetics. Nutshell extracts containing bioactive compounds show promise in pharmaceutical formulations, potentially offering therapeutic benefits such as anti-inflammatory or antimicrobial effects. Incorporating nutshell extracts or powders into animal feed can enhance digestion, nutrient absorption, and overall animal health, while also potentially mitigating microbial contamination risks. Lastly, nutshell-derived biopolymers serve as a sustainable alternative in the production of biodegradable packaging materials, addressing environmental concerns associated with traditional plastics. These myriad applications underscore the versatility and sustainability potential of nut shells, positioning them as valuable resources across various industries. In conclusion, the valorization of nut shells presents a multifaceted opportunity to enhance both environmental sustainability and economic viability. By recognizing and harnessing the potential of these often-overlooked by-products, industries can foster innovation, reduce waste, and contribute to the creation of a more sustainable future. Through innovative processing methods and initiatives in the circular economy, the utilization of valuable components extracted from hazelnut shells can be increased. The potential utilization of hazelnut shells presents a significant opportunity for sustainability and economic development.

Keywords: Sustainability, nut by-products, nut shells, industrial applications, bioactive compounds.

Production of Fermented Beverage from Black Carrot Juice Using *Gluconobacter Oxydans*

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Fermented beverages have a long history and play an important role in various cultures around the world. They are not only enjoyed for their unique flavors and aromas but also for their potential health benefits. Black carrots have high antioxidant capacity and superior quality parameters, and their consumption is increasing daily. It is a potential anthocyanin source and has a rich content of vitamins, minerals, and fiber. Due to these properties, it is a natural colorant in fruit juices, soft drinks, and fermented drinks. This study aimed to develop a new flavored functional fermented black carrot-based beverage from black carrot juice fermented with *Gluconobacter oxydans*. For this purpose, black carrot juice was fermented with *G. oxydans*, and the changes in their physicochemical, microbiological, and bioactive properties were examined throughout the fermentation. At the end of the 5-day fermentation period, pH decreased from 6.33 to 4.74. The count of *G. oxydans* decreased over time from 10.04 log cfu/ml to 5.77. There was no yeast or mold growth in black carrot juice throughout the analysis. While brix and water activity did not change, total acidity increased significantly ($p<0.05$). *L*, *a**, and *b** values were 13.86–15.06, 8.32–10.49, and -6.70–1.99, respectively. Total antioxidant activity did not change throughout fermentation ($p>0.05$), but the total phenolic amount increased significantly ($p<0.05$). The total anthocyanin content was between 7.43 and 9.72 mg/L. According to the results of sensory analysis, the taste, smell, color, turbidity, and general acceptability of the fermented beverage improved ($p<0.05$). As a result, the fermented beverage developed from black carrot juice by acetic acid fermentation with *G. oxydans* may be a new alternative for consumers.

Keywords: Black carrot, *Gluconabacter oxydans*, fermentation, beverage.

Buckwheat Starch-Fatty Acid Complex Formation: An Approach to Increase Resistant Starch

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Starch, the key carbohydrate in cereal-based foods, greatly influences their properties like viscosity, water absorption, texture, and shelf life. Starch is mainly composed of amylose and amylopectin, with amylose forming linear structures and amylopectin being highly branched. During food processing, starch can form complexes with lipids, affecting its characteristics. The interaction of starch with fatty acids, and the resulting starch-fatty acid complex, is influenced by factors such as pH, fatty acid concentration, starch origin, temperature, time, and the length of amylose and fatty acid chains. This interaction affects the physicochemical, structural, and functional properties of food during processing. Studies have shown that it can reduce swelling power and alter the thermal, rheological, and pasting characteristics of starch. Starch-fatty acid complexes are also considered Type-5 resistant starch (RS5), offering health benefits like reducing obesity, diabetes, cardiovascular disease, and colon cancer. The rising prevalence of these diseases highlights the importance of RS production and utilization in the food industry. Hence, researchers are exploring RS production methods alongside alternative sources. Buckwheat, a type of pseudocereal, can be an alternative source of starch, however, there are limited studies on RS production from buckwheat. Besides there's little information on RS formation with buckwheat starch and fatty acids. This study aims to explore the potential of buckwheat starch in complex formation with capric acid and stearic acid. Buckwheat starch was reacted with these fatty acids at various temperatures and pH values and *in-vitro* digestibility, physicochemical and structural properties of starch were investigated. XRD results confirmed the amylose-fatty complex formation between buckwheat starch and fatty acids. Complex formation decreased buckwheat starch digestibility, resembling the formation of RS Type-5, indicating the potential of amylose-fatty acid complex in enhancing the RS content in food formulations.

