



PROGRAM & BOOK OF ABSTRACTS

Edited by

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Georgi Kostov, Desislav Balev**

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**72nd International Conference on
FOOD SCIENCE, ENGINEERING AND TECHNOLOGY**

November 13-14, 2025 | Plovdiv, Bulgaria

Organized by

University of Food Technologies, Plovdiv, Bulgaria

&

**E-learning tools for Food technology and development
education (E-Food)**

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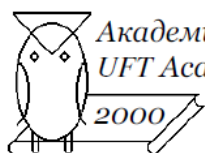
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ORGANIZERS

UNIVERSITY OF FOOD TECHNOLOGIES – PLOVDIV **ALMA MATER ALIMENTORUM**

The University of Food Technologies (UFT) was established as Higher Institute of Food and Flavour Industries in 1953, originating from one of the oldest food technology faculties in the South-Eastern Europe.

Based on the unique linkage between natural, engineering and social-economic sciences, our mission is to create the educational and research background for sustainable development in the *Food & Beverage, Wine, Hospitality & Tourism, Essential Oil & Cosmetics, Biotech and Tobacco* industries.

UFT IN NUMBERS



Students (2025):
3300



Programmes:
20 Bachelor
35 Master
24 PhD



Academic
staff (2025):
176



Academic
publications (till
2025) / of which
articles in peer-
reviewed
international
journals:
2257 Scopus &
1481 WoS



ORGANIZERS

FACULTY OF TECHNOLOGY

Programmes in the fields of:

- Food and beverage technology
- Enology
- Food safety and quality management
- Food chemistry and microbiology
- Functional foods
- Food security
- Biotechnology
- Essential oils, cosmetic and tobacco products technology



Joint MSc in Technology of Wine and Wine-Based Beverages

(PlovdivWineUni Master) (Since 2023) – the 1st programme in the South-Eastern Europe developed in cooperation with the International Organisation of Vine and Wine (OIV)



FACULTY OF ENGINEERING

Programmes in the fields of:

- Mechanical engineering
- Heat engineering and energy management
- Computer systems and technologies
- Automation and mechatronics
- Food packaging technique and technologies

FACULTY OF ECONOMICS

Programmes in the fields of:

- Hospitality and tourism
- Culinary management and catering
- Food and tourism economics
- Management, marketing and entrepreneurship
- Environmental management



ORGANIZERS

UFT AND ERASMUS+



Erasmus+

Обогатява житейския опит, разширява кръгозора.

Erasmus+ is the EU's programme to support education, training, youth and sport in Europe. The 2021-2027 programme places a strong focus on social inclusion, the green and digital transitions, and promoting young people's participation in democratic life. It supports priorities and activities set out in the European Education Area, Digital Education Action Plan and the European Skills Agenda.

UFT has been awarded the Erasmus Charter for Higher Education with a maximum score of 100 points. It enables UFT to participate in all key actions for the full duration of the Erasmus+ programme up to 2027.

Key Action 1 supports the mobility for students and staff members. Currently, two projects – № 2023-1-BG01-KA131-HED-000113186 and № 2024-1-BG01-KA131-HED-000197013 are under implementation by UFT, allowing approx. 200 mobilities to be realized.

Grants under Key Action 2 contribute to projects that strengthen international cooperation and the sharing of experiences between the participating organizations. Currently, UFT is engaged, as a coordinating institution, in the following project:

Project title: E-learning tools for Food technology and development education (**E-Food**)

Programme: ERASMUS+ KA220-HED

Project number:

2022-1-BG01-KA220-000085089

Duration: 36 months

Start: 01.12.2022



COVID-19 highlighted the importance of digital education for the digital transformation that Europe needs. The aim of the proposed project is to develop elements of an e-learning training system in the field of food technology, based on open access resources and developed on the basis of new educational standards. These general objectives and their results will be achieved through the realization of development of educational standards and materials for e-learning training for food industry. The project consortium includes partners from Bulgaria (University of Food Technologies), France (University Claude Bernard Lyon 1), Romania (University Lucian Blaga of Sibiu), Spain (University of Zaragoza) and Hungary (University of Debrecen).



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European Union

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SCIENTIFIC PROGRAM

ORAL SESSIONS

Thursday, November 13, 2025

UFT-Plovdiv, Building 2, Horizon Hall

9h00 Registration

10h00 Opening Ceremony

Plenary Session

Chairs: Galin Ivanov, Georgi Dobrev

10h30 PL1 [MITIGATION OF TOXICITY IN ULTRA-PROCESSED FOODS THROUGH ANTIOXIDANT STRATEGIES](#)

Prof. Youling L Xiong
University of Kentucky, U.S.A.
Department of Animal and Food Sciences

11h00 PL2 [EFFECTS OF INNOVATIVE NON-THERMAL TECHNIQUES ON INDIVIDUAL POLY-PHENOLS IN CV. NOCELLARA DEL BELICE](#)

Prof. Tuba Esatbeyoglu
Head of Institute of Food and One Health
Leibniz University Hannover, Germany

11h30 PL3 [CRYOGENIC FREEZING: MAKE IT FROZEN, MAKE IT FLEXIBLE](#)

Eng. Luca Bellocchio
MSc in Chemical Engineering - Politecnico di Milano
Application Development Dept. for cryogenic processes
in F&B and C&P market, SIAD Group

12h00 Lunch Break & Poster Session

13h00 PL4 [BIOECONOMY IN CENTRAL-EASTERN EUROPE: CHALLENGES AND OPPORTUNITIES](#)

Prof. Francesco Vizzarri
National Agricultural and Food Centre, Department of
Nutrition and Small farm animals, Hlohovecká 2,
Lužianky, Slovakia

13h30 PL5 [E-LEARNING TOOLS FOR FOOD TECHNOLOGY AND DEVELOPMENT EDUCATION](#)

Prof. Georgi Kostov
Department of Wine and Beer Technology
University of Food Technologies, Plovdiv, Bulgaria

14h00
-
15h30

Session 1:
UFT-Plovdiv, Building 2, Horizon Hall
Food science and technology and Food Chemistry,
Microbiology and Biotechnology and Nutrition and
dietetics

Chairs: Vanya Gandova, Denitsa Blazheva

Scientific committee: Stefan Dragoev, Dasha Mihaylova, Georgi Dobrev

- | | | |
|-------|-----|--|
| 14h00 | OP1 | <u>ANTIOXIDANT ACTIVITY CHARACTERISATION OF ROSE PETAL AGRO-WASTE FEEDSTUFF</u>

Francesco Vizzarri, Aneta Kišová, Lubomir Ondruska, Ivana Spevakova, Nikolay Kolev, Mihaela Ivanova |
| 14h10 | OP2 | <u>SUSTAINABLE VALORIZATION OF TECHNICAL EGG ALBUMEN: MODELING AND OPTIMIZATION OF THE COAGULATION PROCESS</u>

Plamen Saraliev, Desislav Balev, Desislava Vlahova-Vangelova, Nikolay Kolev, Nikolay Penov |
| 14h20 | OP3 | <u>CONTROL AND ENSURING SAFETY IN FRESH CHEESE PRODUCTION</u>

Rositsa Boyukova, Tatyana Balabanova, Plamen Mollov |
| 14h30 | OP4 | <u>ISOLATION AND IDENTIFICATION OF YEAST STRAINS FOR BEVERAGE PRODUCTION</u>

Mihaela Pavlova, Vesela Shopska, Rositsa Denkova-Kostov, Zapryana Denkova, Georgi Kostov |
| 14h40 | OP5 | <u>ANTIOXIDANT ACTIVITY OF PROPOLIS EXTRACTS</u>

Nevena Nacheva - Dimitrova, Anastasiya Yankova-Nikolova, Desislava Vlahova-Vangelova, Desislav Balev, Stefan Dragoev |
| 14h50 | OP6 | <u>COLOR CLASSIFICATION OF BULGARIAN HONEY USING SPECTRORADIOMETRY AND NEURAL NETWORK PROCESSING</u>

Ventsislav Simonov |
| 15h00 | OP7 | <u>DYNAMICS OF BIOMASS ACCUMULATION BY ARONIA MELANOCARPA CELL IN LIQUID CULTURE</u>

Petya Shishkova, Alexandra Garmidolova, Pervin Halkoglu, Atanas Pavlov, Albert Krastanov, Vasil Georgiev |

15h10 OP8 [ADVANCES IN NMR METABOLOMICS FOR BEER CHARACTERIZATION AND AUTHENTICATION](#)

Dessislava Gerginova, Plamen Chorbazhiev, Svetlana Simova

15h20 OP9 [REDUCING FOOD WASTE THROUGH THE MECHANISMS OF THE CIRCULAR ECONOMY AI](#)

Petya Biolcheva

15h30 Coffee Break & Poster Session

**14h00 - 17h00 Parallel Session:
UFT-Plovdiv, Building 1, Forum Hall
Project: E-learning tools for Food technology and development education**



Online Parallel Session

<https://www.youtube.com/@E-Food-UFT>

[SymbioBurst: A Case Study in the Development of Functional Dairy and Plant-Based Yogurts](#)

14h00 CS3 (Team3) **Team members:** Ivo García Penas, Morris Mbuthia Wagaki, Yasmine Akraab, Angelena Ganchozova, Anateya Georgieva, Yoann Duroux

Mentors: Rositsa Denkova, Bogdan Goranov

[Original Concept for a Fortified Fartón Sweet Bun with Upcycled Tiger Nut Pulp from Horchata Production](#)

14h15 CS6 (Team 6) **Team members:** Timothé Dubois, Raúl Campillo, Gabriela Sakalieva

Mentor: Monica Mironescu

[Gluten-Free Delights: Innovating Traditional Kozunak and Functional Crackers](#)

14h30 CS7 (Team 7) **Team members:** Yordanka Topuzova, Valentina - Madalina Moga, Neeraja Suresh, Celia Pardos, Yoan Zlatev

Mentors: Rositsa Denkova, Mihai Ognean

[Hyaluronic A Protein Bar](#)

14h45 CS8 (Team 8) **Team members:** Anthony Triviño, Oumayma Amiri, Mari-Kristin Nemska, Maria Mei Martinez de Zuazo

Mentors: Robert Nagy, Endre Máthé

15h00	CS9 (Team 9)	Vegan meat Team member: Sarita Romani Mentors: Diego García, María Jesús Serrano Tea sack with functional products and microencapsulated probiotics
15h15	CS12 (Team 12)	Team members: Alberto Fau Zamorano, Selena Seyzinska, Mateo Taipe Unapucha Mentors: Vesela Shopska, Cecilia Georgescu Ready to eat healthy soup
15h30	CS13 (Team 13)	Team members: Candela Guiral Sánchez, Bianca Giorgiana Ionescu, Houyame Amkraz Mentors: Diego García Gonzalo, María Jesús Serrano Functional dairy product – traditional Bulgarian yogurt with added honey and bee pollen
15h45	CS14 (Team 14)	Team members: Bozhurieta Spasova, Essraa Elmasry, Timea Borbely Mentors: Ion Dan Mironescu, Mihaela Adriana Tita SMART PASTA for healthy life
16h00	CS15 (Team 15)	Team members: Georgi Petkov, Yusuf Bayganov, Andreea Cornelia Stancu, Eka Mazumder Mentors: Georgi Kostov, Rosen Chochkov <u>FIRST STAGE CASE STUDIES</u> Development of an original diet chocolate with a bubbling sensation
16h15	CS1 (Team 1)	Team members: Jorge Andaluz Arbe, Alexandra Florea, Giorgi Khachapuridge Mentors: Monica Mironescu Effect of Pea Protein and Quinoa Addition on Bioactive Compounds in Fermented Chicken Salami
16h30	CS2 (Team 2)	Team members: Eka Mazumder, Carmen Maria Dogaru Mentors: Daniel Berdejo, Maria Jesús Serrano

		<u>Design of ChocoBoost, a new type of clean-label snack supporting well-being and health</u>
16h45	CS4 (Team4)	Team members: Sokol Aliji, Livia Balaguer, Antonia Dancu, Violeta Velikova, Jorge Andaluz Arbe Mentor: Monica Mironescu <u>Pasta Viva: Fruits based gluten free pasta</u>
17h00	CS11 (Team 11)	Team members: <u>Yoan Zlatev, Ghita Warak, Lorenzo Andronic</u> Mentor: <u>Mihai Ognean</u>
15h50		Session 2:
-		UFT-Plovdiv, Building 2, Horizon Hall
16h30		Food Process Engineering
		Chairs: Borislav Milenkov, Donka Stoeva
		Scientific committee: Nikolay Shopov, Plamen Nikovski, Dimitar Spirov
15h50	OP10	<u>EXPERIMENTAL EVALUATION OF THE HYGIENIC PERFORMANCE OF LASER TREATED AND SAND BLASTED SAMPLES FROM AISI 316 STAINLESS STEEL</u>
		Delyan Gospodinov, Denica Blazheva, Bogdan Goranov
16h00	OP11	<u>METHOD AND DEVICE FOR TREATING SLUDGE OBTAINED AFTER DISTILLATION OF SOLVENTS CONTAMINATED WITH PRINTING INKS</u>
		Miroslav Lantovski
		Session 3:
		UFT-Plovdiv, Building 2, Horizon Hall
		Econometrics and Finance
		Chairs: Iva Bichurova, Valentina Nikolova-Aleksieva
		Scientific committee: Snezhinka Konstantinova, Katina Valeva, Georgi Toskov
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		Plamen Ivanov
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Friday, November 14, 2025
Networking & Meetings at the UFT-Plovdiv Departments

PL1

MITIGATION OF TOXICITY IN ULTRA-PROCESSED FOODS THROUGH ANTIOXIDANT STRATEGIES

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Free radical-initiated changes in lipids and proteins during food processing and storage have a significant impact on the quality and nutritional value of affected food. Despite the benefits of mild oxidation for product flavor modification and texture enhancement, uncontrolled oxidative processes occurring in ultra-processed foods (UPPs) are recognized as a putative culprit for health hazards production and nutrient loss. Approximately 70% of food prepared at commercial settings are ultra-processed. Although processing has a crucial role in producing palatable, microbially safe, shelf-stable, and convenience foods, at exceedingly high temperatures and ultra-formulation conditions, processing can generate harmful chemical compounds that are indirectly or directly related to oxidation. UPPs are considered to be a plausible causative factor for diabetes, obesity, cancer, and cardiovascular conditions. A myriad of mitigation strategies, including natural antioxidative phenolic compounds, vacuum, moderate temperature treatment, appropriate acid-base conditions, and clean ingredients, have been proposed to combat the side effects of ultra-processing. This presentation will focus on the plausible relationship between protein oxidation and toxic compound formation in UPPs and suggest antioxidant methods to minimize negative impacts and side effects.

