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SCIENCE, TECHNOLOGY & INNOVATION

2025

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Book of Abstracts

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10:15 – 12:15	**Plenary Session** K Building, Ceremony Hall
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LECTURES

PLENARY SESSION

Registration number: L001

Advances in In Vitro Protein Digestibility: Method Development, Validation and Emerging Tools

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Abstract: *In vitro* digestion methods are increasingly used to assess protein digestibility and nutritional quality of foods. The recently developed *in vitro* protein digestibility method builds directly on the established and validated INFOGEST static digestion protocol (Brodkorb et al, Nature Protocols, 2018, https://doi.org/10.1038/s41596-018-0119-1). The three main digestion steps, including enzyme activities, timing, and fluid composition, are retained unchanged, only minor adaptations where necessary to guarantee method repeatability and robustness.

While the INFOGEST protocol is primarily used for mechanistic and qualitative studies of digestion, the recently developed digestibility protocol (Sousa et al., Food Chemistry, 2024, https://doi.org/10.1016/j.foodchem.2022.134720) was specifically designed to quantify protein digestibility. In addition, it includes a normalization in protein input, a protein blank digestion and post-digestive analytics, to enable calculation of digestibility and calculation of the Digestible Indispensable Amino Acid Score (DIAAS).

The method is designed to be performed in a standard laboratory and with the support of recently established step-by-step protocols and calculation spreadsheets, implementation has become more accessible and reproducible. The method is currently undergoing international standardization within ISO and IDF, with a draft ISO method expected to be available by the end of the year. In addition, validation studies comparing *in vitro* and *in vivo* data were performed, supporting the method's ability to simulate physiological digestibility.

Keywords: food proteins, protein digestibility, protein quality assessment, Digestible Indispensable Amino Acid Score (DIAAS)

Registration number: L002

Microbial Communities and Their Functional Roles in Traditional Vietnamese Fish Sauce Fermentation

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Abstract: Background: Traditional Vietnamese fish sauce (nuoc mam) represents one of Southeast Asia's most important fermented condiments, produced through spontaneous fermentation of anchovy and salt over 12-18 months. Despite its cultural and economic significance, the complex microbial ecosystems driving this fermentation process remain poorly characterized. Understanding these microbial communities is crucial for optimizing production, ensuring quality consistency, and preserving traditional fermentation knowledge. **Methods:** We employed shotgun metagenomics analysis combined with traditional isolation methods to characterize salt-tolerant bacterial communities in fish sauce samples collected from three traditional production facilities: Cát Hải, Thuận Hưng, and Khải Hoàn. Fermentation samples were analyzed at multiple time points (0, 1, 3, 6, 9, 12, and 15 months). Isolated microorganisms were identified using 16S rRNA gene sequencing via Bruker MALDI-TOF MS technology. Salt-tolerant bacteria were selectively enriched in media containing 4-10% NaCl under mesophilic conditions (35-37°C). Functional analysis was performed using metabolomics and enzymatic assays to elucidate microbial roles in protein degradation, amino acid production, and flavour development
Results: A total of 36 salt-tolerant bacterial strains were successfully isolated from fish sauce fermentation samples. The microbial community was dominated by two major genera: *Staphylococcus* (7 strains) and *Bacillus* (4 strains), along with single representatives of *Pantoea eucrina*, *Pseudomonas caricapapayae*, and *Agromyces mediolanus*. Key *Staphylococcus species included S. pisciferm*entans, *S. epidermidis, S. cohnii, S. aureus, S. saprophyticus, S. warneri*, and *S. ureilyticus*. *Bacillus* isolates comprised *B. subtilis, B. atrophaeus, B. velezensis*, and *B. licheniformis*. Both aerobic and anaerobic isolation conditions yielded viable salt-tolerant bacteria, with *Staphylococcus* epidermidis being particularly prevalent in anaerobic samples. Functional annotation identified key pathways for protein hydrolysis, amino acid decarboxylation, and organic acid production. Bacillus species facilitated initial protein breakdown and antimicrobial compound synthesis, while others emerged as the primary contributor to glutamate and nucleotide production.
Conclusions: Traditional Vietnamese fish sauce fermentation is characterized by a relatively simple but functionally important microbial community dominated by salt-tolerant *Staphylococcus* and *Bacillus* species. These halophilic bacteria likely play crucial roles in protein hydrolysis, flavor development, and preservation during the extended fermentation process. Understanding these microbial functions offers opportunities for improving fermentation efficiency and maintaining product quality in commercial applications. The isolation and characterization of these indigenous strains provide a foundation for developing standardized starter cultures that could improve fermentation consistency while maintaining the authentic characteristics of traditional Vietnamese fish sauce production.

Keywords: fish sauce, metagenomics, Vietnam, fermentation, microorganism, functional analysis

Registration number: L003

Precision and Trust: Transforming Food Authentication through Photons and Algorithms

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Abstract: In an era of increasing global food trade and rising incidences of food fraud, ensuring the authenticity of food products has become critical to protecting consumer health, maintaining trust, and supporting fair markets. The verification of food products and processes represents an important topic due to its role in ensuring food safety, quality, consumer protection, and compliance with applicable national legislation and international standards.
Food authentication using photons and algorithms involves analyzing light interactions with food samples and employing machine learning techniques for identification and detection of adulteration or quality issues. This approach combines computer vision and pattern recognition for food verification and compliance with its label description and physicochemical composition.
These techniques have gained more attention because they are non-destructive, have high specificity and sensitivity, and little to no sample preparation for analysis. In order to get efficient qualitative and quantitative information from these photonic techniques, mathematical algorithms such as linear Discriminant Analysis (LDA), k-Nearest Neighbors (kNN), Principal Component Analysis (PCA) are used for authenticity verification. In this study the latest techniques such as using photonic and machine learning algorithms were used.

Keywords: Machine learning, spectroscopy, smart detection

Acknowledgements: The research was supported by Food Conf (MATE).

Registration number: L004

Exploiting the Microbiome of Traditional Fermented Foods to Improve Food Quality and Human Health

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Abstract: In the past decades, the habitual diet in Westernized, developed countries underwent significant changes, with the increased consumption of highly processed foods. This, besides the improved hygienic practices, strongly decreased our exposure to microbes, both in terms of quantity and diversity. Indeed, live safe microbes obtained from daily intake in the diet may "engage" with the mucosal surfaces of the digestive tract, fine-tuning the immune system, bolstering gut function, and reinforcing the ability of the human symbiont to mitigate susceptibility to the development of chronic diseases. The importance of the intake of live microbes through the diet has been recently highlighted by the International Scientific Association for Probiotics and Prebiotics (ISAPP). Traditional fermented foods are an unexplored reservoir of potentially beneficial microbes. They may potentially transfer live bacteria to our gut microbiome, thus influencing our health. Although several speculations exist, it remains unclear whether and how regular fermented food consumption is linked with health outcomes and gut microbiome modulation. The presentation will explore the potential role of traditional fermented foods in improving human health through the modulation of the gut microbiome.

Keywords: food microbiome, probiotics, lactic acid bacteria, fermented foods

Acknowledgements: This work was partially supported by the project HOLOGRAM (P2022X8A9M), funded by the European Union - NextGenerationEU, NRRP Missione 4 "Istruzione e Ricerca" - Componente C2, Investimento 1.1, "Fondo per il Programma Nazionale di Ricerca e Progetti di Rilevante Interesse Nazionale (PRIN)" and by the Italian Ministry of research (MUR) through the project DOGMA-BriDging foOd and Gut microbiome: exploring the role of food Microbes in the modulation of the gut microbiome and in the improvement of human health (FIS2023-00241, CUP E53C24003720001).

SESSION: EMERGING TECHNOLOGIES

Registration number: L006

Applied Minimal Processing Technologies for Food Product Development

Gábor Jónás[1,a], Anna Visy[1], György Kenesei[1], Mónika Máté[1], Lilla Szalay-Dorkó[1], László Friedrich[1]

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Abstract: Consumer demand for fresh-tasting, safe, and additive-free foods has driven the evolution of *minimal processing technologies* that preserve the natural quality of raw materials while extending shelf life. Unlike conventional thermal preservation, these processes rely on physical, non-thermal effects to inactivate microorganisms and enzymes, thus maintaining the sensory and nutritional integrity of foods.
This study presents the application potential of selected minimal processing technologies - High-Pressure Processing (HPP), Ultrasound (US), Pulsed Electric Field (PEF), and Microwave-Vacuum Drying (MVD) - in food product development. These technologies can accelerate mass transfer processes such as salt diffusion during curing, improve drying efficiency, and promote structural changes that enhance texture and water-holding capacity. At the same time, they effectively reduce microbial load and enzymatic activity, contributing to product stability and safety.
The results and literature evidence emphasize that minimal processing provides not only gentle preservation but also a platform for innovation in food technology. Integrating these non-thermal methods enables the design of sustainable processes and high-quality products that meet modern consumer and industrial expectations.

Keywords: minimal processing, non-thermal technologies, HPP, ultrasound, PEF, microwave-vacuum drying, food quality, preservation

Acknowledgements: The research was supported by the Flagship Research Groups Programme of the Hungarian University of Agriculture and Life Sciences.

Registration number: L007

Optimization of Wet Agglomeration Conditions to Improve the Physical Properties of Pomegranate Juice Powder

Emrah Eroğlu[1,2,a], Ayhan Topuz[2]

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Abstract: Caking is an undesired phenomenon. Spray-dried pomegranate juice powder is susceptible to caking due to its high levels of low molecular weight sugar and organic acids. This caking tendency results in poor flowability, presenting significant challenges for handling, packaging, and industrial applications. The primary aim of this study was to enhance the flowability and reduce the caking degree of pomegranate juice powder by employing a wet agglomeration process.

To identify the optimal process conditions, Response Surface Methodology (RSM) with a Central Composite Design (CCD) was employed. The study focused on flowability, measured by the Carr Index, and particle size as the primary response variables. Arabic gum was used as the binder solution during the agglomeration process. The optimal conditions were determined to be a fluidizing air temperature of 78.6°C and a binder concentration of 25% (w/V).