Keywords: Buckwheat starch, capric acid, stearic acid, resistant starch, starch-fatty acid complex.

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Determination of Textural Properties of Sourdough Breads Collected from Different Regions of Turkiye

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Bread, a staple food made from cereal, has been part of the human diet since ancient times. Its taste, aroma, and texture greatly influence its quality. Sourdough, a mixture of flour and water fermented with lactic acid bacteria and yeasts, is often used in bread production. It enhances the dough's rheological properties, improves the bread's structure, increases its volume, imparts a unique aromatic flavor, delays staling, and prevents mold formation due to the acidic environment. Microflora diversity and dominant microorganism species vary according to the region where sourdough is produced. The sourdough process is widely used to obtain breads with unique quality characteristics. By using different flours, ingredients, or fermentation methods, a variety of traditional sourdough breads reflecting cultural and geographical identities are produced worldwide. In this study, sourdough breads were collected from Istanbul, Izmir, Ankara, Tekirdag, and Adana provinces and their textural properties were analysed. Within the scope of textural properties, hardness, springiness, cohesiveness, gumminess, chewiness and resilience properties of the bread samples were determined. The hardness of the breads varied between 1.3-3.4 N and it was determined that the hardest bread was obtained from Istanbul and the softest bread was obtained from Tekirdag. In addition, springiness and cohesiveness values ranged between 0.77-1.36 and 0.63-0.81, respectively. Considering the gumminess and chewiness values calculated as secondary parameters in texture profile analysis, the fact that there was no significant difference in the springiness and cohesiveness ratios caused these values to be shaped according to the hardness value of the samples. The highest gumminess and chewiness values were determined in Istanbul sourdough bread which had the highest hardness value.

Keywords: Sourdough, bread, texture, hardness.

Microbial Biomass as a Sustainable Protein Source

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According to Food and Agricultural Organization, it is estimated that the world population will be approximately 10 million in 2050 and it has been stated that food production must increase by 50% to meet the demand of the increasing population. Traditionally, meat, eggs, and dairy products originating from animals have been used to meet the majority of human dietary protein needs. However; It is clear that animal proteins with a high carbon footprint will not meet future protein demand. This situation has directed the industry to new protein sources. For this reason, sustainable protein sources that can be an alternative to animal protein sources have gained importance. Microorganisms have gained importance as a new food source due to their low carbon footprint, not being dependent on soil, water and seasonal changes, and their nutritional content. Single cell proteins (SCP) are a bulk of dried cells called microbial protein or biomass, known for their high protein content. In addition to its protein content, SCP contain carbohydrates, minerals, vitamins, nucleic acids and various essential amino acids. SCP are produced by yeast, fungi, bacteria and algae. In this review, current developments about SCP, its production methods, and its use in foods are discussed.

Keywords: Sustainability, single cell protein, biotechnology.

Is the Seafood Analog Industry a Sustainable Solution?

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There is a recommended amount of seafood consumption for positive health outcomes by national dietary guidelines. On the other hand, recently there have been serious concerns about contaminated water seas with heavy metals like mercury and macro/microplastic residues in sea and seafood. So, when thinking about the health aspects of seafood consumption, it should be concerned about the safety of seafood resources and the polluted sea effects on seafood. Therefore, marine ecology systems should be under investigation and measurements to make sure that there is no health risk to consuming wild seafood. Overfishing is another problem in the marine environment which restricts the availability of seafood types and fish species. Moreover, global diets focus on more substantial contributions to protect the environment, and due to the increase in chronic diseases, more vegan/vegetarian food substitutes (healthy lifestyle) are urged by consumers. Eventually, all maintained issues are the primary driving factors of the seafood analog industry. The global seafood substitutes market size was valued at $42.1 million in 2021 and is predicted to reach $1.3 billion by 2031. To produce seafood analogs various plant-based proteins such as legumes also fungi and algae ingredients are used. Furthermore, vitamins and minerals are added to fortify seafood analog products. About the seafood analog industry, it can be said that: a) More research on formulation and job opportunities is credible. Several ingredients, various tastes, and acceptable seafood analogs should be investigated, b) Traditional seafood has been consumed for decades in coastal countries. According to more immigration and health concerns plant-based seafood will be accepted and consumed nearly all around the world. c) Water crisis, global warming, CO_2 emissions, and environmental crisis led to the order for more sustainable food production.