PL2

EFFECTS OF INNOVATIVE NON-THERMAL TECHNIQUES ON INDIVIDUAL POLYPHENOLS IN CV. NOCELLARA DEL BELICE

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Table olives (*Olea europaea* L.) are an important part of the Mediterranean diet. They contribute to the prevention of cancer and cardiovascular diseases due to their high content of bioactive compounds. One of the most important Italian cultivars of table olive is the "Nocellara del Belice" (NdB). It produces large fruits that are highly prized for both olive oil and table olives. Furthermore, it has been awarded the official Protected Designation of Origin (PDO, EC Regulation No. 134/1998).

To ensure microbiological safety, traditional thermal processes such as pasteurisation at 70–80 °C are employed. While these processes reliably inactivate microorganisms, they also lead to the degradation and oxidation of secondary metabolites, resulting in nutrient and antioxidant losses. Non-thermal processes are therefore becoming increasingly important. These operate at lower temperatures, which better preserves sensory properties and nutrient profiles. Rather than using heat, they utilise various forms of energy that influence cell structures and enzymes, thus ensuring microbiological safety and modulating polyphenol content. They also offer advantages in terms of energy efficiency and environmental compatibility. PEF (pulsed electric fields), CP (cold plasma) and HPP (high pressure processing) are particularly promising alternatives to traditional heat treatment.

Table olives (cv. Nocellara del Belice) were treated with HPP, PEF, CP and thermal processing, followed by ultrasound-assisted extraction. The characteristic polyphenols were quantified using ultra-high performance liquid chromatography-photodiode array (UHPLC-PDA) and their influence on the polyphenol profile was evaluated. Initially, different parameter combinations were investigated for each non-thermal treatment and then compared with the thermal treatment and the untreated samples. The results showed that the choice of parameters had less influence on the polyphenol profile than the choice of process. While thermal treatment and HPP treatment degrade glycosylated polyphenols and simultaneously enrich aglycones, CP treatment can preserve and slightly increase the native composition.

In summary, the choice of technique should be based on the research objective and the desired application. However, the choice of parameters plays a less decisive role; highly individual effects on the polyphenol profile occur depending on the process and the structural characteristics of the polyphenols.

PL3

CRYOGENIC FREEZING: MAKE IT FROZEN, MAKE IT FLEXIBLE

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SIAD is one of the most important chemical groups in Italy and supplies a full range of industrial, specialty, food and medical gases, in addition to operating in the following sectors connected with the world of gases: engineering, healthcare, LPG and Natural gas.

Founded in Bergamo in 1927, SIAD boasts a solid tradition and has acquired consolidated experience almost 100 years existence. Over time, it has succeeded in entering new geographic markets and sectors, whilst growing as a flexible and dynamic organisation and guaranteeing the utmost quality, reliability and professionalism.

SIAD is engaged in the production, marketing, and distribution of a full range of technical, food, specialty, medical, and refrigerant gases and related services, which find application in a variety of industries, from the food industry to the automotive industry, from the chemical industry to the metallurgical industry.

PL4

BIOECONOMY IN CENTRAL-EASTERN EUROPE: CHALLENGES AND OPPORTUNITIES

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Circular economy (CE) represents a promising strategy for saving relevant resources and reducing agricultural activities' negative environmental impacts while improving economic performance. CE is defined as "an economic system of closed loops in which raw materials, components and products keep their quality and value for the longest possible and systems are fuelled by renewable energy sources. The CE is an increasingly topic of interest worldwide, mainly when it comes to global sustainability. Since the European Commission presented its Circular Economy Strategy and the related Action Plan "Closing the loop", much has been written both on the topic of CE alone and on the relationship between bio-economy (BE) and CE, highlighting the most important differences and overlaps and explaining how to make the best use of both concepts. Enhance societal awareness and elevate public understanding of hot topics like bioeconomy and green transition in agriculture is strongly required. Expected results from dissemination and promotion activities are to enhance the capacity building of public institutions, involving and promoting a public engagement through workshop/info-training-day, inviting the regional and local institution to promote the innovation and sustainability of agricultural farming and raise the awareness and the strategic importance of primary production in Central-Eastern Europe.

E-LEARNING TOOLS FOR FOOD TECHNOLOGY AND DEVELOPMENT EDUCATION

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Advancing digital education aligns with EU priorities for innovation, inclusion, and skills, as outlined in the Digital Education Action Plan and the European Skills Agenda. The aim of the proposed project was to develop elements of an e-learning training system in the field of food technology, based on open access resources and developed on the basis of new educational standards. These general objectives and their results were achieved through the realization of development of educational standards and materials for e-learning training for the food industry.

The following important activities were carried out during the implementation of the project: analysis of existing e-learning systems and selection of a system to be used by the partners; development of a system of educational standards for the development of teaching materials with unified content in the field of food technology; development of databases and training materials in the field of food technology; testing the system through training of students and adults continuing education.

The project achieved results in the following priority areas of the Erasmus+ program: Development of digital educational content in the field of food technologies; Establishment of a system of digital educational standards for food technology training; Establishment of a sustainable partnership between universities with a training profile in the field of food and food technology.

OP1

ANTIOXIDANT ACTIVITY CHARACTERISATION OF ROSE PETAL AGRO-WASTE FEEDSTUFF

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Agro-industrial residues are by-products rich in organic compounds and hold great potential for transformation into valuable resources. Rose petal agro-waste refers to the discarded floral material produced during commercial rose cultivation and its processing in the cosmetic, food, and herbal industries. The objective of this study was to evaluate the antioxidant activities of the rose petal dried waste for potential consideration as livestock feedstuff. Rose petal waste was obtained from a Bulgarian producer of aromatic natural products located in the Sofia-Oblast Region. All samples were dried, milled, and further processed for the characterization of the antioxidant activity. The spent *Rosa damascena* petal dried waste showed a considerable amount of total phenol (341.17 ± 7.20 mg GAE/g) and a remarkable antioxidant activity, in terms of FRAP (3911.55 ± 86.43 mM TE/g) and ORAC (4015 ± 77.34 mg TE/g) values. The in vitro activity also resulted very promising. All these findings together confirm that the rose petal dried waste can be considered as a potential candidate to produce natural functional feedstuff for livestock application.

OP2

SUSTAINABLE VALORIZATION OF TECHNICAL EGG ALBUMEN: MODELING AND OPTIMIZATION OF THE COAGULATION PROCESS

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Industrial egg processing assures convenience and safety for the consumer in the same time generates a significant amount of by-products. The egg white adherent to the shell, referred as technical albumen (TA) is a valuable nutritious liquid by-product. Present study, investigates the influence of pressing force (PF), pH and dry matter concentration (DC) on the acid-thermal coagulation of TA by D-optimal design. The efficiency of pressing (PE) was evaluated in following parameters range: 200 – 400 kg PF and pH 4.8 - 5.2 and 15 – 22% DC. The yield at pH 5.0 and PF 300 kg is highest and high DC concentration 21%. Also, at DC 18.5% and PF 300 kg the yield has maximum value at pH 4.8. The modeling conducted in close to production conditions and the mathematical optimization performed show that the best concentration of the product is above 20%, that is, no dilution is necessary. The optimal acidity is in the range of pH 4.8-5.0. The pressure using a basket press should be 350 g/cm².

OP3

CONTROL AND ENSURING SAFETY IN FRESH CHEESE PRODUCTION

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In the context of a global environment that is undergoing significant change, ensuring the safety and quality of food products has become a key priority for producers. It is acknowledged that the Hazard Analysis and Critical Control Points (HACCP) system embodies a methodical approach to identifying and managing risks within the food chain. This approach is founded on internationally recognised principles for controlling critical points. The objective of this study is to analyse potential hazards and determine the critical control points (CCPs) in a developed technological flowchart for producing fresh cheese from camel milk, cow milk, and a 1:1 mixture of both. The methodology encompasses the implementation of logical modelling utilising the decision tree method, executed individually at each stage of the production process. It is acknowledged that a range of potential hazards may emerge at various stages of the production process. This underscores the necessity for meticulous monitoring and effective control measures to mitigate any risks. The findings of this study will provide a practical foundation for the development of targeted risk management measures and the enhancement of good manufacturing practices in the production of innovative dairy products, including those made from non-conventional raw materials such as camel milk.

OP4

ISOLATION AND IDENTIFICATION OF YEAST STRAINS FOR BEVERAGE PRODUCTION

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The isolation and identification of yeast strains remain central to the development of diverse and high-quality beverages, ranging from beer and wine to emerging functional drinks. Accurate identification is vital not only for functional characterization but also for quality assurance, spoilage prevention, and strain traceability in commercial applications. This paper reviews current methodologies for yeast isolation from natural and industrial environments, including fruits, tree bark, brewery waste, and spontaneous fermentations. It also evaluates classical versus modern methods for yeast isolation. Yeast identification through classical microbiological methods, though foundational, is limited in capturing the full diversity of yeasts. Modern molecular and proteomic tools—including ITS and D1/D2 rDNA sequencing, PCR-based genotyping, MALDI-TOF mass spectrometry, and next-generation sequencing—have significantly improved taxonomic resolution, strain discrimination, and community profiling. Finally, the review addresses industrial and regulatory considerations, highlighting safety, scalability, and consumer acceptance as critical factors. By integrating biodiversity exploration with advanced analytical tools, yeast isolation and identification remain key drivers of innovation in beverage fermentation.

ANTIOXIDANT ACTIVITY OF PROPOLIS EXTRACTS

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Propolis is a naturally occurring bee product that is high in flavonoids and polyphenols and has anti-inflammatory, antibacterial, and antioxidant qualities. Its utilization in the food sector, especially as a natural preservative in meat products, presents a potential and sustainable alternative to synthetic chemicals. This study investigated the antioxidant properties of four propolis extracts: two aqueous (WP1, WP2), one water-propylene glycol (PPGP), and one water-ethanol (ETOHP), to determine the most appropriate candidates for possible application in meat processing. The antioxidant activity was evaluated via total phenolic content (FC), radical scavenging capacity (DPPH, ABTS), ferric reducing power (FRAP), and cupric ion reducing ability (CUPRAC). The results indicated statistically significant differences all extracts. The ethanol extract demonstrated the highest overall activity in the majority of assays, whereas the propylene glycol extract revealed higher performance in CUPRAC. WP1, WP2 exhibited lower antioxidant activity compared to PPGP and ETOHP. On the other hand, WP1 distinguished itself the greatest radical scavenging capability against ABTS. According to these results, propolis extracts are useful natural antioxidants and show promise as a source of useful bioactive additives for the meat manufacturing industry. Keywords: propolis, antioxidant activity, FRAP, DPPH, ABTS, CUPRAC, food applications

OP6

COLOR CLASSIFICATION OF BULGARIAN HONEY USING SPECTRORADIOMETRY AND NEURAL NETWORK PROCESSING

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This publication explores the possibility of implementing a color classifier for various types of Bulgarian honey. For this purpose, spectroradiometric measurement is used based on a measuring device from JETI Technische Instrumente GmbH – Specbos1201 providing a measurement range in the visible spectrum – 380 ~ 820 nm, which is complemented by a reference light source BYK Byko-spectra – D65. The obtained data is used to implement two types of classification, between which a comparison was made in terms of a quality indicator - a KNN classifier and a classifier with a neural network with discrete outputs. In order to reduce the number of inputs, the spectral data was transformed into the standard CIE-Lab 1976 color space. The obtained results show a very good possibility for implementing a classifier using a neural network, with an extremely low level of potential misclassification despite the usage of a relatively small amount of training data $H(p,q)=0.00426$.

IMAGES SEGMENTATION IN HSI COLOR SPACE FOR MOLD IDENTIFICATION ON KASHKAVAL CHEESE

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Growth of unacceptable molds on Kashkaval cheese is a quality problem that could cause by various factors related to storing conditions, packaging and etc. Computer vision methods are preferred for solving many food quality problems due to their benefits such as fast, non-destructive evaluation and low-cost equipment. Thus, the current research focuses on the opportunity for computer-based identification of areas containing mold on the surface of Kashkaval cheese through images processing in HSI color space. The most frequency growth mold on Kashkaval cheese has white color and thus it is a complex task to recognize it through images processing based on thresholding or segmentation. Regarding this, the current research focuses on investigation the effectiveness of segmentation in HSI color space using prioritization of color components. As a referent images are used those that are manually processed by experts to localize areas with growth mold. Based on arithmetic and logical operations the images of Kashkaval cheese that result of automatic processing are compared with referent those and the results indicate that utilized prioritization in HSI color space is relevant regarding task of automatic mold identification.

MASS TRANSFER OF WHOLEGRAIN READY MIXTURE WITH ELDERBERRY

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The received results of the physico-chemical analysis and the sorption characteristics of wholegrain ready flour mixture with added quantity of a waste product – elderberry after alcohol fermentation in juice production are described in the current paper. The nutritional profile of the flour mixture shows that the product is well balanced with significant quantity of carbohydrates 62.32g, dietary fibre 13.65g, low content of fats 3.97g. The conducted mass transferring experiment with ready flour mixture is implemented for three temperatures (100S, 250S and 400S) and seven relative humidities of the air in the range from 11% to 87%. The received equilibrium moistures are with confirmative character for food products, with increase of temperature in constant air humidity the values of the equilibrium moisture lower. The suggested modified model appropriate for isotherms description in conformity with the eligibility criteria is Halsey. The values of the monomolecular moisture received by linearization of the BET model show direct dependence with the temperature for the experiment conditions. In increase of the temperature from 100S to 400S the monomolecular moisture lowers with s 2.6 % dry mass for the process of absorption and 2.2 % dry mass for desorption.