The Carr Index, an indicator of powder flowability, demonstrated significant improvement following the agglomeration process. The values were recorded as 44.94 for the original pomegranate juice powder and 11.09 for the agglomerated powder, indicating a transition from very poor to excellent flow characteristics. Furthermore, the wet agglomeration process significantly reduced the caking tendency by increasing particle size and reducing surface area, thereby limiting moisture absorption and interparticle cohesion.

In summary, the application of wet agglomeration effectively improved the flow properties and physical stability of pomegranate juice powder by reducing caking behaviour. Although some unfavourable changes in colour properties were observed, the overall improvement in functional properties suggests that wet agglomeration is a promising strategy for the industrial processing of fruit juice powders.

Keywords: Agglomeration, Pomegranate Juice Powder, Flowability

Acknowledgements: The research was supported by The Scientific Research Projects Coordination Unit of Akdeniz University (Antalya, Turkey) (Project no. FBA-2021-2780)

Registration number: L008

100 Years of Distillation modeling. Enhancement of the McCabe-Thiele concept Using Generalized Vapour-Liquid Equilibria (VLE)

Csaba Dezső András[1,a], László Mátyás [2], Rozália-Veronika Salamon[1], Éva Molnos[1], Alexandru Szép[1]

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Abstract: Distillation is a separation method for liquids of two or multicomponent mixtures with different volatilities, consisting of the partial evaporation of the mixture and successive condensation of them, obtaining a distillate concentrated in the volatile, low boiling component(s). The first continuous distillation apparatus was patented about 200 years, the first engineering book distillation 130 about years ago, but the most penetrating and still used graphical method was published by Warren McCabe and Ernst Thiele in 1925, based on the Lewis's assumptions on constant molar (originally molal) overflow (1922). The shortcut methods for distillation design and modeling are generally fast with low computation requirement, with acceptable accuracy, limited by simplifying assumptions. These could be categorized into graphical and equation based methods, nowadays using computational software. Simple yet accurate models are crucial for preliminary design of distillation columns. The earliest and still most popular, graphical shortcut method is the McCabe–Thiele (McT) method utilizes the vapour–liquid equilibrium (VLE) curves. The accurate VLE data are obtained experimentally, and could be found in databases (DECHEMA, NIST). For software modeling, the VLE curves should be given as continuous function, achieved by semi-empirical thermodynamic functions (e.g. van Laar, UNIQAC), used by process simulators (e.g. ASPEN Plus^{TM}). The simplest equilibria are represented considering constant relative volatility (ideal behavior) of the low boiling component, applicable only to a restricted mixtures class (homologue series e.g. methanol-ethanol), with very low relative volatilities. The VLE curve of the most important mixture in the food industry ethanol-water system, but their behavior is challenging (azeotrope with inflection). We find a simple, accurate and generally applicable fitting functions (with minimal parameter number), both for zeotropic and azeotropic binary mixtures. Based on them, we developed an Excel McT-derived method for tray number determination of distillation column. The fitting function was tested on more than 50 binary azeotropic mixtures, with lover absolute error, as the existing models. Furthermore, the numerical McT use the inverse VLE function, we given it by determining the root of a specific cubic equation. The graphical method is straightforward, but the representation could be error prone at low relative volatility values. The numerical variant eliminate this problem, without losing the advantage of expressivity, so the interactivity of process variables could be observed clearly, and high accuracy are reached.

Keywords: distillation modeling, McCabe-Thiele method, VLE curves

Registration number: L010

Investigation of the Extraction of Rosehip (*Rosa canina* L.) Active Ingredients Using Microwave-assisted Extraction with Different Solvents

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Abstract: Rosehip (Rosa canina L.) is one of the most well-known and versatile medicinal plants. It is renowned for its exceptionally high content of vitamin C, polyphenols, and antioxidants. It plays an important role in the phytotherapeutic product and herbal tea markets in Hungary and internationally. Currently, large amounts of by-products and waste are generated during filter tea production, accounting for 10-40% of the initial material. This amount can be even higher in the case of rosehip since it is currently treated as a by-product despite its valuable bioactive content. For these reasons, it is important to ensure that rosehips are processed efficiently.

We conducted tests to develop an extraction process using two types solvents: ethanol-water mixture and citric acid-water solution. We kept the ratio of solvent to rosehip powder at 30 ml/g. The experimental design parameters were treatment time (2, 7, or 12 minutes), power level (100, 450, or 800 W), and solvent concentration (ethanol–water: 10%, 35%, or 60%; citric acid–water: 3, 4.5, or 6 pH). The experiments were carried out according to a central composite factorial design with six center points.

We determined the color of the prepared extracts, as well as their total polyphenol content (TPC), flavonoid content (TFC), and antioxidant capacity (AC) using the FRAP and DPPH methods. We used Design Expert statistical software to evaluate the data and establish a mathematical model that would enable us to estimate the measured active ingredient contents (TPC, TFC, and AC) within the examined parameter range. This approach optimizes the efficient extraction of rosehips, which were previously considered a by-product.

Our preliminary assumption is that microwave extraction efficiently extracts biologically active compounds from whole ground rosehips, including both the fruit flesh and seeds. Furthermore, using lower-concentration solvents may result in favorable extraction efficiency with regard to components with antioxidant properties.

Keywords: rosehip, microwave-assisted extraction, total polyphenol content, total flavonoid content, antioxidant capacity

Acknowledgements: The research was supported by the Hungarian University of Agriculture and Life Sciences

Registration number: L011

Encapsulation of *Liquidambar orientalis* Balsam via Ultrasonic Emulsification and Spray-Drying

Gulderen Cosgun[1,a], Keziban Kubra Gungor[1], Fevziye Kardelen Erten[1], Hilal Sahin-Nadeem[2], Mahmut Yildiztekin[3], Ramazan Mammedov[4], Ferhan Balci-Torun[5], Mehmet Torun[1]

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Abstract: This study investigated the application of ultrasonic homogenization (USH) as an emulsification and encapsulation method for *Liquidambar orientalis* balsam (styrax liquidus), a bioactive-rich natural product with limited direct use due to its strong, unpleasant taste and volatility. Emulsions were prepared under varying sonication amplitudes, sonication times, and oil-to-wall material ratios, followed by spray-drying to obtain encapsulated powders. The physicochemical properties, encapsulation efficiency, and release behaviors of the produced micro- and nanoparticles were comprehensively evaluated. USH-generated emulsions exhibited particle sizes between 190–533 nm, with narrow distributions (PDI ≈ 0.22-0.28) and acceptable zeta potential values (−29 to −33 mV), ensuring stability. Spray-dried powders showed drying yields exceeding the 50% success criterion, reaching up to 89.52% under optimized conditions. Nevertheless, encapsulation efficiency was moderate (62.7%), highlighting opportunities for process optimization. Sensory evaluations revealed that the inherent bitter and resinous taste of the balsam could not be fully masked, while only minimal release occurred in the oral phase-an intended outcome since controlled release in the gastric environment is desirable for targeted bioactivity. Total phenolic content in USH-encapsulated powders ranged from 0.89-2.51 mg GAE/g DM. Morphological analyses indicated homogeneous but slightly deformed spherical particles, likely due to drying-induced structural changes. In conclusion, ultrasonic homogenization ensured effective droplet disruption, stable emulsions, and controlled release, while providing a promising green technology for converting *Liquidambar orientalis* balsam-an underutilized forest product-into a stable and value-added functional ingredient for food and pharmaceutical applications.

Keywords: Styrax liquidus, ultrasonic homogenization, encapsulation, spray drying, characterization

Acknowledgements: The research was funded by the Scientific and Technological Research Council of Turkey [TÜBİTAK; Project no: 221O107]

SESSION: MICROBIOME AND APPLIED MICROBIOLOGY

Registration number: L012

Food Microbiomes for Sustainable Production System

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Abstract: Harnessing of microbes for preservation as well as production of foods has very long history even dated back to more than 10 000 years ago. Nowadays, many traditional fermented foods can be found worldwide. The development of these fermentation processes has then evolved and differentiated based on the microbial community (microbiome), the region, the culture and health (human microbiome) of certain folks etc. making them to be more efficient. Food microbiomes now can be defined as the complex microbial networks (microbial community, distributions, interactions, functionalities etc.) in the food processing and supply chains (food networks) even ranged from raw materials to health. Recently, the advances of different technologies such as culturomics, metabolomics, metagenomics, transcriptomics and proteomics as well as their integration help us to understand in more deepening the dynamics and interactions of microbiomes in food production systems This study will focus on the microbiomes and their interactions in food production system as well as how these can be harnessed to improve the efficiency and quality of such production systems, reduce and manage the wastes, refine the good practices, develop new, innovated or optimize methods for preservation of food products, prolong shelf-life of food products especially fruits and vegetables. Hopefully, it will lead to unlock the potentials and to innovate microbiome-based solutions to improve sustainability of our food production system.