Keywords: Algae, marine ecology, seafood analogs, sustainable food production.

Use of Apricot Kernels in Plant-Based Milk Production

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In parallel with the development of the food industry, it leads to the formation of a large amount of biowaste material or a certain by-product containing a high amount of bioactive compounds. The formation of such wastes can cause significant environmental and economic problems. Consequently, their transformation into economically valuable food products is a very important issue and is supported by the concept of circular bioeconomy. One of the solution ways of this problem is the production of functional food products and also ingredients for the food industry. Animal milk has been considered an indispensable food due to its nutritional value for centuries since humans domesticated animals such as mainly sheep, goat, cows, etc. However, in recent years, the demand for plant-based milk (PBM) alternatives has increased due to especially lactose intolerance and protein allergies, as well as different lifestyles including vegetarian and vegan diets. PBM alternatives (or plant extracts) are known as water-soluble extracts of some legumes, oilseeds, cereals, pseudocereals, vegetables, and nuts. In this research, the use of apricot kernel in plant-based milk production was investigated. For this purpose, apricot seeds obtained from a local fruit juice production facility were ground after various pre-treatments and kept in water to obtain a milk-like extract. Nutrient analysis of the obtained apricot kernel milk was carried out and compared with milk. In line with the findings, it was seen that it could be preferred as an animal milk substitute. This study shows that the production of a milk alternative using apricot seeds is technically and nutritionally possible. Apricot kernel milk can be an alternative option to traditional dairy products, offering advantages such as health benefits and environmental sustainability.

Keywords: Sustainability, apricot kernel, milk.

Development of a New Analysis Method Using FTIR Spectroscopy in the Production of Powder Mixtures

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Spices or spice mixtures are dried herbs used in the preparation of foods and enhance the flavor of the product. Spices, which determine the characteristic taste of the product, significantly affect product quality. Seasonings are produced by homogeneously mixing spices in certain proportions. While it is difficult to always produce these mixtures with the same quality, analyzes to verify their quality are time consuming and cause financial losses. Fast techniques that do not require sample preparation, such as infrared spectroscopy, are advantageous methods for authentication, new product development and adulteration detection in dairy, meat, oil and spice products. Fourier Transform Infrared (FT-IR) Spectroscopy is an analytical method that verifies the chemical structure of ingredients by measuring the wavenumber of light against its IR intensity using the mathematical Fourier transform method. FT-IR spectroscopy enables fast, sample-safe, sensitive and reliable analyses at low cost. This method is also known as one of the most effective new technologies for the identification and quality assessment of spice mixtures. The aim of this study is to develop a new analysis method using FTIR method in the production of spice mixtures. Within the scope of the study, curry seasoning was determined as a control sample, the content of the mixture was prepared in different ratios and optimized according to the results of descriptive sensory analysis. The chemical structure of the sample was recorded by spectrophotometric measurements. These measurements were performed with Perkin Elmer Spectrum Two FTIR spectrometer. Then, the chemical structure of the curry seasoning produced according to the agreed recipe was compared with the control sample. After this comparison, 95% similarity rate was determined as the approval decision limit with Spectrum 10 ™ software, where there was no significant difference as a result of sensory analyzes performed on products with different similarity rates. In addition, the homogeneity of the mixtures was tested and values of 95% and above were accepted. In the second stage of the experiment, the similarity of the ratio of yeast extract with natural glutamic acid content in the spices to the curry mixture was analyzed. Yeast extract was scanned with the device and curry mixture prepared with 3 different ratios of yeast extract were scanned with the device. As a result of the analyzes, curry mixtures were searched in the library where raw material yeast extract was added with the "Search" feature of the device and it was determined that the similarity rates increased in direct proportion to the increase in the ratio. With the new analysis method, the accuracy and homogenization of each batch of curry produced without the need for costly and time-consuming analyses (salinity, moisture, HPLC, etc.) and the adequacy of the yeast extract ratio in this mixture were tested using FTIR device. The development of a new analysis method in curry mixture production has led to positive results in terms of time and product quality.

***Keywords*:** FTIR, Spice Mixture, New Analysis Method Development

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