PP3

COMPARATIVE STUDY ON THE CHEMICAL COMPOSITION OF CORN AND CORN GERMS

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The aim of the current study was to evaluate and compare the chemical composition of corn and corn germs. For the evaluation of the chemical composition of the samples were used standard methods by ISO. The oil content was 3.4% in the whole grain but much higher in the corn germ 41.4%. Total carbohydrates found in the grains were almost double than those in the germs (76.8% and 39.2%) with starch being the main component with 44.6% and 16.0%, respectively, and the water-soluble sugars being 2.2% and 0.7%. Fibers were found to be 1.1% in the grains and 4.2% in the germs, and the content of ash was relatively low with 1.1% and 1.2%. The content of proteins was found to be 8.5% in the grains and higher in the germs (12.9%). The compositional analysis indicates distinct chemical profiles between corn grains and germs. Germs exhibit higher concentrations of oil, protein, and fiber, suggesting suitability for both food and non-food applications such as cosmetics and biofuels. In contrast, the grain's elevated starch content confirms its role as a key component in the food industry. These findings support differentiated utilization of corn components based on their specific properties.

PP4

DEVELOPMENT AND CHARACTERIZATION OF COLLAGEN DESSERTS

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The aim of the research was to evaluate the physicochemical, textural, and nutritional properties of collagen desserts incorporating skyr, quark and lyophilized strawberry powder. The assessment included the measurement of ash and moisture content, pH levels, titratable acidity, total soluble solids, water activity, vitamin C concentration, color spectra, and a texture analysis to validate the new formulation. Texture profiling was performed using parameters such as hardness, cohesiveness, adhesiveness, gumminess, and springiness. The analysis of water activity and texture profile was repeated on day 5 of storage. The freeze-dried strawberry powder acted not only as a natural flavor but also as a natural coloring agent in the new formulations. The newly developed product demonstrated an enhanced protein profile. The results underscored the significance of functional protein nutrition in culinary applications. Keywords: strawberry, skyr, protein rich, value-added ingredients, desserts.

PP5

EFFECT OF THE ADDITION OF TURMERIC AND BLACK PEPPER ESSENTIAL OIL ON THE COMPOSITION OF CURD

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The purpose of the research was to conduct a study on the physicochemical and fatty acid composition of cow's milk curd obtained after technological processing with the addition of turmeric and black pepper essential oil /3:1/ in different concentrations. Six concentrations were used to determine the optimal dose of the additive. The changes were established by evaluating the organoleptic, physicochemical and fatty acid indicators. Total fat was highest with 0.75 and 1% turmeric and black pepper oil addition residue with 0.5 and 1.5% addition in the analyzed curds and increased significantly ($P \leq 0.001$) compared to the control curd. Protein varied insignificantly. The addition of the supplement led to an improvement in the fatty acid composition of the curd in terms of a decrease in saturated and monounsaturated fatty acids at the expense of an increase in polyunsaturated ones, due to the enrichment of the food product with omega-3 and omega-6 fatty acids. Keywords: organoleptic assessment, omega-3 and omega-6 fatty acids, concentration of the additive

ACKNOWLEDGMENTS The study was carried out with the financial support of the National Science Fund, Ministry of Education and Science, within the framework of the implementation of the Project "Study of the influence of aromatic plants and.

PP6

QUALITY CHARACTERISTICS OF CURD WITH THE ADDITION OF THYME ESSENTIAL OIL

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The purpose of the research was to conduct a study on the physicochemical and fatty acid composition of cow's milk curd obtained after technological processing with the addition of thyme essential oil in different concentrations. Six concentrations were used to determine the optimal dose of the additive. The changes were established by evaluating the organoleptic, physicochemical and fatty acid indicators. Total fat was highest with 1.5, 2 and 2.5% thyme oil addition residue with 0.5 and 1.0% addition in the analysed curds and increased significantly ($P \leq 0.001$) compared to the control curd. Protein varied insignificantly. The addition of the supplement led to an improvement in the fatty acid composition of the curd in terms of a decrease in saturated and monounsaturated fatty acids at the expense of an increase in polyunsaturated ones, due to the enrichment of the food product with omega-3 and omega-6 fatty acids. Keywords: organoleptic assessment, omega-3 and omega-6 fatty acids, concentration of the additive The study was carried out with the financial support of the National Science Fund, Ministry of Education and Science, within the framework of the implementation of the Project "Study of the influence of aromatic plants and their essential oils on the quality of.

NUTRITIONAL, MICROBIOLOGICAL AND FUNCTIONAL PROPERTIES OF UNREFINED OMEGA-3 OILS AND NATURAL ESSENTIAL OILS AS PRESERVATIVES

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This study evaluates the oxidative stability, microbiological parameters, color characteristics, and fatty acid profiles of unrefined omega-3-rich oils (flaxseed, hemp seed, grape seed, chia, algae, fish, and cod liver oils). Volatile compounds from essential oils of coriander, bay leaf, and dill—used as natural antioxidants—were analyzed, along with their antimicrobial activity. All oils demonstrated acceptable oxidative stability and typical color values. Coriander oil showed the highest chlorophyll A (32.98 ppm) and carotenoids (61.14 ppm). Infrared spectroscopy indicated the highest omega-3 content in flaxseed, hemp, and chia oils. Fish, cod liver, and algae oils showed unique ester profiles due to their vitamin and phospholipid content. Microbial analysis revealed values below 10 cfu/g for the presence of pathogenic bacteria, molds, yeasts, and total viable count (TVC), with essential oils—particularly coriander—exhibiting strong antimicrobial effects. Chia oil was richest in omega-3s, followed by flaxseed, algae, fish, and cod liver oil. Grape seed oil had high α - and γ -tocotrienol content, enhancing its antioxidant potential. Phytosterols and triterpenoids were present in all plant oils, with squalene in chia oil and cycloartenol in flaxseed oil. Chia, algae, and cod liver oils show promise for functional dairy applications due to their stability and favorable sensory properties.

PP8

CHARACTERIZATION OF COMMERCIAL BULGARIAN DILL (*ANETHUM GRAVEOLENS* L.) FRUIT ESSENTIAL OIL

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Dill (*Anethum graveolens* L.) fruits are used in the food industry as a spice and a source of essential oil. The aim of this study was to characterize Bulgarian dill fruit essential oil, with a focus on its potential to enhance the flavor, improve quality, and extend the shelf life of food products. The chemical composition of the oil was determined by GC/MS analysis, revealing 11 aromatic compounds that together accounted for 99.93% of the total content. The major constituents were carvone (45.91%), limonene (26.56%), α -phellandrene (16.64%), and dill ether (4.38%). The antimicrobial activity was tested against four bacterial strains: *Escherichia coli*, *Salmonella enterica*, *Listeria monocytogenes*, and *Staphylococcus aureus*. The oil exhibited dose-dependent inhibition of *E. coli* and *S. enterica*, with the most pronounced effect observed at 0.10 mL, producing inhibition zones of 35 mm and 23 mm, respectively. No inhibitory activity was observed against *L. monocytogenes* or *S. aureus* at any tested concentration. The antioxidant activity was evaluated using the DPPH and FRAP assays. The oil demonstrated significant antioxidant potential, with values of $485 \pm 0.04 \mu\text{M TE/mL}$ (DPPH) and $787.24 \pm 0.05 \mu\text{M TE/mL}$ (FRAP), indicating its suitability as a natural antioxidant in food and health-related applications.

PP9

HIGHER ALCOHOLS VOLATILITY INFLUENCED BY REFLUX RATE AND SYSTEM OF DISTILLATION DURING WINE SPIRITS PRODUCTION

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Batch distillation of model wine solution using laboratory-scale pot and wine distillation using industrial hybrid type distillation system were made. The samples of distillates were collected during distillation and physicochemical and GC-FID analyses were performed. Ethanol, higher alcohols, isoamylol and isobutanol concentrations in the different fractions were determined and dynamic coefficient of diffusion (equilibrium ratio) and coefficient of rectification (relative volatility) were calculated. The efficiency of industrial system using continuously change of reflux rate to separate the two main high alcohols from "heart" fractions was estimated compared with standard batch distillation.

TECHNOLOGICAL CHARACTERISTICS AND COMPARATIVE QUALITY ASSESSMENT OF LOCAL AND GREEK ORIENTAL TOBACCOS IN THE KRUMOVGRAD REGION

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The study aimed to perform a comparative assessment of the quality characteristics of local and Greek Oriental tobaccos produced in the Krumovgrad region. Tobaccos of Krumovgrad (varieties "Krumovgrad 90" and "Krumovgrad 58") and Basma (of Greek origin) ecotypes, grown during the 2019 harvest in five micro-regions, were analyzed. A complex methodology for tobacco quality assessment was applied, including chemical analysis, expert assessment of the leaves and tobacco smoking profile. The results showed a more balanced chemical composition in "Krumovgrad 58" variety (Krumovgrad ecotype) and the tobacco of Greek origin (Basma ecotype), produced in Krumovgrad micro-region. The expert assessment gave an advantage to the local tobaccos of Krumovgrad ecotype, with the exception of "Krumovgrad 58" sample from Zvezdel micro-region. The smoking analysis graded the Basma ecotype tobacco (Krumovgrad micro-region) with the best smoking qualities, followed by the samples representing "Krumovgrad 58" (Strandzhevo) and "Krumovgrad 90" (Baratsi) varieties. The complex assessment through the generalized quality index distinguished the "Krumovgrad 58" variety from Zvezdel, followed by the Basma ecotype tobaccos from Krumovgrad and Pashintsi micro-regions. The results emphasize the need for annual quality examination of Bulgarian Oriental tobaccos and provide valuable information for the strategic management of their varietal structure and market position.

PROBIOTIC FRESH CHEESE WITH ROYAL JELLY: A NOVEL FUNCTIONAL DAIRY PRODUCT

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Fresh cheeses are valued for their nutritional and sensory properties. This study developed probiotic cheeses enriched with *Lacticaseibacillus casei* RC-1 and royal jelly (RJ), and evaluated their physicochemical, microbiological, fatty acid, and metabolite profiles during 14 days of refrigerated storage. Three formulations were prepared: control (C), probiotic with *L. casei* (Pro), and probiotic with *L. casei* plus RJ in amount of 2% (Pro+RJ). Pro+RJ showed higher initial acidity (1.30% lactic acid) and maintained stable dry matter and protein content. Ash content was slightly higher in Pro+RJ. Microbiological analysis indicated that Pro+RJ limited total plate and yeast counts compared to the control sample. The fatty acid profile of Pro+RJ displayed reduced palmitic acid and increased oleic and linoleic acids. The characteristic RJ compound 10-hydroxy-2-decenoic acid (10-HDA) was detected only in Pro+RJ. Metabolite profiling revealed higher essential amino acids and reduced lactic acid accumulation. Rheological tests showed increasing elastic and viscous properties during ripening, with Pro+RJ exhibiting the greatest structural stability. In conclusion, probiotic fresh cheese enriched with RJ improved microbial stability, displayed distinct lipid and metabolite profiles, and maintained nutritional quality, supporting its potential as a functional dairy product.

PP12

PHYSICOCHEMICAL AND SENSORY ANALYSIS OF WAFERS WITH DIFFERENT TYPES OF TAHINI FILLINGS

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Wafers are popular low-moisture confectionery products, typically composed of thin baked sheets and sweet fillings, which provide extended shelf life and distinctive texture. This study investigates the influence of different tahini-based fillings on the sensory and physicochemical properties of wafers. Tahini, a nutrient-dense paste from roasted oil-bearing seeds, offers high dry matter content (98.42–99.53%) and functional health benefits, making it a suitable long-life ingredient. Four tahini types—sesame, peanut, sunflower and hazelnut—were incorporated into fillings, and their hygroscopic behavior at $\phi = 68\%$ relative humidity was assessed. Sensory analysis revealed that tahini fillings reduced wafer crispiness across all variants, likely due to moisture migration into wafer sheets. Sweetness perception varied, with sesame tahini wafers rated sweetest and sunflower tahini wafers least sweet, while hazelnut and peanut variants showed no significant difference. Hedonic evaluation ranked hazelnut tahini wafers highest for appearance and texture, and peanut tahini wafers highest for aroma and taste, whereas sesame tahini wafers received the lowest ratings overall. The results highlight that tahini type significantly influences wafer hygroscopicity, sensory attributes, and consumer acceptability.

PP13

COMPARATIVE STUDY ON SENSORY AND RHEOLOGY CHARACTERISTICS OF CHOCOLATE PRODUCTS OBTAINED FROM COCOA BEANS ROASTED IN DIFFERENT CONDITIONS

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Roasting conditions of cocoa beans, used in chocolate production, were evaluated in the following study as one of the main factor determine quality of the chocolate products. Four samples were prepared under different roasting parameters for the purposes of sensory and rheology analysis. The first three chocolate samples were produced from cocoa nibs, while the fourth was prepared from cocoa mass obtained under industrial conditions of roasting. All samples were processed according the same technological scheme of chocolate production. The results reveal that there is a significant difference mostly in some sensory characteristics between four chocolate samples, as for the rheological characteristics they are statistically indistinguishable.