Keywords: food microbiomes, fermentation, food production system, sustainability

Acknowledgements: The research was supported by the Flagship Research Groups Programme of the Hungarian University of Agriculture and Life Sciences and TKP2021-NVA-22 projects

Registration number: L013

Screening of Hypoglycemic Probiotics Based on Silkworm/Zebrafish Models and Strategies for Improving *Pediococcus acidilactici* SWU-HY34 viability by Microencapsulating

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Abstract: Type 2 diabetes mellitus (T2DM) poses a global health challenge, and probiotics represent a potential therapeutic option. In this study, three strains of probiotics with α-glucosidase inhibitory activity were screened in vitro, and the inhibitory effect of *Pediococcus acidilactici* SWU-HY34 (HY34) was the strongest, reaching 35.2%, which was further evaluated in vivo using a hyperglycemia silkworm model and zebrafish diabetes model. Strain HY34 effectively reduced blood glucose levels in diabetic zebrafish (p<0.05), suppressed the mRNA expression of pro-inflammatory cytokines, tumor necrosis factor alpha (TNF-α), interleukin 1 beta (IL-1β) and interleukin 6 (IL-6), alleviated liver tissue damage (p<0.05), improved lipid profiles by decreasing triglyceride (TG), total cholesterol (TC), and low-density lipoprotein cholesterol levels (LDL) (p< 0.05), while increasing high-density lipoprotein (HDL) levels (p<0.05).Furthermore, HY34 ameliorated diabetes-induced dyslipidemia and mitigated oxidative stress by enhancing antioxidant enzyme activity. The mechanism by which HY34 improves metabolic health and alleviates diabetes may involve modulating the gut microbiota composition and the production of beneficial metabolites in zebrafish. These results suggest that *Pediococcus acidilactici* HY34 could be further explored for the development of novel hypoglycemic probiotics. To increase the viability of HY34 during the storage a series of dodecenyl succinic anhydride (DSA) modified rice starches with different degrees of substitution were prepared, and their functional properties were compared for the purpose to select better wall materials. Fourier transform infrared spectroscopy (FTIR), X ray diffraction (XRD), and nuclear magnetic resonance (NMR) confirmed successful DSA modification and disruption of starch molecules'long range order. These structural changes altered starch's physicochemical properties: modified rice starch showed increased apparent viscosity and viscoelasticity, and significantly improved freeze thaw stability and emulsion capacity. Moreover, the modified starches exhibited promising performance for microencapsulation

Keywords: Hyperglycemia, Probiotics, Zebrafish, Rice starch, Microencapsulation

Acknowledgements: This work was supported by the National Key Research and Development Program of China (2024YFE0213900 and 2022YFE01210800).

Registration number: L014

Development of the Ultrabiome Preparation and Application in Sport Performance

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Abstract: Faecal microbiota transplantation (FMT) is increasingly recognized as a physiological intervention in sports performance, where targeted modulation of the gut microbial ecosystem influences endurance capacity, metabolic efficiency, and recovery dynamics. UltraBiome is a standardized, orally administered, lyophilized human microbiota graft derived exclusively from elite ultra-endurance athletes. Donor selection involves strict performance criteria and comprehensive medical, serological, and microbiological screening, ensuring both safety and high functional microbial diversity. The preparation contains concentrated colon-derived microbial communities associated with enhanced lipid oxidation, improved mitochondrial substrate use, and increased lactate processing efficiency.

The therapeutic model is based on controlled ecological replacement. Daily capsule administration over a sustained time period initiates gradual colonization, shifting the recipient's gut flora toward donor-characteristic microbial network architecture. This shift is associated with increased lactate threshold, improved tolerance to second-zone prolonged effort, and reduced systemic inflammatory load under training stress. The resulting microbial profile supports stable intestinal homeostasis, more efficient nutrient utilization, and heightened endurance physiology.

The presentation traces this concept from its earliest documented application—conditioning Persian war horses by transferring intestinal material from faster animals—to modern controlled human protocols. We outline how a structured, high-density FMT regimen contributed to a documented case in which a 48-year-old subject, following intensive microbiota transplantation, completed a 70+ km endurance run despite no prior history of ultra- distance capability. This case serves to illustrate the mechanistic potential of microbiota-driven metabolic reprogramming in real-world athletic performance.

The lecture thus reframes FMT from a therapy reserved for recurrent infection to a reproducible tool in performance physiology, grounded in microbial ecology and measurable functional adaptation.

Registration number: L015

Evaluation of the Antimicrobial Properties of Kombucha Enriched with Encapsulated *Lactobacillus hilgardii*

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Abstract: Kombucha is a traditional beverage that is usually prepared by fermenting sweetened black tea using a symbiotic consortium of acetic acid bacteria (AAB) and yeast. Kombucha exhibits several functional properties such as antioxidant, antimicrobial, anticancer, etc, but oftenly can not be labeled as a probiotic product, since the number of probiotic microorganisms usually does not reach the specified criteria. Lactic acid bacteria (LAB) are major microorganisms used for probiotic purposes. LAB that exert health benefits should be able to survive sometimes harsh conditions during fermentation, storage, and passing through the gastrointestinal tract. Several methods of microencapsulation of probiotic microorganisms are widely used to improve their viability. In this study, the wild strain *Lactobacillus hilgardii* isolated from sour dough was encapsulated in whey protein by lyophilisation method and added at the beginning of kombucha fermentation. During fermentation chemical (pH and titratable acidity) and microbiological (number of yeasts, AAB and *L. hilgardii*) parameters were determined. Antimicrobial activity of obtained kombucha was tested against reference strains: Gram positive bacteria (*Bacillus cereus, Staphylococcus aureus, Listeria monocytogenes*), Gram negative bacteria (*Escherichia coli, Salmonella* Typhimurium, *Pseudomonas aeruginosa*) bacteria, yeast (*Candida albicans*) and moulds (*Aspergillus brasiliensis, Penicillium aurantiogriseum*). with control samples of acetic acid, neutralized, denatured kombucha and black tea itself. Whey protein showed good efficiency in protecting LAB cells since their number at the last day of fermentation was 7.55 log CFU/mL, exceeding the recommended minimum level for probiotic products. Antimicrobial activity results show that acetic acid and kombucha in its native form are effective against various bacterial pathogens. Kombucha sample showed activity against all bacterial strains tested, except for *Listeria monocytogenes,* whether bactericidal or bacteriostatic and against fungi *Penicillium aurantiogriseum*. However, when kombucha is neutralized, there is a significant loss of activity, which highlights the importance of low pH and the presence of untreated bioactive components for the antimicrobial effect. This data may be of importance for further research into the use of kombucha as a natural antimicrobial agent in the food industry or healthcare.

Keywords: kombucha, probiotics, antimicrobial activity, encapsulation

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Registration number: L016

Production of Set-type of Yogurt from Dairy milk by Sequential Enzymatic hydrolysis and Microbial Fermentation

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Abstract: For a long time, the wide range of beneficial outcomes has catapulted dairy foods to the forefront of the functional food sector. Dairy products are recognized as a well-balanced source of nutrition across diverse socio-demographic, cultural, lifestyle and environmental contexts. Although dairy foods offer benefits, their ability to improve health and promote sustainable wellness is constrained by certain limitations. Lactose intolerance and dairy protein allergies restrict dairy foods consumption for a significant portion of the global population. It was proven that eliminating dairy foods from the diet chart may result in nutritional deficiencies to consumers. It may be realized that the development of dairy products that are both allergen- and lactose-free has the potential to enhance the nutritional intake of populations by increasing dairy consumption and overcoming current dietary restrictions, given that dairy foods are a rich source of diverse essential nutrients.
The objective of this research was to develop a set-type of yogurt having antioxidant capacity, anti-angiotensin enzyme activity, lactose free and lower allergenic activity. In this study ultraheat treated (UHT) milk and extended shelf life (ESL) milk were used to understand their effects on physical properties and biochemical activities of yogurt. Papain enzyme and lactic acid bacteria were applied sequentially to produce such a kind of yogurt. Different concentrations of papain prior to microbial fermentation and lactase during the microbial fermentation process were used to reduce the antigenic activity and lactose content of yogurt. Hardness of yogurt from UHT milk was higher compared to yogurt from ESL milk, and hardness of yogurts was reduced due to the application of papain prior to the microbial fermentation. The lower molecular weight of peptides was produced due to the consideration of papain and microbial fermentation according to sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). According to the electron donation capacity to reduce an oxidant (DPPH and FRAP assays), the antioxidant capacity of yogurts was increased due to the consideration of papain and microbial hydrolysis. Similarly, anti-angiotensin enzyme activity of yogurt was increased due to the consideration of papain and microbial hydrolysis. The modulation of mentioned biochemical activities was concentration dependent on papain. The antigenicity of casein, α-lactalbumin (α-La) and β-lactoglobulin (β-Lg) against Rb anti-casein, Rb anti-α-La and Rb anti- β-Lg was reduced increased due to the consideration of papain and microbial hydrolysis.

Keywords: Milk protein, physical properties, antioxidant capacity, anti-angiotensin enzyme activity, antigenicity

Registration number: L017

Effect of Exogenous Nitrogen Supplementation on the Fermentation of Commercial Unfiltered Apple Juice with Lactic Acid Bacteria

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Abstract: Probiotic fruit juices allow the consumption of beneficial microorganisms by people whose are intolerant to lactose, allergic to milk proteins, hypercholesterolemic, strict vegetarian, or resident in places where dairy products are not accessible. The aim of this study is evaluation of effect of exogenous nitrogen supplementation on the fermentation of commercial apple juice by two different Lactic Acid Bacteria (LAB) strains *L. plantarum* and *L. acidophilus*. Soy peptone and yeast extract were added at 1% and 2%, respectively. Samples were taken at 0, 8, 16, 24, and 32 hours of fermentation, and pH, bacterial count, total phenolic content, antioxidant capacity, sugar content, and organic acids were measured. Supplementation maintained bacterial growth at ~9 log CFU/ml over 32h, while a noticeable decline in cell counts after 20h of fermentation was detected for non-supplemented apple juice. Fermentation led to a decline in both antioxidant capacity (AAC) and total phenolic content levels (TPC), with the degree of loss highly dependent on strain and supplementation in all fermented juices. The antioxidant capacity of beverage without supplementation with soy peptone and yeast extract exhibited higher (4mM for both strains) than ones supplemented with exogenous nitrogen sources except the one supplemented with 2% soy peptone and fermented with *L. plantarum* strain. It resulted the highest AAC value (4.69 mM) after 32h of fermentation. Fresh apple juice contained 2.98 g/100ml glucose, 8.19 g/100ml fructose, 0.16g/100ml lactic acid, and no acetic acid was detected. After fermentation, all sugars concentrations decreased while the lactic acid concentration increased due to the bacteria's metabolism. Highest sugar consumption was noticed when apple juice was supplemented with nitrogen sources, and the highest lactic acid production was when apple juice was supplemented with 2% yeast extract for *L. plantarum* strain (2.65 g/100ml) and with 2% soy peptone for *L. acidophilus* strain (2.42 g/100ml) after 32h of fermentation. It can be concluded that the exogenous N supplementation supports a higher metabolism activity of LAB.

Keywords: lactic acid bacteria, apple juice, fermentation, nitrogen sources

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Registration number: L018

Enhancement of Protein Quality and Bioactive Properties of Milk Protein Concentrate and Isolate by Fermentation with *Lactobacillus acidophilus 150* Strain

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Abstract: Milk-protein concentrate (MPC) and milk-protein isolate (MPI) are high-protein content food products. Despite these products consisting mainly milk caseins, their biological values (BV) are relatively low, around 0.85, in comparison with ones of egg protein or human milk protein that are in the range of 0.95-1.00. In this study, the enhancement of protein quality of MPC and MPI by fermentation with probiotic lactic acid bacterium *Lactobacillus acidophilus 150* strain was focused on. Meanwhile, both MPC and MPI were supplemented with 1 % glucose, whereas the MPI was additionally added with 10 % whey protein concentrate (WPC) and essential amino acids. The fermentation was carried out for 48 h, and samples were taken at intervals and monitored for biochemical and nutritional changes. A steady decline in pH indicated active fermentation, while high-performance liquid chromatography (HPLC) confirmed the formation of lactic and acetic acids alongside depletion of glucose and lactose. The digestible indispensable amino acid scores (DIAAS) of MPC and MPI increased by 15% and 5% respectively. The antioxidant activities of the fermented samples were also higher than ones of natural MPC and MPI. The SDS-PAGE confirmed the release of different peptide fractions during the fermentation process. These findings highlight the potential of probiotic fermentation to improve the nutritional and functional properties of protein-rich formulations. Such strategies may support the development of next-generation products for sports nutrition, clinical applications, and functional foods.

Keywords: milk protein, quality, probiotic, fermentation, DIAAS

Acknowledgements: The research was supported by the Flagship Research Groups Programme of the Hungarian University of Agriculture and Life Sciences, GINOP_PLUSZ-2.1.1-21-2022-00048 and TKP2021-NVA-22 projects, as well as by Doctoral School of Food Science.

SESSION: DIGITALISATION AND SPECTROSCOPY IN FOOD APPLICATION

Registration number: L019

Spectroscopy Without Borders: Advancing Food Quality and Safety Through Portable Technologies

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Abstract: Spectroscopy has become an indispensable tool for ensuring food quality and safety, yet traditional laboratory-based methods often limit accessibility, speed, and global applicability. Portable spectroscopic technologies are transforming this landscape by enabling rapid, non-destructive, and on-site analysis across diverse environments. From detecting adulteration and contaminants to monitoring nutritional composition, handheld and mobile devices empower scientists, regulators, and producers with real-time insights that transcend geographical and infrastructural boundaries. This talk will highlight recent advancements, practical applications, and the future potential of portable spectroscopy as a driver for safer, more transparent, and globally accessible food systems.

Keywords: portable spectroscopy, food quality and safety, on-site analysis, handheld devices, adulteration detection

Registration number: L021

Quantitative Detection of Depleted Nutmeg Powder Adulteration Using Miniaturized and Benchtop NIR Together with ATR-IR Spectroscopy

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Abstract: Adulteration of herbs and spices is a persistent problem in food authentication. Nutmeg (Myristica fragrans Houtt.) presents a particularly challenging case: unlike many food fraud scenarios where foreign adulterants with distinct chemistry are introduced, here a realistic scheme involves the use of depleted or low-quality nutmeg powder blended into genuine material. Such depletion, typically due to prior oil extraction or industrial processing, results in reduced volatile and lipid content but maintains close overall matrix similarity. This subtle contrast makes spectroscopic discrimination more demanding. In this study, freshly ground nutmeg from whole seeds was spiked with varying amounts of low-grade commercial nutmeg powder to yield 100 calibration samples across the range of 0.5–30% adulteration. Spectral data were acquired using several miniaturized near-infrared (NIR) instruments (e.g., microPHAZIR, MicroNIR 1700 ES, NeoSpectra Scanner), a benchtop FT-NIR spectrometer (Büchi N-500), and an ATR-IR spectrometer (Shimadzu IRSpirit with QATR-S ATR). Partial Least Squares Regression (PLSR) was applied, and model performance was compared across platforms, including exploratory low-, mid-, and high-level data fusion strategies. All spectroscopic techniques enabled quantitative detection of depleted nutmeg adulteration, with robust calibration and validation results even at low adulterant levels. Miniaturized NIR instruments performed comparably to the benchtop reference, confirming their suitability for practical on-site screening. ATR-IR spectroscopy provided complementary information, particularly in the volatile-associated bands, though with higher noise. Fusion of NIR and ATR-IR data offered added robustness and interpretability. These findings demonstrate that quantitative authentication of nutmeg adulteration with depleted material is feasible using vibrational spectroscopy, and that portable NIR devices supported by chemometric modeling represent a promising route for real-world deployment.

Keywords: nutmeg authentication, depleted powder adulteration, NIR spectroscopy, ATR-IR spectroscopy, PLSR, data fusion

Registration number: L022

Advanced Digital Solutions for Food Traceability: Enhancing Origin, Quality, and Safety Through NIRS, RFID, Blockchain, and IoT

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Abstract: In today's agri-food sector, ensuring product authenticity, safety, and quality has become a major challenge as consumer expectations rise and supply chains grow more complex. Our study explored the transformative role of advanced digital technologies in enhancing traceability and transparency across the entire food production process and supply chain. A key focus is the integration of rapid, non-destructive quality assessment methods, such as near-infrared spectroscopy (NIRS) and machine vision (MV), with robust tracking systems utilizing radio frequency identification (RFID) and Internet of Things (IoT) connectivity. Furthermore, the deployment of blockchain technology offers a secure and transparent framework for data verification, reducing the risk of fraud and improving stakeholder confidence. This comprehensive approach enables real-time environmental monitoring, automated quality checks, and reliable documentation from farm to fork. The study also highlights how these technologies can improve supply chain coordination, regulatory compliance, and consumer trust. Finally, current obstacles to adoption and possible future developments have been explored, underscoring the importance of cross-disciplinary collaboration for the sustainable digital transformation of food systems.

Keywords: digitalization, NIRS, RFID, traceability, authentication

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Registration number: L023

Authentication of Paprika Spices: Quantitative Detection of Azo Dye Adulteration by Vis-NIR, FT-NIR, and LIBS

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Abstract: The adulteration of herbs and spices continues to represent a major challenge in food quality control. Paprika (Capsicum annuum L.) is especially vulnerable, as premium products from protected origins command high prices and are often falsified by addition of synthetic or natural dyes. Azo dyes are among the most frequently encountered red colorants in fraudulent paprika products. Despite the relevance of this problem, the potential of spectroscopic methods such as near-infrared (NIR) and visible–NIR (Vis–NIR) spectroscopy has so far received only limited attention. In this work, we explored a multispectral approach for quantitative authentication of paprika. Measurements were carried out with a portable full-range Vis–NIR instrument (350–2,500 nm), a benchtop FT-NIR spectrometer (1,000–2,500 nm), and laser-induced breakdown spectroscopy (LIBS). Three azo dyes were investigated: the food colorants Allura Red (E129) and Ponceau 4R (E123), and the non-food dye Orange II, which is of toxicological concern. Calibration and test sets were prepared across 17 concentration levels (0.1–6%) and analyzed by Partial Least Squares Regression (PLSR). Both Vis–NIR and FT-NIR spectroscopy achieved excellent quantitative performance, with RMSEP values of 0.2–0.3% and coefficients of determination (R^2) between 0.96 and 0.99. Interestingly, the handheld Vis–NIR device delivered more interpretable PLSR models compared to the benchtop FT-NIR, while maintaining similar predictive accuracy. LIBS also enabled quantitative assessment, though with somewhat lower performance (RMSEP ≈ 0.7%, R^2 ≈ 0.86). These findings highlight the strong potential of Vis–NIR spectroscopy, in particular portable instruments, for practical and robust detection of dye adulteration in paprika spice.

Keywords: paprika authentication, azo dyes, Vis–NIR spectroscopy, FT-NIR spectroscopy, LIBS

Acknowledgements: This research was supported by the Austrian Science Fund (FWF) [V1014-NBL].

Registration number: L024

Multidimensional Characterization of Egg White Protein Products: Application of NIR Spectroscopy, Texture Profiling, pH Measurement, Colorimetry, and Rheological Analysis — A Pilot Study

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Abstract: This research aims the investigation of the properties egg white-protein products determining the techno-functional parameters and using non-destructive technique to evaluate the differences among the samples. The samples include four different Totu products: Totu cream, extra cream, crumble and milk replacement drink. Three batches with different production dates were analyzed for each product alongside a reference sample, where parameters such as: pH, colour, texture (SMS- texture analyzer) and rheological properties (measuring using both viscosity and plate mode) were determined. The main aspect of the research was the application of near-infrared (NIR) spectroscopy as a non-destructive technique evaluating the molecular structure and compositional variations of the samples. Significant variations were present between samples. PCA and LDA were used as models, where LDA groups samples with similar properties. Initial results show significant changes of pH values among the samples, from slightly acidic to slightly alkaline. Variations are present also in the color analyses, depending on the physical composition between solid, semi-solid and liquid samples. Rheological parameters indicate that Totu cream showed shear-thinning behavior and in contrary Totu milk replacement showed near- Newtonian flow.