CONTEMPORARY ANALYSIS OF THE CHEMICAL COMPOSITION AND MICROBIAL CONTAMINATION OF RYO/MYO TOBACCOS FROM THE BULGARIAN MARKET

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Fine-cut tobacco blends for handmade cigarettes (RYO/MYO) are gaining popularity not only because of their price advantage, but also because of the perceived possibility of "more controlled" use, which positions them as a preferred choice among certain consumer groups. In response to this demand, the modern production of RYO/MYO tobaccos relies on blends with controlled physical, chemical and microbiological characteristics, ensuring stable product quality. A study of seven commercial brands of RYO/MYO tobaccos distributed on the Bulgarian market was conducted. High content of nicotine (2.03-3.33%), reducing sugars (11.50-15.72%) and nitrogen (2.16-2.82%) was found, as well as the presence of glycerol and heavy metals, within the quantitative limits typical for the regarded tobacco product type. Despite the increased moisture content (14.16-21.60%), the low water activity gives the products relative microbiological stability. The analyses show low microbial contamination and a statistically significant negative correlation between microorganism abundance and water activity. The results obtained highlight the need for continued research on RYO/MYO tobaccos in view of their complex quality, safety and perceived lower risk compared to factory cigarettes. Such scientific evaluation is essential to better understand the actual characteristics and potential impact of these products on consumers, especially given their increasing market presence.

PP15

ENZYME TECHNOLOGY FOR OAT MILK PRODUCTION

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Oat milk production through enzymatic hydrolysis was investigated. The effect of hydromodule on chemical composition, yield and rheological behaviour of oat milk was studied. The process combined α -amylase and amyloglucosidase hydrolysis to obtain controlled liquefaction and saccharification of oat slurry. As a result of the controlled enzyme hydrolysis the oat slurry was liquified and the viscosity significantly decreased. At 50 °C and hydromodule 1:6 the viscosity decreased from 4.5 to 0.9 Pa.s. Protein, lipid levels and reducing sugars decreased proportionally with higher water-to-oat ratios, whereas the yield of oat milk increased.

PP16

EVALUATING ACIDITY LEVELS IN PACKAGED COFFEE IN ORDER TO ENHANCE PRODUCT LABEL ACCURACY

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Numerous coffee products are marketed as low-acid coffee. The objective of this study was to examine and compare the differences in acidity levels across various packaged coffee products. Eleven products of ground roasted coffee were examined in this study. The coffee samples were given codes as XL. The coffee samples were brewed using a drip coffee maker. The pH values of each sample were measured by placing the pH electrode into the sample after cooling down the sample to room temperature. The total of dissolved substances (TDS) was measured using a refractometer. The pH measurements for coffee samples showed a low acidity in sample XL96 (pH 5.74) that was significantly different compared to the other samples. The higher acidity was observed in samples XL10, XL65, XL98 (pH 4.96, 4.99, and 5.02) respectively. Most coffee samples exhibited a TDS range between (1.4-2%). The results serve to emphasize the need to establish a reliable set of standards for the labelling of low acid coffee products. This new standard should include a standardized method for measuring pH, and clear information regarding acidity levels on all packaging labels.

PP17

DETERMINING THE INFLUENCE OF GRAPE SEED OIL, FLAXSEED OIL AND EXTRA VIRGIN OLIVE OIL ON THE QUALITY CHARACTERISTICS OF FINISHED BREAD

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This review article examines the influence of grape seed oil (GSO), flaxseed oil (FO), and extra virgin olive oil (EVOO) on the quality characteristics of finished bread. The rising interest in functional bakery products has stimulated research into the use of plant-based oils rich in bioactive compounds. GSO, obtained as a by-product of winemaking, is notable for its high linoleic acid, vitamin E, and polyphenolic content, which enhance oxidative stability and extend shelf-life. FO provides a unique source of alpha-linolenic acid (ALA) and lignans, improving the nutritional profile of bread with valuable omega-3 fatty acids. EVOO, central to the Mediterranean diet, is rich in monounsaturated fatty acids and phenolic antioxidants, contributing to crumb softness, dough stability, and enhanced sensory attributes. The article synthesizes findings from recent studies on the effects of these oils on loaf volume, texture, crust and crumb color, freshness, and consumer acceptance. Comparative analysis highlights that each oil provides distinct technological and nutritional benefits. It is concluded that targeted incorporation, or blends of GSO, FO, and EVOO, can improve both functional and sensory quality, offering promising directions for innovation in breadmaking.

STUDY OF NEWLY ISOLATED SORGHUM STRAINS AND THEIR APPLICATION FOR BEER PRODUCTION

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Twenty yeast isolates isolated from sorghum grains were studied. Their morphological, cultural and physiological characteristics were studied. The ability of three isolates to ferment carbohydrates was studied by paper chromatography, the reproductive capacity and fermentation activity in grape juice were determined. Partial identification was conducted according to Kurtzman et al. (2011). The three isolates can be assigned to the genus *Saccaromyces cerevisiae*. It was found that the three isolates do not ferment maltose. The possibility of using the three newly isolated sorghum strains for the production of sorghum beer was investigated. The beer produced with *Saccaromyces cerevisiae* strain 2.3. is characterized by a harmonious fresh taste, an intense aroma dominated by cloves and tropical fruit, and a spicy residual bitterness. Real possibilities for the production of non-alcoholic and low-alcohol sorghum beer have been established with some of the studied strains.

PP19

IMPACT OF THERMAL PROCESSING ON THE NUTRITIONAL AND CHEMICAL COMPOSITION OF EDIBLE SNAIL MEAT (*HELIX ASPERSA MAXIMA*)

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A comparative study was carried out to assess the effect of different thermal processing methods on the nutritional value and chemical composition of edible snail meat (*Helix aspersa maxima*). The experimental design included sous-vide treatment at 80 °C for 200 minutes, conventional boiling at atmospheric pressure and boiling under high pressure. The results demonstrated that the applied thermal treatments strongly influences the nutritional profile and chemical composition of cooked snail meat. Compared to other thermal processing techniques, the sous-vide method most effectively preserves the content of proteins, fats, minerals, and carbohydrates whereas boiling at high pressure produces snail meat characterized by comparatively higher concentrations of essential amino acids and polyunsaturated fatty acids. Sous-vide, as a contemporary culinary technique, presents additional technological and quality-related advantages, making it a promising method for the preparation of snail meat.

COMPARATIVE STUDY OF THE DESIGN AND CHEMICAL COMPOSITION OF HEATED TOBACCO PRODUCTS

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Heated tobacco products (HTPs) are marketed as alternatives to conventional cigarettes and as products with potentially reduced harm. Despite the growing consumption of HTPs worldwide, their chemical composition and physical properties remain insufficiently explored. This study aims to examine the design and the physical and chemical characteristics of HTPs sold on the Bulgarian market. The physical dimensions and weight of the sticks and their structural components were determined, as well as the main chemical indicators of the incorporated tobacco material and the aerosol produced, respectively - ash, total reducing sugars, nicotine, cellulose; total and dry particulate matter, etc. The results indicate high cellulose levels in the tobacco material (13.10–18.39%) and relatively higher total particulate matter (26.63–39.86 mg/stick) compared to conventional cigarettes. The obtained results expand the knowledge about the structure and composition of HTPs and contribute to a deeper understanding of their physical and chemical characteristics.

PP21

PROTEIN-PHENOLIC INTERACTIONS: EFFECTS ON THE PROPERTIES OF BIOPOLYMER FILMS

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The targeted search for sustainable and safe packaging materials increases the interest in biopolymer films derived from natural ingredients. This study analyses the potential of protein-phenolic complexes as a material for the creation of multifunctional and environmentally friendly biopolymer films. The protein-phenolic complexes used in the study are of soy protein isolate (SPI) and pomegranate peel polyphenol extract (PGPe) in three different ratios of the constituent components. The resulting films were analysed for physicochemical and mechanical properties and bioactive functionality. The results show that the protein-phenolic complexes can be used as a basis for obtaining biopolymer films, consistent with the goals of sustainable development of biodegradable and functional packaging and systems for the needs of the food and pharmaceutical industries.

PP22

ENHANCING YOGURT TECHNOLOGICAL PROPERTIES WITH MILK AND MEALWORM PROTEINS AND CHIA SEEDS

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The protein content of yogurt is commonly increased by incorporating milk protein concentrates, whey protein, or other protein sources. The objective of this study was to evaluate the effects of skimmed milk powder, whey protein concentrate (WPC), mealworm powder, and chia seeds on the rheological and technological properties of yogurt. The aim of this study were to evaluate total solids and fat content, pH, whey syneresis, and viscosity changes during storage. Results of this study showed that the incorporation of chia seeds resulted in a increase in dry matter content, reaching 47.9%, whereas the addition of 3% mealworm powder led to a decrease of dry matter to 12.83%. The addition of 3% mealworm powder also raised the fat content from 3.5% in the control yogurt to 4.1%. During fermentation, a decrease in pH was observed across all samples. Syneresis measurements indicated that chia seeds improved whey stability, reducing syneresis to 23%. In contrast, yogurts containing WPC, skimmed milk, and mealworm powder exhibited higher syneresis values of 49.51%, 45.92%, and 48.37%, respectively. Viscosity analysis demonstrated that samples containing chia seeds exhibited the highest viscosity 22,248.07 cP, whereas yogurts with 3% mealworm powder showed the lowest value of viscosity 557.43 cP.

ASPECTS OF IMPROVING MACARONS PRODUCTION TECHNOLOGY

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Macarons are a product in which aesthetics play a particularly important role; therefore, synthetic colorants are often used in their production to achieve bright, visually appealing colors. The aim of the study is to evaluate the sensory properties and quality indicators of macarons colored with natural colorants (lyophilized berries and vegetables). When selecting raw materials to add color to the macarons, unconventional, naturally derived ingredients were chosen – lyophilized beetroot, blueberries, pumpkin, and raspberries. To determine the quality of the products, moisture content was measured using a KERN MLS-50-3. The color analysis was performed using a Lovibond LC 100 spectrophotometer. The calorific value was determined using the IKA C2000. The mineral content was determined according to ISO 6869:2000. The sensory evaluation was carried out by 30 assessors. Freeze-dried beets and blueberries were found to be the most suitable for macaron production, exhibiting intense color and good technological properties. The moisture content, mineral matter, and caloric value were influenced by the type of freeze-dried raw material used, with results ranging from 8.40% to 9.89%, 0.94% to 1.23%, and 490 to 512 kcal/100 g, respectively.

STATE OF KNOWLEDGE ON THE USE OF ARTIFICIAL INTELLIGENCE IN FOOD PRODUCTION

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The application of AI in food production spans multiple areas, including quality control, food safety, logistics, and machinery maintenance. The implementation of AI-based software in the food sector also significantly reduces food waste. Despite its benefits, the use of AI remains associated with concerns and controversies. Therefore, the aim of this study was to assess public knowledge and awareness regarding the application of AI in food production. The survey was conducted among 267 respondents from Poland using a questionnaire consisting of 35 closed-ended, single-choice questions and a demographic section. The findings revealed that while most respondents are familiar with the concept of AI, they rarely or only occasionally encounter information about its use in food production. Participants expressed concerns primarily related to the lack of control over the technology. According to respondents, AI is expected to have its greatest impact in optimizing food production processes, with the main benefits being improved product quality and reduced losses. Moreover, AI is perceived as a tool that supports the optimization of production processes and enhances food quality. However, the level of knowledge and awareness about AI varies depending on respondents' age and education.

OP7

DYNAMICS OF BIOMASS ACCUMULATION BY ARONIA MELANOCARPA CELL IN LIQUID CULTURE

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Cellular agriculture is an emerging field of biotechnology that aims to produce foods, and other agricultural products directly from cultured cells, offering a sustainable alternative to traditional farming. In plant cell culture systems, the avoidance of herbicide application is crucial. Accordingly, we present results from a plant cell culture system optimized through adaptation with natural growth regulators. In this work, growth dynamics and consumption of key nutrients (phosphate, ammonium, and nitrate ions) by Aronia cells, grown under submerged conditions have been investigated. The accumulation of secondary metabolites was monitored by analyzing changes in total phenolic content and antioxidant activity. The culture accumulated a maximum biomass of 7.83 ± 0.79 g/L (dry weight) on 9 day. Our study demonstrate that by using natural growth regulators for cultivation of Aronia cell suspension it was plausible to produce a high amount of cell biomass with increased nutritional value. The results can be used as a base point for development of sustainable biotechnology process for Aronia biomass production. Acknowledgements: This work was supported by the Bulgarian National Science Fund, Bulgarian Ministry of Education and Science, under the contract KP-06-H66/14; BG-175467353-2022-04-0214-C01

OP8

ADVANCES IN NMR METABOLOMICS FOR BEER CHARACTERIZATION AND AUTHENTICATION

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Beer is a chemically complex beverage influenced by various raw materials, fermentation conditions, and maturation techniques. Recent advances in proton nuclear magnetic resonance (NMR) spectroscopy have established it as a powerful tool for the untargeted metabolomic profiling of beers, offering quantitative and reproducible insights into fermentation and aging processes. In our recent studies, we applied NMR-based metabolomics coupled with multivariate statistical analysis to examine compositional variability in craft and commercial beers. Techniques such as hierarchical cluster analysis (HCA) and orthogonal partial least squares discriminant analysis (OPLS-DA) effectively differentiated beer styles. Characteristic metabolites, such as amino acids, organic acids, saccharides, and nucleosides, emerged as markers of yeast, ingredient composition, and barrel-aging effects. Integrating chemometrics with NMR spectroscopy enables the rapid, non-destructive evaluation of beer quality and authenticity, demonstrating the potential of NMR metabolomics as an essential analytical tool in brewing research. Acknowledgements: This research was funded by the Bulgarian National Science Fund and relied on project KP-06-M79/2. The authors are grateful to the INFRAMAT project and the Centre of Competence "Sustainable Utilization of Bio-Resources and Waste of Medicinal and Aromatic Plants for Innovative Bioactive Products" (BIORESOURCES BG) for providing essential research equipment.