Keywords: near-infrared (NIR), egg white-protein products, techno-functional parameters, dairy free alternatives

Registration number: L025

Non-destructive Authentication of Functional and Traditional Powdered Food Ingredients Using Near Infrared Spectroscopy

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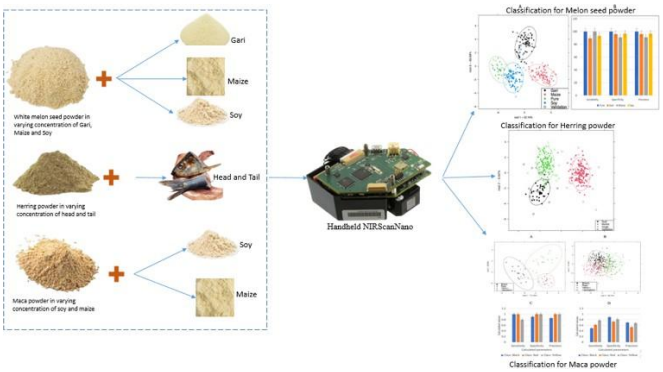
Abstract: Food fraud poses a significant challenge to food safety and product quality usually in developing regions where there is limitation to regulatory enforcement. This study investigated the application of Near Infrared Spectroscopy liaised with chemometrics to authenticate a maca powder, white melon seed powder and herring powder. Pure herring powder was adulterated with the tail and head in 7 different concentration. Chemometric models were developed, tested and validated with herring powder from 5 different markets. Adulterants including soybeans, gari (*Manihot esculenta*), and maize were added to pure white melon seed powder in 10 different concentrations. Authentic maca powders i.e Yellow (YM), black (BM), and red (RM) were adulterated with adulterants (soybean and maize powders) in 5 different concentrations Chemometric models were developed, tested and validated using 3-fold cross validation and leave one sample out cross validation respectively.



High classification accuracy was obtained for pure cultivars and adulterated samples in Maca adulteration, with PLSR models optimized using Savitzky-Golay smoothing (filters 17 and 19) achieving strong predictive performance ($R^2 > 0.95$, RMSE < 6.81% w/w). Adulteration led to reduced fat and protein content and increased carbohydrates, while NIRS combined with LDA achieved high recognition accuracies for adulterated samples in white melon seeds powder. Quantification using PLS-DA also yielded excellent results ($R^2CV > 0.95$, RMSECV < 3.92% w/w). For herring powder, visible color changes were effectively modeled using PLSR ($R^2CV = 0.9093$, RMSECV = 7.7351 g/100g), and LDA classified both market and laboratory samples with over 80% accuracy, emphasizing the robustness of NIRS-based models for detecting food adulteration.

Keywords: Nnear infrared spectroscopy, machine learning food fraud, protein powder, authentication

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SESSION: INNOVATION AND TRENDS IN FOOD SECTOR

Registration number: L026

Future Trends in Food Development

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Abstract: The future of the food industry is being shaped by global challenges such as population growth, climate change, shrinking agricultural resources, and rapidly evolving consumer expectations. Sustainability, health preservation, and technological innovation are together steering the food system toward a new, digitally supported, circular, and conscious model. The relationship between production and consumption is being redefined through a "farm-through-digital-to-fork" approach that prioritizes data-driven decision-making and transparent supply chains. One of the strongest directions is the rise of alternative proteins, which respond not only to environmental and animal welfare concerns but also to the demands of health-conscious consumers. Plant-based, microbial, fermentation-derived, and cell-cultured proteins are becoming increasingly accepted, with ongoing developments aimed at achieving sensory and textural parity with traditional meat. In parallel, functional and personalized nutrition is moving to the forefront: consumers seek products that not only nourish but also contribute to physical and mental well-being, support the microbiome and immune system, or help manage stress. Through precision nutrition and biological data analysis, more individually tailored diets and products are expected in the near future. The digitalization and automation of the food industry represent another major trend: artificial intelligence, IoT, and robotic systems are enhancing production efficiency, reducing waste, and accelerating innovation cycles. Data-driven development also enables closer tracking of consumer preferences and real-time monitoring of sustainability indicators. Closely linked to this is the strengthening of the circular economy and upcycling principles: food by-products are increasingly used to create new raw materials, proteins, fibers, and flavor compounds, reducing waste and ecological impact. Sustainability has become more than a marketing claim—it is now the cornerstone of consumer trust. Shoppers expect food production to demonstrably minimize environmental impact, ensure transparent energy and water use, and utilize recyclable or biodegradable packaging. Smart packaging in the future will serve as both an information carrier and a quality assurance tool, incorporating features like QR codes, sensors, or blockchain-based traceability. In consumer behavior, health consciousness is complemented by a desire for convenience and experience. Demand is growing for ready-to-eat, quick, yet high-quality foods that fit urban, fast-paced lifestyles. The food of the future will thus be health-promoting, sustainable, technologically advanced, and consumer-friendly at once. The key challenge for industry players will be maintaining safety, authenticity, and value for money while innovating rapidly. Success will depend on how effectively new technologies—such as precision fermentation, digital supply chain management, and smart packaging—are integrated with consumer expectations and experiential eating. In the coming years, the food industry will not only introduce new products but also shape new values: food will no longer be seen merely as nourishment but as a central element of a sustainable, conscious, and technologically sophisticated lifestyle.

Keywords: future, food, development, trends

Registration number: L027

Consumer-driven Shelf-life Determination and Consumer Perception of Chicken Samples

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Abstract: During storage, raw chicken meat produces off-odours and off-tastes due to microbial growth. The speed of this process mainly depends on storage conditions (temperature, moisture, and presence of preservatives), as well as the initial contamination. Consumers consider the product unfit for consumption once it reaches a certain level of spoilage.
The expiry date is one of the key quality and safety indicators that producers provide for consumers. However, determining the actual expiry date can be challenging, as many factors are at play, such as batch variation and storage environments, which contribute to the gradual spoilage of products.
Currently, research linking storage time, microbial growth, sensory changes, and consumer perception is limited. Studies investigating the various aspects of product spoilage are necessary for determining the appropriate shelf life for raw chicken.
This study aims to address the following objectives:

1) Determine consumers' sensory perception of chicken samples stored under different time points and conditions and identify the time points at which consumers deem the products unfit for consumption.
2) Link consumer scores of sensory quality and fitness for consumption to measurable parameters that can be used to establish shelf life (e.g., bacterial counts, microbiota, sensory profile).
3) Integrate consumer, sensory, and microbial results from the laboratory experiment into shelf-life determination methods applicable to the food industry.

The experiment was conducted in three countries: Hungary, Norway, and Portugal. Chicken samples were obtained from one local producer per country, and the same batch of chickens was used for the analysis. A cutting-edge reversed storage design was employed; with sampling plans tailored to each country based on the original expiration date set by the producer. The plan included storing the samples in their original packaging at different time points and at two storage temperatures: 4 °C and 8 °C. The samples were tested for total microbiological load and microbiome composition, and at the end of the shelf-life storage test, all samples were used for consumer and semi-trained sensory analyses. For the consumer analysis, a minimum of 120 participants were recruited in each country to evaluate the degree of disliking and overall acceptance of the samples. Meanwhile, in the semi-trained test, a 9-point hedonic scale was used to assess the intensity of 11 sensory attributes.
Results from the consumer test showed that in Norway and Portugal, higher intensity scores were observed for samples stored at abusive temperatures (8 °C). In Hungary, however, storage conditions did not significantly affect the intensity scores. An increase in intensity scores and disliking was observed in Hungary between 3 and 6 days, in Norway between 7 and 15 days (8

°C) and at 18 days (4 °C), and in Portugal at 7 days (8 °C) and between 7 and 11 days (4 °C). For the semi-trained panel test, all sensory attributes related to spoilage were highly correlated in all countries. The most important attributes contributing to perceived spoilage were total

intensity, cloying, sour/fermented, ammonia/burnt/pungent, and sulphur.

The predominant microbiota identified in the three countries differed significantly, as shown in the table below.

Country	4 °C	8 °C
Hungary	*Photobacterium*	*Photobacterium*
Norway	*Carnobacterium*	*Hafnia*
Portugal	*Brochothrix* (& *Serratia*)	*Serratia* (& *Brochothrix*)

The *Photobacterium* was discovered through microbiota analysis, but it was likely underestimated by conventional PCA total count methods, as we cannot be certain what grew on the plates.
The total intensity score from the semi-trained panel test seems to depend primarily on the total bacterial counts and the aggregated bacterial load. For industry recommendations, total intensity can be suggested as a reliable indicator for producers. However, variability observed in microbial analyses is not always detectable through sensory analysis, so further investigation is needed.
The majority of consumers accepted all samples across all countries. The data support that, provided raw chicken is stored under proper conditions, an additional 2 days of shelf life can be recommended for Norwegian and Portuguese chicken samples.
Additionally, we will report the results of a recently concluded digital survey in Hungary which was also done in 9 other European countries. A total of 1006 respondents were gathered in Hungary using stratified random sampling and a predefined criterion. The questionnaire was divided in different sections involving aspects like purchase decision making, food waste data, new innovations in measuring shelf-life, acceptability of two different food preservation methods, and whether they will support government and policy initiatives to support the improvement of shelf life and reduce food waste.

Keywords: shelf-life study, consumer science, food microbiology

Acknowledgements: This project has received funding from the European Union's Horizon Europe research and innovation programme under the MICROORC project with grant agreement No. 101136248.

Registration number: L028

The Selfish Effect – When Food Science Meets Market Innovation

Combining gentle fish processing, Darfresh macro-pack technology and consumer insight to create an entirely new category of ultra-fresh, ready-to-cook seafood

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Abstract: Fresh fish is one of the most perishable food categories, with the shelf life of freshly filleted raw fish typically ranging from 3–6 days in melting ice and 4–7 days under modified atmosphere, depending on species. This limited stability is especially true for domestic freshwater fish, which show rapid microbiological spoilage due to their high initial microbial load.
Extending freshness without significant sensory changes or food-safety risks requires gentle, non-thermal preservation technologies. This study investigated the combined application of electrolyzed active water (EAW) and high hydrostatic pressure (HHP) as preservative-free methods to improve shelf life and microbial stability in fish fillets.
During the development of the Selfish product line, these techniques were integrated into processing steps including stress-reduced slaughter (ike-jime), surface sanitation, and optional HHP treatment (300–400 MPa, 2–5 min), followed by MAP or Darfresh® macro-pack skin packaging.
Compared to conventional MAP-packed controls, the combined approach achieved a 20–30% shelf-life extension while maintaining color, texture, and sensory freshness. HHP-assisted variants reached up to 18–21 days of stability, though species with red muscle tissue exhibited noticeable color changes, limiting the applicability of this method.