KINETIC STUDY OF THE OXIDATIVE DEGRADATION OF LINSEED OIL WITH THE ADDITION OF SOPHORA JAPONICA L. EXTRACT

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This study investigates the oxidative stability of cold-pressed linseed oil enriched with various natural and synthetic antioxidants, including Sophora japonica extract (SJE), ascorbyl palmitate (AsP), quercetin (Q), and butylated hydroxytoluene (BHT), under different storage conditions (6, 25, 60 °C). Oxidative changes were assessed via weight gain (WG), free fatty acid (FFA) content, peroxide value (PV), and kinetic and thermodynamic analyses. The WG test demonstrated that antioxidants delayed oxidation, with the best effect observed for LO+AsP and LO+Q, while SJE showed a moderate impact. FFA values remained relatively stable across storage temperatures, with SJE exhibiting the highest inhibition of hydrolysis at 6 °C. PV increased with temperature and storage time. Regression analysis was performed and kinetic parameters were determined at 25 and 60 °C. Kinetic parameters derived from the Arrhenius model revealed the lowest activation energy ($E_a = 36.002 \text{ kJ/mol}$) and Q_{10} (1.625) for SJE-supplemented oil, indicating enhanced oxidative stability. Thermodynamic analysis further supported the antioxidative role of SJE, yielding the lowest Gibbs free energy ($\Delta G^\ddagger = 48.574\text{--}65.846 \text{ kJ/mol}$) and enthalpy ($\Delta H^\ddagger = 35.553 \text{ kJ/mol}$), along with the least negative entropy values. These results suggest that SJE (200 ppm), is a promising natural antioxidant for improving linseed oil shelf life.

PP26

USEFUL PROCEDURE FOR FUNGAL INFECTED POTATOES USING FTIR MICROSCOPY

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Some fungal pathogens are responsible for severe plant diseases, and may cause serious problems in food production. Thus, early identification of these fungal pathogens plays a crucial role in devising effective control strategies. Currently, available methods for identifying fungi are often time-consuming and lack specificity. Fourier-transform infrared (FTIR) microscopy is considered a sensitive method for detecting molecular changes in cells. Due to the high similarity between spectra of different fungal pathogen species, this method becomes paramount to enhance fungal discrimination in potatoes. We evaluated three potential procedures for preparing pathogen samples for examination using FTIR microscopy. Our results show that direct preparation of fungal samples from liquid growth media is the optimal method for FTIR microscopy examinations, offering improved results in the discrimination of potato fungal species.

PP27

STUDY OF THE MICROBIOLOGICAL STATUS OF BOTTLED NATURAL MINERAL, SPRING AND TABLE WATERS FOR THE PERIOD 2015 - 2024

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Mineral and spring waters are good examples of natural aquatic habitats, as these aquifers originate from underground water sources and are protected from human intervention. This widespread use of water requires meeting certain sanitary and hygienic requirements set out in national and European regulations, thus ensuring its quality and safety. Compliance with these requirements is controlled through annual monitoring. The present study is in this regard. The aim is to track the microbiological monitoring of bottled natural mineral, spring and table waters (including 19 liter gallons), Bulgarian production for the 2015 – 2024 period. A total of 696 samples of bottled water were tested according to the requirements of the Regulation on the requirements for bottled waters intended for drinking purposes. The microbiological parameters by which the samples were tested are set out in national legislation. The methods used are ISO standards. During the monitored period, the indicator *Pseudomonas aeruginosa* showed the highest non-standardity. Of all 45 analyses that did not meet the requirements of the Regulation, 33 were non-standard for the indicator *Pseudomonas aeruginosa* – 73.3%. The high prevalence of *P. aeruginosa* in bottled water can be explained by its ability to form biofilms and its resistance to chlorine.

BIOACTIVE POTENTIAL OF ELDERBERRY (SAMBUCUS NIGRA L.): ANTIOXIDANT AND PREBIOTIC POTENTIAL AFTER YOGURT ADDITION

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Oxidative stress is associated with multiple diseases and health problems, including COVID-19, cancer, diabetes, cardiovascular disease, neurodegenerative disorders, inflammatory conditions, and aging. Therefore, the development of antioxidant treatment strategies has emerged as a major area of medical research. Yogurt is often labeled as a "superfood" and is increasingly recommended for the prevention of various "diseases of civilization". One of the key reasons for the inclusion of natural additives in yogurt is to enhance its antioxidant activity. To improve the functional benefits of Bulgarian yogurt, we investigated the antioxidant potential of yogurt enriched with lyophilized extracts of *S. nigra* flowers and fruits. We evaluated the free radical scavenging activity and the inhibition of lipid peroxidation by in vitro assays. The probiotic effects of lactic acid bacteria on the quality, sensory, and microbiological characteristics of yogurt enriched with the extracts were also investigated. The results indicate that the addition of lyophilized *S. nigra* fruit juice extract to yogurt is beneficial and can be used to strengthen the body's defenses against diseases associated with oxidative stress. Keywords: yogurt, *S. nigra* L., total polyphenols, antioxidant capacity, lipid peroxidation.

NON-CONVENTIONAL YEAST AS A TOOL FOR THE PRODUCTION OF LOW ALCOHOL AND ALCOHOL FREE BEERS

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The global trend for the production of beverages with reduced alcohol content is a result of both consumer desire for a healthy lifestyle and the producers' efforts to innovate and expand their product portfolios in response to market demands. Although low alcohol and alcohol free beers are traditionally obtained by physical methods, non-conventional yeast strains that are unable to metabolize maltose (the main carbohydrate in wort) has been studied extensively for the production of beer with reduced alcohol content. This paper investigated the possibilities of four non-conventional yeast species: *Saccharomyces ludwigii*, *Zygosaccharomyces bailii*, *Saccharomyces bayanus* (*S. oviformis*), and *Metschnikowia pulcherrima* for the production of low- and non-alcoholic beers at fermentation temperature of 15 °C. The results indicated that *Z. bailii* was suitable for the production of alcohol free beers with good sensory characteristics, while *S. ludwigii*, *S. bayanus*, and *M. pulcherrima* could be effectively used to produce low-alcohol beers with balanced organoleptic profiles. The laboratory produced beers were compared to commercially available ones and no significant differences in the concentrations of yeast-derived metabolites were observed.

PP30

INVESTIGATION OF THE KINETIC GROWTH PARAMETERS AND BIOLOGICAL ACTIVITIES OF PROBIOTIC STRAIN HEYNDRICKXIA COAGULANS M DURING SUBMERGED CULTIVATION

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Heyndrickxia coagulans M is a probiotic strain with antimicrobial activity against various foodborne pathogens and saprophytes, including bacteria and fungi. It has the potential for applications in probiotic preparations and plant protection. The strain was cultivated in three different nutrient media and the logistic curve and exponential mathematical models were employed to study the kinetics of the growth and sporulation processes. The strain demonstrated maximal value of the maximum specific growth rate of 0.122 h⁻¹ in nutrient medium C and maximum specific sporulation rate of 0.198 h⁻¹ in nutrient medium A. The obtained culture liquids were investigated for biological activities. Six ninhydrin-positive compounds with antifungal activity and different R_f values were detected through thin-layer chromatography (R_{f1} = 0.72; R_{f2} = 0.81; R_{f3} = 0.27; R_{f4} = 0.96; R_{f5} = 0.16 and R_{f6} = 0.08). The enzymatic profile of the strain was determined.

PP31

INFLUENCE OF THE COMPOSITION OF THE CULTURE MEDIUM ON THE GROWTH, SPORULATION AND BIOLOGICAL ACTIVITIES OF PROBIOTIC STRAIN HEYNDRICKXIA COAGULANS BJ

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The influence of the composition of the nutrient medium on the growth and sporulation of *Heyndrickxia coagulans* BJ during submerged cultivation was investigated. The logistic curve and exponential mathematical models were employed to study the kinetics of the growth and sporulation processes. The strain demonstrated maximal value of the maximum specific growth rate of 0.174 h⁻¹ and maximum specific sporulation rate of 0.198 h⁻¹ in nutrient medium B. The obtained culture liquids were investigated for biological activities. Three ninhydrin-positive compounds with antifungal activity and different R_f values were detected through thin-layer chromatography (R_{f1} = 0.55; R_{f2} = 0.07; and R_{f3} = 0.81). The strain exhibited proteolytic, amylolytic and lipolytic activities.

PP32

MOLECULAR GENETIC TECHNIQUES IN FOOD QUALITY CONTROL, AUTHENTICITY, AND BIOTECHNOLOGY

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The growing demand for safe, high-quality, and traceable food, feed, and biotechnological products has led to the widespread adoption of molecular genetic techniques in both analytical and regulatory frameworks. The present review explores the application of advanced molecular tools such as PCR-based methods, DNA barcoding, and next-generation sequencing (NGS) in ensuring product quality, verifying authenticity, detecting contamination, and supporting biotechnological innovation. These methods offer high sensitivity, specificity, and speed, making them powerful alternatives to conventional techniques. They are particularly valuable for detecting food adulteration, identifying genetically modified organisms (GMOs), authenticating species origin in complex matrices, and monitoring microbial contamination in food and medicinal products. In addition, the global threat of foodborne pathogens underscores the importance of timely and cost-effective microbial detection. Molecular techniques, including polymerase chain reaction (PCR), isothermal amplification methods, gene probes, and DNA microarrays have shown high specificity and efficiency in pathogen identification and surveillance. Each technique offers distinct advantages and applications, which are discussed in detail along with their benefits, and limitations. Overall, molecular genetic approaches represent a robust and indispensable tool for modern food analysis, offering unparalleled precision, reliability, and adaptability across diverse applications in food safety, authenticity verification, and biotechnology.

PP33

POTENTIAL OF THE WHITE-ROT FUNGUS TRAMETES VERSICOLOR FOR FLUORENE DEGRADATION IN SUBMERGED CULTURE

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Polycyclic aromatic hydrocarbons (PAHs) are widespread environmental contaminants formed mainly through incomplete combustion of organic matter (fossil fuels, biomass, industrial processes). They are hydrophobic, persistent, and tend to accumulate in soils, sediments, and biota. Fluorene, a three-ring PAH, is commonly detected in urban air, surface waters, and sediments, especially near industrial sites and areas with high traffic emissions. Although fluorene is less studied compared to high-molecular-weight PAHs, it is often found in relatively high concentrations in the environment. White-rot fungi (WRF), predominantly belonging to the Basidiomycota, are recognized as efficient degraders of persistent organic pollutants, including fluorene. The present study is focused on the evaluation of the biodegradation ability of the WRF *Trametes versicolor* 8939 towards fluorene under submerged cultivation conditions. Fluorene was used in the culture media in concentrations up to 200 ppm either as sole source of carbon or as additional component of the medium. The activities of lignin-degrading enzymatic system (laccase and manganese-dependent peroxidase) were monitored during all experiments. The fungus was able to degrade 100% of fluorene with initial concentration of 200 ppm for 10 days when cultivated in rich medium in submerged conditions. Intermediates from the compound's degradation were identified using GC/MS.

PP34

A BIOTECHNOLOGICAL APPROACH TO FUNGAL BIOMASS PRODUCTION: CULTIVATION OF FOMITOPSIS PINICOLA USING PLANT-DERIVED WASTE MATERIALS

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The utilization of plant-derived waste materials as a nutrient source for the cultivation of basidiomycetes has attracted increasing interest within the scientific community due to its sustainability and biotechnological potential. Bulgaria, a major exporter of wheat and globally renowned for its high-quality rose and lavender oils, generates substantial volumes of agricultural by-products that remain underexploited. This study investigates the potential of such plant-based residues as alternative culture media for the in vitro cultivation of *Fomitopsis pinicola*, and to model the growth kinetics of a newly isolated strain from Bulgaria. Nine different media were evaluated using logistic and reversed autocatalytic growth models. Among the tested substrates, wheat straw with wheat bran (WSWB) supported the most efficient mycelial growth ($\mu_{\max} = 0.841 \pm 0.001 \text{d}^{-1}$). Comparable growth potential was also observed on media containing steam-distilled lavender straw and wheat bran (SDLSWB). Kinetic modeling revealed that the optimal cultivation temperature for *F. pinicola* on WSWB medium is 25 °C, while pH 6.0 was determined to be the most favorable for the growth of the strain. These results highlight the suitability of plant-based residues as sustainable substrates for fungal biomass production and lay the groundwork for the development of eco-friendly biotechnological processes involving basidiomycete fungi.

PP35

DEVELOPING A SWEET POTATO MEDIUM FOR THE CULTIVATION OF LACTOBACILLUS SP

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The objective of this study was to investigate the use of sweet potato as a primary component in developing a medium for the cultivation of lactobacillus sp. Seven Lactobacillus strains were used in this study. Fresh sweet potato was baked in a conventional oven at 200 °C for 1 h. The sweet potatoes were then blended in a kitchen blender with deionized distilled water. This solution was centrifuged, and the supernatant was collected to form sweet potato extract (SPE). Three batches of SPE were supplemented with a different concentration of nitrogen sources to form three samples of media (SPM1, SPM2, and SPM3). The three samples of SPM were inoculated and incubated for 12 hr. at 42 °C. The bacterial growth and the optical density (OD_{610nm}) in SPM were measured and compared to that in Lactobacilli MRS medium. The bacterial populations accorded with OD₆₁₀, and log CFU/ml indicated that the growth of the tested Lactobacillus strains in SPM2 and SPM3 was significantly higher than that in SPM1 or MRS. Our findings demonstrated that SPM2 could be a suitable medium for the growth of Lactobacillus sp.

PP36

ENHANCED TRANSESTERIFICATION PERFORMANCE OF IMMOBILIZED LIPASE

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Enzyme immobilization is a powerful strategy to enhance stability, reusability, and industrial applicability of biocatalysts. In this study, lipase from *Aspergillus carbonarius* NRL369 was immobilized on polyethylene terephthalate (PET) beads and assessed for its performance in transesterification reactions. The influence of reaction time, acyl acceptor type and concentration, solvent medium, and operational stability was systematically investigated. Iso-amyl alcohol and ethyl acetate emerged as the most effective acyl acceptors at 0.8 mmol/L, whereas methanol completely inhibited catalytic activity. Optimal activity was achieved after 90–120 minutes, particularly in hydrophobic solvents such as hexane and diethyl ether, while dimethylformamide and tert-butanol led to enzyme deactivation. The immobilized lipase demonstrated strong reusability, maintaining 85–89% of its initial activity after five cycles. These results highlight the potential of *A. carbonarius* NRL369 lipase as a high-performance and efficient biocatalyst for industrial transesterification processes, including biodiesel production and functional ester synthesis, where stability and solvent tolerance are critical for sustainable and scalable biocatalysis.