The Selfish concept demonstrates how scientific knowledge and market-driven design can converge to create sustainable, additive-free, ultra-fresh seafood products, linking food science and innovation through consumer-oriented technology.

Keywords: electrolyzed active water, high hydrostatic pressure, MAP packaging, fish processing, shelf-life extension

Acknowledgements: The research was supported by The Fishmarket Ltd. internal R&D program and based on doctoral studies at the Hungarian University of Agriculture and Life Sciences (MATE), Faculty of Food Science.

Registration number: L029

Hot Air Drying as a Pre-Treatment Strategy to Enhance the Physical and Nutritional Quality of Puff-Dried Sultana Grapes

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Abstract: In recent years, the demand for healthy, ready-to-eat fruit-based snacks has increased considerably due to evolving consumer preferences and busy lifestyles. Among these, grape chips present a promising alternative owing to their high nutritional content and natural sweetness. However, drying high-moisture fruits such as grapes presents significant challenges due to their waxy skin and high sugar content, which hinder efficient moisture removal and expansion during drying.

Explosion puff drying (EPD) is recognized for producing crispy fruit snacks with desirable sensory and nutritional qualities. Nevertheless, its direct application to fresh grapes is limited by inadequate internal vapor pressure buildup. Pre-drying has thus emerged as a critical step for enhancing puffing efficiency. This study explores the effectiveness of hot air drying (tray drying) as a pre-treatment prior to EPD for Sultana grapes.

Grapes were pre-dried in a hot air dryer at three temperatures (50°C, 60°C, and 70°C) to achieve target moisture contents of 70%, 65%, and 60% (wet basis), followed by EPD under fixed conditions (1.9 bar, 100°C, 10 min, 60°C system temperature). Quality assessments included moisture content, water activity, expansion ratio, bulk density, browning index, total phenolic content (TPC), antioxidant capacity (DPPH, FRAP, ABTS), specific moisture extraction rate (SMER), and texture profile analysis.

Findings indicate that hot air drying at 60°C to 60% moisture content provided a balanced trade-off between structural integrity and nutritional preservation, yielding grape chips with high crispness, moderate expansion, acceptable antioxidant retention, and favorable color properties. Hot air drying also offers practical advantages in industrial scalability, process control, and product safety.

These results underline the potential of hot air drying as a reliable pre-treatment in EPD applications and contribute to the development of sustainable, value-added grape-based snack products. Future research should explore energy optimization and combined tray–microwave approaches to further enhance product quality.

Keywords: Sultana grape, hot air drying, puff drying, antioxidant activity, phenolic content, snack food

Acknowledgements: The research was supported by the Scientific and Technological Research Council of Turkey (TUBITAK 124 O 716)

Registration number: L030

Effects of UV-B Light Application in Refrigerator Crisper Compartments on the Quality and Shelf Life of Fresh Product

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Abstract: Fresh fruits and vegetables are rich sources of bioactive compounds, including vitamins, minerals, dietary fiber, and phenolic substances, all of which contribute to human health and well-being. However, these products are highly perishable and subject to rapid physical, chemical, and microbiological degradation during the postharvest period. This susceptibility significantly limits their shelf life and contributes to substantial food waste. Consequently, the development of innovative preservation strategies is essential to maintain the freshness and nutritional quality of fresh produce. Although cold chain systems are widely employed in food preservation, they are often insufficient on their own, highlighting the need for complementary technologies. In this study, the potential application of ultraviolet-B (UV-B) light technology was investigated as an alternative preservation method for fresh fruits and vegetables. UV-B light, with a wavelength range of 295–325 nm, possesses relatively low energy but can induce various metabolic responses in plant tissues, including the stimulation of phenolic compound and antioxidant synthesis. Furthermore, when applied at appropriate doses, UV-B light may reduce microbial load and delay spoilage processes. The study focused on assessing the effects of different UV-B light intensities on cherry tomato samples during storage. A UV-B light system was integrated into the vegetable compartment of a domestic refrigerator, and samples were subjected to three different UV-B intensity levels, alongside an untreated control group. Key quality attributes including moisture content, weight loss, total phenolic content, antioxidant activity, color, and texture were monitored throughout the storage period. The results indicated that UV-B exposure for 10 minutes per hour positively influenced certain quality parameters, particularly color retention and firmness, during the initial stages of storage. However, these beneficial effects diminished under prolonged storage conditions. Thus, while UV-B light technology demonstrates potential as a supplementary preservation method for fresh produce, its efficacy is contingent upon factors such as exposure duration, light intensity, and the specific quality parameters being targeted.

Keywords: UV-B, cherry tomato, refrigerator, shelf life

Acknowledgment: This study was supported by TÜBİTAK-2209B and VESTEL Beyaz Eşya San. ve Tic. A.Ş.

Registration number: L031

Temperature-Dependent Pyrolysis and Characterization of Carbon Nanodots from Urea and Citric Acid

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Abstract: Carbon nanodots (CNDs) are emerging carbon-based nanomaterials characterized by their small size (<10 nm), strong photoluminescence, chemical stability, and biocompatibility. This work aimed to develop cost-effective and scalable methods for synthesizing CNDs with tailored structural and optical properties suitable for applications in agriculture and food industries. Various precursors like glycine, lysine, curcumin, urea, and citric acid were used through pyrolysis-based synthesis. Urea/Citric acid 4:1 pyrolysis was performed using a range of temperature from 110°C to 180°C to focus on structural and optical changes induced by the heat treatment. The resulting CNDs were studied with the assistance of high-performance liquid chromatography (HPLC), which detected 2 main peaks with molecular weights ranging from 124,396 to 548,265 Da, indicating the generation of heterogeneous structure of the CND. 3D fluorescence spectroscopy showed that higher synthesis temperatures produced stronger emission profiles, while FTIR spectra confirmed characteristic surface functional groups (O–H, N–H), indicative of surface passivation. Elemental analysis showed that increasing the pyrolysis temperature led to higher carbon and nitrogen content that reached respectively 16,18% and 40,44% at 180°C, enhancing both carbonization and nitrogen doping.
Future work will focus on samples synthesized at 180 °C, a temperature that demonstrated promising emission and molecular structure, by systematically varying the reaction time to optimize fluorescence intensity, particle size distribution, and surface functionalization. These controlled studies aim to refine the structure–property relationships in urea/citric acid-derived CNDs for future applications such as Exploring Carbon Nanodots as Smart Nanocarriers and Sensors for Plant Health and Growth Enhancement.

Keywords: CND, pyrolysis, surface fonctionalization, florescence spectroscopy

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Registration number: L032

Understanding the Formation of Carbon Dots in Processed Foods

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Abstract: The unintentional formation of carbon dots (CDs)—fluorescent, nanoscale carbon-based particles—during thermal food processing has raised increasing concerns regarding food safety and nanomaterial exposure. Despite growing recognition of their presence in commonly consumed foods, the formation mechanisms and influencing factors remain poorly understood. This study aims to investigate the pathways and key precursors contributing to CDs formation during the thermal processing of various food matrices. Representative food samples from six major categories—bakery, chocolate, beverages, black foods, spices, and cereals—were analyzed to evaluate CDs concentrations. Thermal models were designed to mimic baking, roasting, and boiling processes. The synthesized CDs were characterized using fluorescence spectroscopy, HPLC-SEC-FD, UV–Vis, FTIR, TEM, and XRD to determine their structural and optical properties.

Our findings suggest that the Maillard reaction and lipid oxidation are major contributors to CDs formation, with critical roles played by temperature, time, cooking methods and precursor composition. CDs produced under these conditions exhibited excitation-dependent fluorescence, spherical morphology (2–10 nm). This indicates that both sugar-amino acid and lipid degradation pathways are central to the nucleation and growth of CDs during food processing.

To address potential risks, we propose key mitigation strategies: selecting safer natural precursors, optimizing processing conditions to avoid excessive temperatures, modifying surface functionalities to reduce cytotoxicity, and developing robust detection protocols. These approaches aim to control CD formation during food processing and support safer, more informed applications in food systems.

Keywords: carbon nanodots, nano in foods, formation mechanism, detection; thermal processing

Acknowledgements: The research was supported by Stipendium Hungaricum scholarship.

Registration number: L033

Introduction to Honest Food System and Adaptation Status

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SESSION: FOOD FERMENTATION AND FOOD SAFETY

Registration number: L034

The Power of Lactic acid Fermentation: Functionality, Health and Safety - Reflections from the Past, Insights from the Present and Perspectives for the Future

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Abstract: Lactic acid fermentation is one of the humanity's oldest biotechnological processes, having played a crucial role for millennia in food preservation, flavor and texture development and the enhancement of nutrient bioavailability. This presentation explores the multifaceted role of lactic acid bacteria (LAB) in developing the nutritional, sensory and safety profiles of fermented foods.

A historical retrospect illuminates ancient practices where human civilizations instinctively harnessed the capabilities of LAB to stabilize foods (e.g. fermented vegetables, dairy products, bread, meats) and improve their organoleptic properties. These "empirical" discoveries laid the foundation for later scientific research and the traditional fermentation techniques served as the basis for modern biotechnological applications.