PP37

EFFECT OF STORAGE CONDITIONS ON THE PHYSICOCHEMICAL PROPERTIES, POLYPHENOLIC CONTENT, AND BIOLOGICAL ACTIVITIES OF FIG LEAVES (*FICUS CARICA* L.)

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Fig tree leaves (*Ficus carica* L.) are a rich source of biologically active compounds and possess both nutritional value and therapeutic potential. This study compared the physicochemical properties, polyphenolic content, and biological activities of fig leaves processed and stored under different conditions: air-drying and freezing. Dried leaves (DL) exhibited higher protein (13.6 %) and carbohydrate (11.4 %), contents than the frozen leaves (FL) - 6.64 % and 5.93 %. DL extracts exhibited higher contents of total polyphenols and flavonoids (24.53 mg GAE/g dw and 0.83 mg QE/g dw) than FL extracts (1.80 mg GAE/g dw and 0.07 mg QE/g dw). DL showed greater antioxidant activity (DPPH: 183.81 vs. 8.38; FRAP: 193.60 vs. 13.81 mM TE/g dw). Antimicrobial tests revealed higher inhibitory activity (inhibition zones ≥ 12 mm) of DL extracts against *Bacillus subtilis*, *Bacillus amyloliquefaciens*, *Bacillus cereus*, *Enterococcus faecalis*, *Micrococcus luteus*, *Salmonella enteritidis*, *Escherichia coli*, *Proteus vulgaris*, *Proteus mirabilis*, and *Pseudomonas aeruginosa*, while FL extracts were less active. Both dried and frozen fig leaves exhibited notable biological activities, with DL showing superior antioxidant and antimicrobial potential. Consequently, drying was the more suitable storage method, better preserving the bioactivity of fig leaves and enhancing their functional and therapeutic potential.

DESIGN OF BUFFALO YOGHURT ENRICHED WITH ROSA DAMASCENA EXTRACTS ENCAPSULATED IN MALTODEXTRIN AND AGAVE INULIN AS CARRIERS

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This study aimed to develop and characterize a novel buffalo yoghurt enriched with lyophilized *Rosa damascena* petals extract encapsulated in maltodextrin and agave inulin. The fatty acid profile, sugar composition, inulin content, phenolic and flavonoid levels, and antioxidant activity of the yoghurts were evaluated. Nutritional indexes, including atherogenicity, thrombogenicity, and hypocholesterolemic/hypercholesterolemic ratio, were also calculated. Among the 17 identified fatty acids, palmitic (C16:0) and oleic (C18:1) acids predominated. Lactose, glucose, and galactose were the main sugars across all samples, while fructose and inulin were detected only in yoghurts with agave inulin. The highest total phenols (1.96 ± 0.11 mg gallic acid equivalents/100 g), flavonoids (2.45 ± 0.21 mg quercetin equivalents/100 g), and antioxidant activity were found in yoghurts containing both *Rosa damascena* extract and agave inulin, even after 14 days of storage. Sensory evaluation showed satisfactory results, with the control and agave inulin-enriched samples receiving the highest scores. Overall, agave inulin proved more effective than maltodextrin for preserving bioactive compounds in yoghurt. To our knowledge, this is the first detailed study on the use of *Rosa damascena* extract, alone or combined with agave inulin or maltodextrin, for the production of traditional Bulgarian buffalo yoghurt with enhanced nutritional and functional properties.

MORPHOLOGICAL AND CULTURE FEATURES AND SPORULATION IN MICROORGANISMS ISOLATED FROM SPONTANEOUSLY FERMENTED WINES

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The morphological and culture features of newly isolated yeast and bacterial strains and the process of sporulation in yeast, were studied. As a result of spontaneous alcoholic fermentation of grape pomace from 10 samples of grapes from autochthonous white and red vine varieties, a total of 38 morphological types were isolated. A morphological and culture characterization of the isolated pure cultures of microorganisms was made, of which 26 yeast and 12 bacterial strains. For the investigation, 72-hour liquid cultures grown in sterile grape juice medium and colonies formed on grape juice–agar medium were used. In shape, the yeast cells were spherical to slightly elliptical, located singly in the medium. They multiplied by budding, most often unilateral, polar. Cell sizes ranged from 3-6 µm to 4-10 µm in length. The growth of the different strains of yeast and bacteria in liquid and on solid nutrient media was similar. Their propagation started around 18-24 hours. The flocculation of individual yeast strains varied, with no definite trend. A sporulation process was observed in yeast. Almost all isolated strains produced spores without prior copulation. Sporulation was most often fairly abundant to abundant, as about 50-60% and 70-80% of the cells formed spores.

MOLECULAR IDENTIFICATION AND PHYLOGENETIC ANALYSIS OF FUSARIUM SPP. ASSOCIATED WITH TRITICUM AESTIVUM L. BASED ON DNA BARCODING

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Fusarium spp. are active producers of mycotoxins that enter the food chain and pose risks to human health. Identifying pathogenic agents is a key step in developing disease management strategies. For the first time in Bulgaria, we identified *Fusarium* species in wheat, harvest 2024÷2025, through the application of DNA barcoding. For genetic marker and construction of phylogenetic tree, the protein-coding gene β -tub was chosen. Among 26 identified isolates, *F. sporotrichioides* (42.3%) dominated, followed by *F. proliferatum* 23.1%), *F. avenaceum* (7,7%), *F. armeniacum* (7.7%), and *F. poae* (7,7%). *F. tricinctum* (3.8%), *F. oxisporum* (3.8%), and *F. equiseti* (3.9%) were weakly expressed. Phylogenetic analysis classified the isolates into 5 species complexes: FSAMSC, FFSC, FTSC, FIESC, and FOSC and highlighted the genetic distances between them. Molecular genetic analysis showed that 84.6% of the wheat samples contained only one species of *Fusarium*, and in 15.4% the co-presence of two species was established. The largest share was in samples with low infestation 2÷4%, which represented 35% (n=32) of all positives. No statistically significant difference was found between the varieties and the level of contamination, as well as between the origin of the selected varieties and the level of contamination.

PP41

BIOACTIVE COMPOUNDS AND ANTIOXIDANT POTENTIAL IN COMFREY PLANT MATERIALS

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The aim of the current study was to investigate the bioactive compounds in the leaves and roots of comfrey. The fructan content, total flavonoids and total polyphenols, as well as antioxidant activity were evaluated in the water extracts. The highest fructan and inulin values were found in ex-situ comfrey roots (12 and 8 g/100 dw, respectively). In comfrey leaves were detected only simple sugars (glucose, fructose and glucose). The highest value of total flavonoids were found in roots, while in leaves dominated total polyphenols. The antioxidant activities were the highest in leaves and roots of comfrey plants. The current study reveals the potential application of comfrey roots and leaves as source of dietary fiber with prebiotic activity and antioxidants.

PHYTOCHEMICAL PROFILE AND BIOLOGICAL ACTIVITIES OF MALVA SYLVESTRIS AS A BASIS FOR IMPROVING FOOD QUALITY: A REVIEW

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Malva sylvestris is a widely distributed traditional edible plant with ethnomedicinal uses. This review presents its phytochemical profile and the associated biological activities. Studies by various researchers have demonstrated that extracts of *M. sylvestris* possess antimicrobial, antioxidant, and anti-inflammatory properties, as well as hepatoprotective and anticancer effects. The rich phytochemical composition and multifunctional properties of mallow make it a promising additive for the development of functional foods with enhanced nutritional and biological value, which in turn provide beneficial effects on human health. The application of *Malva sylvestris* in the food industry represents a potential natural alternative for improving product quality, extending shelf life and supporting human health.

NATURAL PIGMENTS, PHENOLIC CONTENT AND ANTIOXIDANT ACTIVITY IN IRONWORT

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The current study aimed to evaluate total carotenoids, chlorophylls, phenols, flavonoids, and antioxidant potential in ironwort (*Sideritis syriaca* L.) collected from different locations in Strandzha Mountain, Bulgaria, and from a single location in Turkey. We compared the results with cultivated samples from Momchilovtzi and Malko Tarnovo. The cultivated samples exhibited the highest levels of total carotenoids and chlorophylls, followed by those collected from the Turkish side of Strandzha Mountain. The samples from the Bulgarian side of Strandzha Mountain (Sredoka area) showed 1.5 to 2 times higher levels of total flavonoids and polyphenols, as well as twice the antioxidant activity, compared to cultivated ironwort samples. Therefore, the wild-growing samples accumulate more secondary metabolites, such as phenols and flavonoids, compared to cultivated ones.

CHEMICAL PROFILING OF LAGER BEERS VIA ^1H NMR SPECTROSCOPY

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Lager beers have a rich brewing tradition dating back to the Middle Ages, originating in Central Europe after the invention of pasteurization and evolving into a diverse category of bottom-fermented styles. From Munich's golden Helles to the crisp Pilsners and the robust Festbiers, each style reflects the region's unique ingredients, techniques, and historical influences. Over time, international adaptations such as American Pilsners and India Pale Lagers (IPL) have further expanded this diversity. Despite their well-defined styles, the chemical profiles of lager beers remain largely unexplored. In this study, we apply ^1H NMR spectroscopy to analyze Helles, Pilsners, Festbiers, IPL, Pale, American, and Dark lager beers. We quantified the identified compounds and implemented statistical methods to distinguish the sample's profile based on their style. Nightingale diagrams were used to illustrate the key differences between dark and light lagers, as well as craft and commercial beers. Acknowledgments: This work was supported by the Bulgarian National Science Fund, Project KP-06-M79/2. The research infrastructure INFRAMAT, which is part of the Roadmap for Research Infrastructures of the Republic of Bulgaria 2020-2027 and is supported by the Ministry of Education and Science, was used in this investigation.

CHEMICAL PROFILE AND POTENTIAL FOR UTILIZATION OF PLANT BY-PRODUCTS FROM THE CANNING INDUSTRY

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This study focuses on the chemical profile of pepper and eggplant stems (pedicel) with seeds obtained as plant by-products from the canning industry. The contents of proteins, carbohydrates, fats, fatty acid composition, β -carotene, mineral elements, dietary fiber (including pectin), and other components were determined. A granulometric analysis was also performed. The samples were characterized by high protein content (13.21% for pepper and 15.02% for eggplant). The dominant fatty acids in pepper stems were linoleic (68.15%), palmitic (10.41%), oleic (9.42%), and linolenic (5.55%), while in eggplant stems – linoleic (33.10%), linolenic (20.83%), palmitic (15.52%), and stearic (11.13%) acids. Among the mineral components, potassium, calcium, and magnesium predominated in both samples. Dietary fiber content was 47.57% for pepper and 56.92% for eggplant. The results show that both materials are potential sources of valuable nutritional components for the food and biotechnological industries. **Keywords:** plant by-products; canning industry; chemical profile; fatty acid composition; dietary fiber; bioactive compounds

EXPERIMENTAL EVALUATION OF THE HYGIENIC PERFORMANCE OF LASER TREATED AND SAND BLASTED SAMPLES FROM AISI 316 STAINLESS STEEL

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There are strict and quite rigid hygienic requirements regarding the materials, which are meant to be used in direct contact with food products. Their surfaces shall not be prone to retain water based contaminants, as well as food oils. They should also allow easy and efficient cleaning and sanitation. Currently there are plenty of available methods, which could be implemented to achieve this, such as: applying coatings, laser treatment, chemical etching, growing nanostructures and blasting the surfaces with solid microscopic beads. The article presents the results from an experimental evaluation of the hygienic performance of laser treated and blasted samples of AISI 316 steel. The evaluation was carried out with common food contaminants: tap water, milk and olive oil. Ultra-hydrophobic properties were achieved by combining infrared laser treatment with a subsequent passivation with HNO₃ – the measured wetting angles for water and milk exceeded 150°. Treatment with ultraviolet laser directly resulted in ultra-hydrophobic properties without the need for additional chemical passivation. Regarding the olive oil – the laser treatment made the samples even more oleophilic. Blasting the surface with microscopic glass beads led to a decrease of the wetting angle regarding water and milk, but increased it for olive oil.

OP11

METHOD AND DEVICE FOR TREATING SLUDGE OBTAINED AFTER DISTILLATION OF SOLVENTS CONTAMINATED WITH PRINTING INKS

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This article presents a method and device for treating sludge obtained after distillation of solvents, contaminated with printing inks. The proposed approach is an improvement of existing technologies for regeneration of developers, observing high extraction efficiency with a simplified design and low operating costs. The method for extracting solvents by vacuum-dried sludge in a multi-layer chamber with “fluidized bed” trays. As a result, a recovery rate of over 98% is achieved, and the remaining solvent content in the dry residue does not exceed 1.5%. The resulting product is suitable for reuse, and the solid residue - for recovery or safe disposal. The implementation of the method for reducing the amount of hazardous waste, reducing resource efficiency and complying with the principles of the circular economy and sustainable development, in the spirit of the Strategy for Transition to the Circular Economy of the Ministry of Environment and Water.

COLOUR CHANGES OF EXTRUDATES FROM WHEAT SEMOLINA WITH ADDED COCOA BEAN SHELLS

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Response surface methodology was employed to evaluate the influence of cocoa bean shells content (5 % and 10 %), moisture content (14 % and 20 %) and temperature of the matrix (160 °C and 180 °C) on the colour characteristics of extruded products from wheat semolina with added cocoa bean shells. The extrusion cooking was performed using a Brabender 20 DN single-screw extruder. A NS800 spectrophotometer was used to determine the lightness (L), redness (a), yellowness (b) and total colour difference (ΔE) of extrudates. The extrusion process resulted in a noticeable darkening of the samples relative to the non-extruded mixtures. The average values of lightness varied from 60.68 ± 0.81 to 69.04 ± 0.81 , redness from 7.11 ± 0.10 to 8.20 ± 0.25 , yellowness changed from 15.29 ± 0.19 to 16.92 ± 0.48 and for the total colour difference from 2.26 ± 0.17 to 4.08 ± 0.01 respectively. The moisture content exerted the greatest influence on the total colour difference, followed by the temperature of the matrix, whereas the cocoa bean shells content had no significant effect.

**DESIGN AND DEVELOPMENT OF SOFTWARE FOR OBJECTIVE EVALUATION
VISUAL CHARACTERISTICS OF EXTRUDED FOODS**

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Nowadays, the rapid development of computer technologies provides numerous approaches and methods for objective non-destructive assessment of quality characteristics of different food products. The aim of this study is to present the development and implementation of a software designed for the objective evaluation of visual characteristics of extruded food products in the process of their production. Utilizing advanced digital image processing techniques and methods for computer vision, the software enables precise measurement of both color and dimensional attributes, specifically width variations, in extruded samples. The system provides a non-invasive and reproducible method for assessing product consistency, supporting quality control and process optimization in food manufacturing. The results obtained show that the developed software can be effectively used in assessing uniform color distribution during the extrusion process. The results demonstrate the software's effectiveness in capturing subtle visual changes such as the width of extrudes, thereby contributing to more reliable product assessment and standardization in the food industry.

INDUSTRIAL IOT IN THE FOOD SECTOR: A SCOPUS BIBLIOMETRIC MAPPING

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This study uses bibliometric analysis of data from Scopus to map scientific output on the Industrial Internet of Things (IIoT) in the food sector between 2014 and 2025. Two approaches were applied: co-authorship by country (threshold: ≥ 5 publications) and co-occurrence of all, author, and index keywords (threshold: ≥ 5), with an overlay of the average year of publication. The results demonstrate an increasing volume of publications during this time period, the central role of the IoT/IIoT, and robust connections to Industry 4.0, machine learning, cybersecurity, and applications in energy and maintenance. Overlay analysis revealed new topics, such as digital twins, federated learning, and privacy-preserving techniques. The co-authorship network identifies leading research centers in the US, China, and Europe, as well as growing activity in the Middle East and Global South. This study provides a multi-layered picture of the thematic structure and evolution of the IIoT in the food industry that can inform future research and policy.

FROM HONEY TO FUNCTIONAL POWDER: DRYING TECHNOLOGIES, CARRIER AGENTS, AND INDUSTRIAL APPLICATIONS

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Honey is a natural product that provides significant nutritional and bioactive value; however, there are limitations to its direct application in powder form due to its high sugar content, hygroscopic properties, and stickiness nature of honey. Transforming honey into a functional powder presents a key technological challenge and market opportunity for the food sector. This article discusses a review of the main drying technologies employed to honey focusing primarily on freeze drying and spray drying technologies, plus some emerging hybrid processes. The use of carrier agents such as gum arabic, maltodextrin, and dextrin is discussed. These help reduce the stickiness nature of honey, stabilizes the product and improves the functional and physicochemical properties of the final product. Case studies at both laboratory and industrial scale illustrate the prospects of honey powders being applied in functional foods, nutraceutical and confectionery applications. The prospects of honey combined with other bioactive ingredients such as propolis, vitamins, and probiotics are also discussed. This review builds on the science of honey powders and technological options for converting honey in liquid form into a dry, functional stable powder for commercial formulations.

MODELING, INTENSIFICATION AND OPTIMIZATION OF THE ACETIC ACID FERMENTATION PROCESS

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Over the years, the beneficial effect of acetic acid on human well-being has been proven. All the benefits of using acetic acid ferments are a favorable basis for expanding research in the field of biological fermentation processes. This publication is devoted to the analysis of the main characteristics, modeling and optimization of acetic acid fermentation. In the exchange of nutrients by acetic acid microorganisms, factors such as the composition of the substrate, fermentation temperature, physiological characteristics of the strain used, etc. have a significant impact. For the purposes of management and intensification of the process, the kinetic models of Mono, Mono-Jerusalemky and Andrews have been analyzed. Regression dependencies of basic technological indicators and kinetic coefficients have been determined. The influence of fermentation temperature and aeration intensity on the microbiological indicators of the acetification process has been confirmed. In the scientific work, static optimization was carried out by minimizing the duration of the fermentation process and maximizing the economic coefficient of the substrate. An optimization composite model has been synthesized for the purpose of process intensification. The good results obtained encourage the authors to continue to invest efforts dedicated to the management, modeling and optimization of the acetic acid fermentation process.

REDUCING FOOD WASTE THROUGH THE MECHANISMS OF THE CIRCULAR ECONOMY AI

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Global data shows that waste levels are a serious environmental problem. One tenth of this is food waste, and it can be significantly reduced by implementing the principles and mechanisms of the circular economy. The purpose of this paper is to examine how food waste can be reduced by returning it to the circular cycle and being fully utilized. The results of the scientific research are expressed in a developed roadmap aimed at companies in the food industry, which reveals the individual steps through which, with the help of various AI technologies, companies can achieve more efficient production with less food waste.

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DEVELOPMENT AND CHARACTERIZATION OF NO-ADDED-SUGAR CHERRY PUDDING

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The objective of the study was to assess the physicochemical, biological, texture, and nutritional characteristics of puddings with reduced sugar content, utilizing lyophilized cherry fruit as a functional ingredient. The evaluation involved measuring ash and moisture levels, pH, titratable acidity, total soluble solids, water holding capacity, water activity, vitamin C concentration, color spectra, antioxidant capacity, total phenolic content, total flavonoid content, and conducting a texture analysis to support the new formulation assessment. The freeze-dried cherry powder served not only as a natural sweetener but also as a natural coloring agent in the pudding formulation. The newly created product exhibited improved total phenolic content, total flavonoid content, and antioxidant activity. The no-added-sugar cherry pudding was noted for its increased moisture content ($50.63 \pm 4.52\%$) and reduced water activity (from 0.989 to 0.974). Texture profiling was conducted using parameters such as hardness, work, adhesion, and adhesive force. The findings highlighted the potential use of lyophilized fruit powders in culinary applications, cosmetics, pharmaceuticals and other.

QUALITY CHARACTERIZATION OF VEGETABLE OILS FOR APPLICATION IN CULINARY TECHNOLOGY

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Physical and chemical characteristics of selected vegetable oils were investigated in order to evaluate their potential application in culinary technology. The study included eight vegetable oils commonly used in culinary practice: sunflower, maize, grape seed, olive, pumpkin seed, walnut, sesame, and soybean oil. The quality of the oils was investigated by determination of color, density, moisture content, refractive index, acid value, free fatty acids content, saponification value, average molecular weight of fatty acids, iodine value and peroxide value. Based on the physical and chemical characteristics, oils suitable for different applications in culinary technology were selected. Sunflower oil, olive oil, maize oil and grape seed oil had low acid value, relatively low iodine value, and acceptable peroxide value, which suggest possible stability at high temperature. For these reasons these oils were considered suitable for frying. Pumpkin seed oil, walnut oil, sesame oil, and soybean oil were characterized by high acid value, relatively high iodine value, and respective high peroxide value, and they were selected for application in cold salad dressings. Salad dressings containing pumpkin seed oil, walnut oil, sesame oil, and soybean oil were prepared and their sensory characteristics were determined.

PP53

HEALTH ASSESSMENT OF SHALLOW FRYING PROCESS OF POTATOES IN VEGETABLE OILS

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The process of shallow frying of potatoes was investigated from the perspective of improving the health and sensory properties of the fried product. The oxidative stability of the oil during frying was studied, and it was evaluated by determination of peroxide, iodine and acid value in dynamics. Different vegetable oils (sunflower oil, olive oil, maize oil, and grape seed oil) were investigated in order to select the type of oil that provided maximum stability and good nutritional and sensory characteristics of the fried potatoes. Mathematical models for the dynamics of oxidative stability of the oil during frying were developed. Grape seed oil and maize oil showed highest oxidative stability during shallow frying. After 30 min of frying these oils were characterized by the lowest peroxide value, corresponding slight decrease of iodine value and constant acid value. Potatoes, shallow fried in maize oil and grape seed oil were prepared and their nutritional value was determined. The type of oil did not significantly influence the nutritional and energy value of the product. The fried potatoes prepared in maize oil and grape seed oil had good sensory characteristics.

CONSUMER AWARENESS OF TRADITIONAL AND REGIONAL FOOD PRODUCTS

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The aim of the study was to examine the opinions, attitudes, and consumer habits of individuals purchasing food products, with particular emphasis on factors influencing the choice of regional and traditional products, awareness of EU quality certificates, and knowledge of the “slow food” and “fast food” movements. The research was conducted using an anonymous questionnaire survey, available both online and in paper form. A total of 210 respondents aged 18–70 residing in Poland participated in the study. The results indicate that most respondents are conscious consumers familiar with regional products and willing to support local producers. Gender was found to influence purchasing behavior and meal preparation habits. Only half of the participants occasionally purchased products bearing the PDO, PGI, or TSG labels. Most respondents considered regional products to be more natural than mass-produced ones, especially those with higher education. Although the term “fast food” was widely recognized, awareness of the principles of the “slow food” movement was limited. The findings highlight the need for continued education and promotion of regional products as well as the idea of conscious and sustainable nutrition.

ASSESSMENT OF INNOVATION CULTURE IN BULGARIAN DAIRY PROCESSING ENTERPRISES

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The food and beverage industry is the largest employer within the manufacturing sector, and dairy processing represents one of its most significant subsectors. Influenced by a range of factors, including shifting consumer preferences, intensifying global competition, and the impact of global crises, the sector faces mounting pressure that requires producers to adopt increasingly innovative approaches. This paper provides an overview of the current state of the Bulgarian dairy processing industry as part of the agri-food value chain, situating it within the European context. Special attention is given to the level of innovation in the sector, as well as to the opportunities and challenges for its future development. The study measures innovation culture in 20 enterprises in the sector, highlighting the relationship between the identified innovation culture and the sector's overall performance. The findings indicate both strengths and areas that need improvement, offering insights into how innovation culture can be enhanced to better support competitiveness. Based on the results, the article proposes potential pathways for strengthening innovation performance and improving the international competitiveness of Bulgarian dairy processing enterprises. The research contributes to how fostering an innovation culture can serve as a driver of sustainable growth in traditional food industries.

OP13

TECHNOLOGICAL TRANSFORMATION IN THE FIELD OF ORGANIC PRODUCERS IN SUPPORT OF COMPETITIVENESS AND SYNERGISTIC EFFECTS WITH THE HOSPITALITY INDUSTRY

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The study examines the technological progress in organic production and, more specifically, its impact on the organizational competitiveness. The innovative approaches and technologies that organic producers apply are analyzed according to the optimization of work processes, the loss reduction, the shrinkage of the impact of the seasonal factor and the improvement of the quality of the final product. The aim of the report is to prove that the technological transformation in the organic sector is a two-way process - on the one hand, it is a response to the needs of agricultural enterprises and the search for effective solutions, and on the other hand, it is a consequence of the fact that the hospitality industry relies on the availability of quality products for its development, thus the "organic" label becomes a guarantee of quality and a driving force for an elite target group. The study illustrates the synergistic effects between organic production and the tourism sector, some of which are expressed in the concepts of sustainability, circular economy and orientation towards constant growth. The synergistic effects are proven by study which results specify the appropriate indicators for assessing the competitiveness of the established company in a limited industry.

PP55

AI-DEMATEL IN SUSTAINABLE FOOD INDUSTRY AND INDUSTRY 5.0 – A COMPREHENSIVE REVIEW

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The present study employs a bibliometric and conceptual analysis of the application of DEMATEL and its AI-based extensions in sustainable entrepreneurship, the food industry, and Industry 5.0. A comprehensive analysis of 1,312 publications from Web of Science and Scopus (2009–2025), processed through Biblioshiny, has led to the identification of a multidisciplinary field that is rapidly gaining prominence. The findings indicate the preeminent position of journals such as the Journal of Cleaner Production and Sustainability, along with the substantial contributions of prominent authors in the domain of multi-criteria analysis. The primary research foci comprise the integration of DEMATEL with artificial intelligence, sustainable supply chains, the circular economy, and consumer behaviour. AI-DEMATEL is a strategic tool for process optimisation and the creation of human-centred sustainable solutions within Industry 5.0.

PP56

CHARACTERISTICS, FEATURES AND MANAGEMENT OF THE COLD SUPPLY CHAIN

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Characteristics, Specifics and Management of the Cold Supply Chain
Abstract This paper analyzes the main characteristics and specifics of the logistics process for transporting food products from third countries to the member states of the European Union. The primary objective is to identify and examine the key factors that determine both the efficiency and the challenges of this extended supply chain. The study also considers the strategic aspects of routes that pass through multiple transit countries. Special emphasis is placed on road transport as the most widely used mode, with an assessment of its advantages and disadvantages in terms of speed, cost, and reliability. Central to the analysis is the management of the cold chain, which is essential for preserving the quality and freshness of perishable food products. Attention is also given to issues such as product preparation for transport, packaging requirements, the necessary accompanying documentation (including phytosanitary certificates), and customs procedures. **Keywords:** logistics, cold chain, food products, transport, European Union.