Contemporary research highlights the molecular and microbiological processes, the probiotic potential of LAB strains, their immunomodulatory effects, functionality, texture modification through exopolysaccharides, the formation of bioactive peptides and their capacity to enhance gut microbiota resilience. Moreover, the safety aspects of fermentation—particularly the inhibition of foodborne pathogens and the reduction of toxic compounds—are critically examined. In reviewing these current researches, we present the latest research trends by presenting the results of our research group on this topic, such as fruit juice fermentation, cell immobilization on natural carriers, improvement of the bioavailability of nutrients and reducing the risk of certain allergic reactions and we demonstrate how LAB can inhibit the proliferation of pathogenic microorganisms and in certain cases – such as with mycotoxins – contribute to the detoxification.

Looking ahead, „perspectives for the future" outline the innovation potential of lactic acid fermentation, trends such as precision fermentation, personalized nutrition, microbiome-targeted functional foods, food waste reduction and the establishment of sustainable fermentation systems in the context of global food security and climate resilience. By integrating past wisdom with present innovation, the lactic acid fermentation can be the future path of a dynamic and health-promoting bioprocess.

Keywords: lactic acid bacteria, fermentation, bioprocess, food safety, functionality

Registration number: L035

Wastewater from the Confectionary Industry as a Medium for Bacterial Growth

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Abstract: The confectionary industry is one of the largest effluent generators in the food sector, generating wastewater with high chemical and biological oxygen demand, which is generally considered non toxic in comparison to other industrial wastewaters due to absence of heavy metals and similar contaminants. The seasonal and daily variability of the confectionary wastewater composition and quantity complicates its safe disposal and treatment, usually engaging physicochemical, biological (aerobic/anaerobic) or multi-stage treatment processes. Its high content of biodegradable organic matter makes it a suitable substrate for microbial growth. Therefore, in this study, the raw wastewater from the confectionary industry and the wastewater supplemented with 5 g/L of glucose were investigated as potential substrates for the growth of biocontrol strain *Bacillus* sp. BioSol021, with a previous record of antifungal and antibacterial activity against plant pathogens. The cultivation was carried out at 28°C, with an agitation rate of 150 rpm during 96 h, while the inoculum was prepared using the nutrient broth medium and used for inoculation in the amount of 10% (v/v). The biomass content of the bacterial strain was determined by the plate count method, while the antifungal activity of the obtained cultivation broth samples was tested by the well diffusion method against *Aspergilllus flavus* ŠT2B, isolated from corn. The results have indicated the higher bacterial biomass content in the wastewater supplemented with glucose, mostly due to presence of readily available sugar substrate for bacterial growth. On the other hand, larger inhibition zone diameters were observed in the case of non-supplemented wastewater medium (61.00±6.56 mm) compared to glucose-supplemented medium (51.67±3.21 mm), suggesting that nutrient limitation could stimulate secondary metabolism of *Bacillus* sp. BioSol021 and production of antifungal compounds. This study has provided background for further bioprocess development in the area of linking food industry and agrochemical industry in the circular economy framework via valorization of confectionary industry wastewater by microbial biotransformation to value-added microbial pesticides.

Keywords: *Bacillus*, biocontrol, waste valorization, cultivation, circular economy

Acknowledgements: The research was supported by the programs 451-03-136/2025-03/200134 and 451-03-137/2025-03/200134 of the Ministry of Science, Technological Development and Innovations of the Republic of Serbia and by the Provincial Secretariat for Higher Education and Scientific Research of the Autonomous Province of Vojvodina in the framework of the project "Development of industrial symbiosis in the AP Vojvodina through valorization of fruit processing by-products using green technologies" (project number 003075720 2024 09418 003 000 000 001 04 004)

Registration number: L036

From Field to Framework: Segmenting Food Safety Attitudes in Vientiane

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Abstract: Foodborne illness remains a major public health concern in Southeast Asia, especially in Laos, where domestic food handling practices are a significant contributor to disease transmission. Despite awareness campaigns, unsafe practices and food safety myths are still common, particularly among at-risk groups. This study explored how consumer segmentation can support more targeted and culturally appropriate food safety communication in a low- and middle-income country context.
A structured survey was conducted with 500 adults across seven districts of Vientiane Capital. The fieldwork was locally coordinated, with special attention to interviewer training, cultural adaptation, and ethical oversight. Principal component analysis revealed three key behavioural dimensions: food safety competence and responsibility, microbiological awareness, and resistance to food safety misbeliefs. Based on these factors, hierarchical and K-means clustering identified four consumer segments.
The segments ("drifters", "picky", "providers" and "carpe diem!") differed in food safety competence, attitudes and learning motivation. The results highlighted the limitations of generic communication and support the use of behavioural profiles to guide risk communication. The framework can inform targeted interventions aligned with national food safety goals and public health priorities in Laos and similar low- and middle-income country contexts.

Keywords: food safety, consumer segmentation, PCA, risk communication

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Registration number: L038

Invisible Survivors: Chlorine-Resistant Bacteria in Our Tap Water

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Abstract: This study aimed to investigate the extent of chlorine resistance among bacterial strains isolated from drinking water distribution systems. In total, 26 distinct bacterial isolates were examined using the disc diffusion assay to evaluate their susceptibility to chlorine. The isolates were exposed to four different concentrations of chlorine solution, designed to simulate the range of disinfectant levels typically encountered in water treatment processes.

The antimicrobial effect of chlorine was assessed by measuring the diameter of the inhibition zones surrounding the discs. Notably, a considerable proportion of the tested strains displayed a marked tolerance to chlorine, as evidenced by reduced inhibition zones or complete absence of growth suppression at higher concentrations. This trend indicates an adaptive resistance mechanism that allows certain bacteria to withstand oxidative stress caused by chlorine exposure.

Among the examined isolates, members of the genus Pseudomonas exhibited the highest levels of chlorine resistance. In several cases, these strains showed minimal or no inhibition zones, even when exposed to the highest chlorine concentration applied in the study. This observation is particularly concerning, as Pseudomonas spp. are known for their environmental persistence, ability to form biofilms, and potential pathogenicity.

The findings underscore the potential limitations of current chlorination practices in fully eliminating microbial contaminants from drinking water systems. The survival of resistant strains, particularly Pseudomonas, highlights the need for ongoing microbiological surveillance and a critical reassessment of existing disinfection protocols. Ensuring the microbial safety of drinking water may require the integration of alternative or complementary treatment strategies to address the persistence of chlorine-tolerant bacteria.

Keywords: bacteria, chlorine-resistance, water distribution systems, drinking water

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Registration number: L039

Impact of Cold Plasma Treatment on Bioactive and Microbial Properties of Different Red Peppers

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Abstract: Plasma is a system developed in 1970 for the purpose of eliminating surface infections. The highly reactive species that make up non-thermal plasma include gas molecules, charged particles in the form of positive and negative ions, free radicals, electrons, and electromagnetic radiation (photons) at ambient temperatures. Cold plasma (CP) has demonstrated its potential as a non-thermal technique for reducing contamination in various foods, and numerous studies have confirmed its ability to maintain or improve quality parameters, such as antioxidant activity. This technology is environmentally friendly and has the potential to serve as an alternative to conventional treatment methods. It is offered to the spice industry and related food processing sectors. Compared to conventional decontamination techniques, which often have disadvantages, cold plasma represents a paradigm shift.

Red peppers belong to the genus Capsicum and the Solanaceae family. They are among the most widely used spices worldwide. In this study, low-pressure cold plasma was evaluated as a non-thermal alternative for treating these spices. Four ground pepper varieties, chili, red pepper, paprika, and isatt pepper, were exposed to plasma treatment.

Following this process, a comprehensive evaluation of the samples was carried out. For microbial safety, a significant reduction in the populations of total mesophilic aerobic bacteria (TMAB) and total yeasts and molds (TYAM) was observed. Importantly, the essential quality characteristics of the spices were found to be well-preserved. Alterations were observed in the product's color, total phenolic content (TPC), total antioxidant capacity (TAC), and capsaicinoid levels, which determine pungency. Furthermore, examination of the spices by scanning electron microscopy (SEM) indicated that the treatment resulted in only subtle surface modifications.

It is concluded from these findings that low-pressure cold plasma is an up-and-coming technique. It has been shown to effectively enhance the microbial safety of pepper spices while successfully maintaining the crucial quality attributes valued by consumers.

Keywords: low-pressure cold plasma, non-thermal processing, microbial decontamination, capsaicinoids

Registration number: L040

Natural Antimicrobial Strategies: Incorporation of Furcellaran capsules impregnated with the Hop Extract in Raw Meat to Inhibit bacterial growth

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Abstract: The continuous emergence of pathogenic microorganisms in meat products remains a significant concern in public health due to its potential to cause severe foodborne illness. In recent years, there has been a growing demand for "clean label" products. This shift necessitates the search for novel and natural antimicrobial strategies that align with consumer expectations. The study investigates the effectiveness of incorporating hop (*Humulus lupulus* L.*) supercritical* SCO_2 extract into furcellaran polymer capsules which were further mixed in different concentrations with raw beef - contaminated with *Listeria monocytogenes*. Antimicrobial efficacy was tested using standard microbiological assays and also physicochemical properties of meat were investigated. Meat samples stored at 6 Celsius degrees, were tested after four different intervals: 0, 24, 48 and 72 hours. The results demonstrated a significant reduction in bacterial growth in the treated samples compared to controls. The findings suggest that furcellaran-based formulations, combined with supercritical SCO_2 hop extracts, can significantly inhibit multiplication of *Listeria monocytogenes* in raw beef. It highlights the potential of furcellaran as an effective carrier for bioactive compounds, offering an innovative solution to the growing need for more natural food preservation.