MILK AND DAIRY PRODUCTS - VIEWS AND EATING HABITS AMONG ADULTS IN THE SAUDI ARABIA

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According to numerous scientific studies, milk and dairy products constitute an important component of the diet among adult residents of Saudi Arabia; however, their consumption remains below the recommended level. The objective of the present study was to assess the attitudes and dietary habits related to milk and dairy product consumption among the adult population of Saudi Arabia. The research was conducted using the CAWI method (Computer-Assisted Web Interviewing) on a representative sample of adults aged 18- over 79 years. A modified questionnaire developed by the Committee on Human Nutrition Science of the Polish Academy of Sciences was employed, restricted to questions pertaining to the consumption of milk and its derivatives (questions nos. 1–11, 31–34, 56, 69, and 74–76). The analysis enabled the determination of the frequency of consumption of milk and other dairy products, as well as the respondents' perceptions regarding the importance of these products in the daily diet. The obtained results were likely influenced by cultural factors, product availability, and individual taste preferences among Saudi residents. The study was funded by the Ministry of Science and Higher Education under contract no. MEiN/2023/DPI/2872 dated October 4, 2023, action no. I.2, in the amount of PLN 1,350,000.00.

ACCESSING THE APPLICABILITY OF THE SERVQUAL MODEL FOR THE DEVELOPMENT OF BULGARIAN ECO-TOURISM

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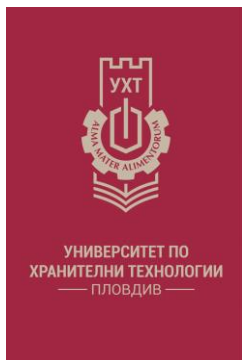
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The application of service quality models is crucial for the development of the tourism industry, as they help providers improve services, enhance customer satisfaction, and foster loyalty, which in turn strengthens competitiveness and long-term success. Widely used tools such as SERVQUAL, which evaluates gaps between expectations and perceptions across five dimensions—tangibility, reliability, responsiveness, assurance, and empathy—are especially important for the sustainable growth of Bulgarian ecotourism. As a niche segment grounded in environmental preservation, cultural authenticity, and community engagement, ecotourism requires service frameworks that not only align with ecological and socio-cultural values but also ensure memorable and high-quality visitor experiences. When applied to settings like national parks, protected areas, and rural communities, SERVQUAL provides valuable insights into how nature-based experiences are perceived and how service delivery can support environmental education, conservation practices, and community well-being. The goal of this study is therefore to assess the applicability of SERVQUAL in Bulgarian ecotourism by reviewing prior research, measuring consumer perceptions, and suggesting practical adaptations of the model that could strengthen both the quality of services and the sustainable development of the sector.



E-learning tools for Food technology and development education



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**You can watch the case study
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CASE STUDIES

CS3

SYMBIOBURST: A CASE STUDY IN THE DEVELOPMENT OF FUNCTIONAL DAIRY AND PLANT-BASED YOGURTS

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The present case study presents the development of *SymbioBurst*, a line of innovative functional yogurts designed to meet the growing demand for health-enhancing, clean-label food products. The project includes two distinct formats: a dairy-based yogurt and a vegan, allergen-free plant-based alternative made with rice or hemp. Both variants are enriched with symbiotic cultures, multi-strain probiotics, prebiotics, chaga mushroom flour, and fruit juice spheres, with the plant-based version featuring also encapsulated avocado essential oil.

The objective was to develop scientifically grounded, consumer-oriented products that support digestive and immune health while delivering a unique sensory experience. Key outcomes include successful formulation, pilot-scale production, and early consumer feedback from 84 respondents. Market analysis confirms strong potential in the premium functional yogurt segment. Financial projections indicate promising margins, especially at scale. Strategic recommendations focus on targeted marketing, clear labeling, and phased distribution. *SymbioBurst* is positioned as a forward-looking brand in the evolving functional food landscape.

ORIGINAL CONCEPT FOR A FORTIFIED FARTÓN SWEET BUN WITH UPCYCLED TIGER NUT PULP FROM HORCHATA PRODUCTION

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At the heart of Valencian culinary tradition lies horchata – a refreshing beverage with deep cultural roots, crafted from precious tiger nuts. These nuts not only provide a unique taste but also impress with their richness in fiber, vitamins, and minerals, while being suitable for people with various dietary needs. However, horchata production generates a nutritious pulp that often remains unutilized. The innovative idea of this project is to transform this pulp into a key ingredient for creating a modern, valuable product that meets the growing demand for healthy and sustainable foods. Thus, tradition blends with innovation in a product that combines authentic flavor with a commitment to waste reduction and support for sustainable production. This approach turns a by-product into a resource, enhances nutritional value, and contributes to a circular food economy.

CS7

GLUTEN-FREE DELIGHTS: INNOVATING TRADITIONAL KOZUNAK AND FUNCTIONAL CRACKERS

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This case study highlights the development and market potential of two innovative gluten-free bakery products: a traditional Kozunak sweet bread and low-glycemic crackers. Both products target consumers with gluten intolerance, celiac disease, and health-conscious individuals seeking clean-label, allergen-friendly options. The Kozunak combines a blend of gluten-free flours and natural binders to deliver the classic texture and flavor of this traditional sweet bread, overcoming common challenges in gluten-free baking. Complementing this, the crackers use alternative flours like green banana and are enriched with functional ingredients such as turmeric, psyllium husk, and flaxseed, offering nutritious, low-glycemic snacking. Together, these products meet evolving consumer demands for gluten-free, functional foods with appealing sensory qualities and enhanced nutritional value. The study demonstrates strong market opportunities across Europe and beyond, emphasizing the importance of innovation, ingredient selection, and strategic positioning in the competitive gluten-free segment.

HYALURONIC A PROTEIN BAR

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This case study presents the development of the Hyaluronic A Protein Bar, a functional, plant-based snack combining soy and asturian beans with hyaluronic acid (HA) and vitamin A. The primary objective was to create a nutritious, convenient product targeting health-conscious consumers particularly those interested in fitness, skin health, and anti-aging benefits. Key findings highlight the technical viability of incorporating HA into a protein bar without compromising its stability, flavor, or nutritional integrity. A production process was developed to maintain ingredient functionality while meeting shelf-life and safety standards. Market analysis revealed strong growth in both the protein bar and HA markets, supported by rising consumer demand for multifunctional, on-the-go snacks. The project concludes with a positive financial outlook, provided that regulatory compliance, clear allergen labeling, and targeted marketing strategies are prioritized. The Hyaluronic A Protein Bar represents a promising innovation at the intersection of wellness, beauty, and convenience.

CS9

VEGAN MEAT

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VitaJack breaks the mold of plant-based burgers, not by mimicking meat, but by reinventing it. Made with upcycled young jackfruit, protein-rich red beans, and ancient Andean quinoa, this clean-label patty delivers a satisfying, juicy bite that surprises even the most dedicated flexitarian. Packed in recyclable stand-up pouches and ready in just 10 minutes, **VitaJack** meets modern demands for fast, convenient, and truly sustainable food. With clear branding, realistic pricing, and diverse distribution channels, **VitaJack** is primed to win a share of Europe's booming alternative protein market. Financial projections show healthy profit margins and an attractive return on investment, confirming that taste, ethics, and profit can coexist. By fusing the power of quinoa and the natural texture of jackfruit, **VitaJack** doesn't just offer a burger, it offers a bold promise: **Expect the Unexpected Bite** and join the movement redefining what real food can be.

CS12

TEA SACK WITH FUNCTIONAL PRODUCTS AND MICROENCAPSULATED PROBIOTICS

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This case study explores the development of an innovative dual-step functional tea that combines tradition, sustainability, and advanced food technology. The primary objective was to create a shelf-stable infusion containing functional ingredients and viable probiotics, offering health benefits without requiring refrigeration. The final product features two biodegradable tea bags: one for hot infusion of functional ingredients, and another containing microencapsulated *Lactiplantibacillus plantarum* and upcycled brewer's yeast, added once the infusion cools to around 40 °C. The formulation supports gut health, immunity, and eco-conscious consumption. Market analysis indicates strong consumer interest in probiotic, sustainable, and convenient formats. Financial projections show a 40–50% gross margin with a break-even point at 35,000–40,000 units. Despite challenges such as probiotic viability and user compliance with preparation steps, the product demonstrates strong commercial potential. This project highlights how rethinking traditional formats can address modern health and environmental concerns in functional food innovation.

CS13

READY TO EAT HEALTHY SOUP

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This case study presents the development of a ready-to-eat (RTE) halal healthy soup incorporating self-heating technology, designed to meet the growing consumer demand for convenient, nutritious, and inclusive meals. The product offers a balanced and protein-rich formulation with low salt content, integrating halal-certified lamb to address the needs of Muslim consumers—a currently underserved segment in the RTE market. Seasonal vegetables and food industry by-products are used to enhance sustainability, reduce waste, and support local agriculture. The soup is packaged in self-heating cans that allow for consumption anytime, anywhere, making it suitable for outdoor activities, school lunches, or emergency situations. A sensory panel guided the formulation to optimize taste, texture, and aroma. The product stands out due to its eco-friendly technology, nutritional quality, and inclusiveness, offering a viable solution for health-conscious consumers seeking convenient meals. Financial projections indicate strong profitability and market potential, with scalability and positive environmental and social impact.

FUNCTIONAL DAIRY PRODUCT – TRADITIONAL BULGARIAN YOGURT WITH ADDED HONEY AND BEE POLLEN

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The developed case study proposes a new functional dairy product, traditional Bulgarian yogurt with added honey and bee pollen. A detailed analysis of the target market, its characteristics, and trends has been conducted. The target audience, and their needs are presented. The competition and the market for similar products have been analyzed. The study includes a description of the product, technological processes for its production, recipe, and nutritional composition. A marketing strategy, pricing strategy, distribution channels, promotional activities, and solutions for labeling, packaging, and branding of the product are proposed. A financial analysis of the costs for development and production of the new food product and sales revenue based on conducted market research is presented. Profitability and return on investment have been evaluated. Potential challenges, risks, and obstacles that could affect the success of the new product are identified. Strategies for handling emergencies related to these challenges are also suggested.

SMART PASTA FOR HEALTHY LIFE

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SmartPasta for Healthy Life is an innovative line of functional and personalized pasta products tailored to modern health-conscious consumers. Combining three unique concepts— beetroot pasta for natural flavor and color enhancement, fruit-purée-colored pasta for children, and functional **SmartPasta** enriched with protein, fiber, and low-carb ingredients—the product line addresses diverse dietary needs. The beetroot variant offers a flavorful alternative requiring fewer sauces, while the children’s pasta, made with rice and white flour, uses natural berry pigments to create visually engaging and nutritious meals for young eaters. The **SmartPasta** base incorporates eco-packaging and QR codes for personalized nutrition tracking and guidance. Designed for families, athletes, and individuals with dietary sensitivities, this concept responds to rising demand for nutritious, appealing, and sustainable food products. This case study outlines the development and marketing strategy of **SmartPasta**, demonstrating its potential to disrupt the pasta market with customization, clean-label ingredients, and environmental responsibility.

CS1

DEVELOPMENT OF AN ORIGINAL DIET CHOCOLATE WITH A BUBBLING SENSATION

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This study has developed a new type of diet chocolate, formulated to offer a healthy and attractive alternative to the modern consumer. The product uses erythritol as a sugar replacer and ground flaxseed as a natural source of prebiotic fibre and omega-3 fatty acids, providing additional functional benefits. In addition, a bubbling sensation is incorporated when chewing, thanks to the addition of carbonic acid, creating an innovative sensory experience. This chocolate is aimed primarily at health-conscious young adults interested in products with no added sugars and clean labels. To this end, a product aligned with these demands was designed, and its financial viability was assessed, considering the costs of raw materials, labour and positioning strategy. Finally, potential associated risks were identified, such as market acceptance, differentiation from competitors, consumer perception and potential reputational challenges around the use of novel ingredients.

**EFFECT OF PEA PROTEIN AND QUINOA ADDITION ON BIOACTIVE COMPOUNDS
IN FERMENTED CHICKEN SALAMI**

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This study explores the development of an innovative fermented chicken salami enriched with pea protein and quinoa. The product is a hybrid fermented meat product or sometimes called dual protein, combining animal and plant proteins to meet the growing consumer demand for high-protein, clean-label, and functional foods. The innovation lies in the use of pea protein and quinoa, which not only improves the product’s amino acid profile but also contributes to antioxidant activity and improved texture. The development was driven by increasing health consciousness, the need for sustainable protein sources, and the popularity of flexitarian diets. Some studies demonstrated that the addition of these ingredients enhanced the nutritional quality and bioactivity of the final product without compromising sensory attributes. This study aims to create a healthier alternative to traditional meat products by incorporating plant-based ingredients rich in bioactive compounds, such as polyphenols, flavonoids, and dietary fiber.

DESIGN OF CHOCOBOOST, A NEW TYPE OF CLEAN-LABEL SNACK SUPPORTING WELL-BEING AND HEALTH

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ChocoBoost is a new functional food product designed to combine indulgence with health. It features a dark chocolate with matcha shell filled with **HoneyBoost** — a nutrient-rich core made from spray-freeze-dried honey, propolis, vitamin C, and encapsulated probiotics. This dual-layer structure creates a unique sensory and nutritional experience, offering immune, digestive, and antioxidant benefits in a convenient, enjoyable format. The product was developed in response to the growing demand for natural, clean-label snacks that support well-being without compromising taste. **ChocoBoost** is free from added sugars and artificial additives, using only dark chocolate and natural honey for sweetness and matcha as a prebiotic and energy-enhancing agent. Through research, formulation trials, and sensory feedback, the product has been optimized for both function and flavor. **ChocoBoost** positions itself as a next-generation functional chocolate, ideal for health-conscious consumers seeking daily support through smart snacking.

CS11

PASTA VIVA: FRUITS BASED GLUTEN FREE PASTA

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Pasta VIVA is a food which intends to combine fruits taste, flavour, colour and nutritional value with the versatility of pasta in a food attractive for childs and only. Usually pasta is combined with vegetables, dairy products or meat. This product is designed to increase the consumption of fruits by childs and it is gluten free. Gluten free pasta are suitable for people with gluten intolerance or allergy. The combination of gluten free pasta with fruits is unique on the market. The use of ingredients rich in proteins (beans flours) will improve even more the nutritive characteristics and it will make the products even more attractive for the childs with a high demand of proteins and people with celiac disease which often suffer from malnutrition.