Keywords: food safety furcellaran, hop extract, *Listeria monocytogenes*

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SESSION: MEASUREMENT AND ANALYTICS

Registration number: L041

Digital Solutions and Transformation of the Food Industry

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Abstract: The digital transformation of the food industry aims developing current technology by improving efficiency, transparency, sustainability, nutrition, and health as well as involve customers. Solutions comprise multiple layers from production to public relations. The presentation is focusing on the data sources and available information to support decision making. The modern measurement technology provides remote sensing, IoT data acquisition, inline quality control, all together producing a huge data lake. Analysis of such complex databases requires novel approaches like machine learning and artificial intelligence. The expertise of the Department of Food Measurement and Process Control are to be introduced: process control, automation, robotics, modern measurement techniques, data analysis, decision support, data-driven decision making, AI development. Our projects involved numerous companies, and the final deliverables were in wide range from product development and technology optimization to software component and mobile application. Since we are university people, besides applied research we are keen on teaching, providing training programmes on undergraduate and postgraduate level. Qualified workforce is one of the major barriers of digitalisation. New skills and knowledge are required in modern production lines as well as in the management of the company.

Keywords: digital strategy, smart technology, data-driven decision making, infrastructure, development and education

Registration number: L042

Multisensor System for Monitoring Honeybee Colonies

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Abstract: The health and resilience of honeybee colonies are strongly influenced by environmental conditions, with climate change and air pollution representing major risk factors. To address these challenges, this project proposes the development of a multisensor monitoring system capable of collecting and transmitting real-time information from hives. Internal parameters monitored include temperature, relative humidity, hive weight, noise levels, and vibrations. Acoustic and vibrational profiling provides valuable insights into colony activity, enabling early detection of swarming, queen loss, or stress induced by external factors. In parallel, the system integrates chemical sensors for the detection of critical atmospheric compounds: ozone (O_3), oxygen (O_2), methane (CH_4), and nitrogen compounds (NO, NO_2, NH_3). These external stressors affect honeybee metabolism, orientation ability, disease resistance, and the quality of hive products. Data collected are transmitted via communication networks (Wi-Fi, BLE, or LoRa) to a digital platform, where they are correlated with meteorological variables and analysed to generate early warnings and predictive risk models. Implementing such a multisensor system supports the transition toward precision beekeeping, providing beekeepers with sustainable management tools, reducing colony losses, and protecting pollinators—key elements for biodiversity conservation and food security.

Keywords: honeybee, resilience, multisensor, biodiversity, monitoring system

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Registration number: L043

Methodological Developments in Multimodal Direct and Indirect Preference Tests with Scale Transformation

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Abstract: During sensory testing, assessors evaluate the intensities of sensory modalities on different sensory scales in accordance with standard methods. However, the standards do not address two important methodological issues: (1) how category scales with verbal labels can be correctly transformed into numbers; (2) how inconsistent assessors can be identified and to what extent they influence the results of sensory tests. Our research focuses on these unanswered questions. The first objective of our research is to determine the numerical values that best fit the verbal categories for four different modalities describing aromas. The second objective of our research is to identify inconsistent respondents by combined evaluating direct (category scale) and indirect (pairwise comparison) assessments, as well as to examine the modality dependence of inconsistency. The third objective of our research is to explore the stimuli and cognitive patterns of textual and visual modalities by analysing eye movement parameters and patterns. In our research, we examined the preference for six aroma alternatives (chocolate, vanilla, cinnamon, apple, almond, coffee) in different sensory modalities (text, image, smell, taste) with 100 participants in a sensory laboratory under standardised conditions, using two types of evaluation methods: direct (nine-point numerical preference category scale) and indirect (pairwise comparison with a four-item verbal scale). Eye movement tests were performed using a high-resolution eye camera (Tobii Pro Fusion 250 Hz), using six eye movement-based parameters (time to first fixation, first fixation duration, fixation duration, fixation count, dwell duration, dwell count). Our results confirmed that there is a great need in sensory testing to convert modality-dependent verbal categories into precise numerical values. In our research, we identified inconsistent respondents and the modality dependence of the degree of inconsistency. We identified similarities and differences in eye movement-based parameters for inconsistent evaluators. Based on our research results, we recommend converting verbal category scales into numerical values using this method for each test task in order to avoid the distortions caused by the lack of conversion in consumer studies and thus obtain more reliable results.

Keywords: pairwise comparisons, inconsistency, preference test, sensory modalities, eye-tracking

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Registration number: L044

Laser Backscattering Imaging for Non-destructive Assessment of Cheese Ripening

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Abstract: Cheese ripening is a complex, type-dependent process that presents a major obstacle for developing universal, non-destructive quality control methods. The rate and nature of biochemical and structural changes vary widely between cheeses due to differences in composition, microbial activity, and production conditions. Conventional assessment techniques often require invasive sampling and are tailored to specific products. This study explores the potential of laser backscattering imaging (LBI) as a tool for monitoring cheese ripening across different cheese types. LBI was applied at multiple wavelengths (532, 635, 650, 780, 808, 850 and 1064 nm) to capture the change of scattering properties throughout ripening. Cheese samples were ripened in cold storage at 7.0 ± 1.0 °C, with measurements taken weekly. As reference indicators of ripening, texture profile analysis was used to quantify properties such as, hardness, cohesion, adhesiveness, springiness, gumminess and chewiness, while the cutting test measured maximum cutting force and total work of cutting. Two multivariate statistical approaches were applied: classification of cheese types and regression for ripeness prediction. Classification models achieved high accuracies, while regression models produced low root mean square error values. The analysis of LBI data across multiple wavelengths revealed statistically significant differences in light-scattering behaviour between different cheese types, enabling their accurate classification. More importantly, the successful application of regression models, which achieved low root mean square errors when correlating LBI data with traditional ripening metrics, strongly demonstrates the ability of LBI as a rapid, non-destructive, and objective technique for tracking and predicting the ripening stages of various cheeses.

Keywords: cheese ripening, laser backscattering, multivariate analysis

Acknowledgements: The research was supported by the Doctoral School of Food Science of the Hungarian University of Agriculture and Life Sciences.

Registration number: L046

Energy- and Resource-Efficient Water Technologies Tailored to Food Industry Needs

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Abstract: Efficient water use has become a critical factor in the sustainability performance of the food industry, where large volumes of high-quality process water are required, and wastewater characteristics are often complex. This study focuses on improving water use indicators by integrating energy-efficient water treatment and wastewater management technologies tailored to specific food industry processes. The approach combines advanced membrane technologies—such as ultrafiltration, nanofiltration, and reverse osmosis—with traditional purification methods including ion exchange, activated carbon adsorption, and biological treatment. These hybrid systems are optimized to recover valuable water streams, reduce specific water consumption, and minimize the overall environmental footprint. Case studies from implemented industrial projects demonstrate measurable improvements in water reuse ratios, energy efficiency, and compliance with increasingly stringent discharge regulations. The results highlight that the integration of customized membrane-based solutions within conventional treatment trains can significantly enhance circular water use and sustainability performance in diverse food processing sectors.

Keywords: water treatment, wastewater treatment, membrane technology

Acknowledgements: The research was supported by Hidrofilt Ltd.

Registration number: L047

Data and AI Authenticity from Fam to Fork and Health – OnX TRUST / ChAinOnX: The Role of Blockchain in the Data-Driven Food Industry

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Abstract: The increasing digitalization of supply chains presents a critical challenge: developing digital data-driven collaborations, product traceability systems, and Artificial Intelligence (AI) solutions that corporations, regulatory bodies, and—most importantly—consumers can unconditionally trust.

The pressure from data falsification, manipulation, and cyber-attacks is intensifying in the agriculture and food sectors too. Therefore, a technological solution is required that can guarantee data authenticity and resilience against hacking along the entire supply chain.

In my presentation, I will demonstrate how blockchain technology—moving beyond its divisive cryptocurrency applications—is capable of establishing the authenticity of digital data. I will also discuss why the European Blockchain Service Infrastructure (EBSI) is being built and why legislators have incorporated this technology into the eIDAS Regulation as a tool for digital authenticity.

I will briefly outline how blockchain technology can transform digital trust and the role it can play in the food industry by ensuring the integrity of databases, data-driven collaborations, supply chains, and AI solutions.

My aim is to demonstrate that the application of blockchain technology is no longer the exclusive privilege of large global corporations, but is now an accessible solution for responsibly-minded food producers and their supply chains.

By providing credible DIGITAL verification of a food product's origin, composition, and quality, as well as its production under healthy, sustainable, and "fair" business practices, a new PREMIUM PRODUCT LINE can be established. As the base of health- and eco-conscious consumers expands globally, this solution provides a significant competitive advantage for producers who build upon high-quality ingredients, particularly in export markets.

The presentation will briefly introduce the OnX TRUST / DaTaOnX data authentication blockchain toolkit and its core principles. It will also feature the ChAinOnX product traceability (MDPI) article, authored in cooperation with colleagues from the Institute of Food Science and Technology at MATE We are actively seeking collaborative and pilot project partners for its real-world application in food production processes, for which SAP integration is also feasible.

Beyond authentic "farm-to-fork" traceability, the scientific analysis of the health impacts of food consumption is becoming increasingly important. In the healthcare sector, our MedX TRUST blockchain project is taking shape, which will introduce novel solutions for authentic yet anonymous health data exchange.

As a future function of a food industry data hub—also built on blockchain—it may become feasible to link the food consumption habits of a consenting customer, based on electronic receipt data, with their health records. This could create a comprehensive solution capable of providing scientific and credible answers to many of the currently open questions at the intersection of food and health science.

SESSION: BIOACTIVE COMPOUNDS AND DIGESTION

Registration number: L048

How Does Breast Milk Lipid Efficiently Mediate the Bioavailability of Lutein?

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Abstract: The best way to feed infants aged 0 to 6 months worldwide is exclusive breastfeeding, however, less than 50% of infants are exclusively breastfed. Why do nutrition experts around the world advocate for breastfeeding? This report takes the rich content of lutein in breast milk, especially colostrum, as a starting point to explore the research that our laboratory has done on breast milk lipids in recent years, carefully studying how to effectively promote the bioavailability of lutein in breast milk. The main content includes the structure and composition of lipids in breast milk; the characteristics of lutein and its esters in breast milk; how breast milk lipids promote the micellarization and bioavailability of lutein under specific infant digestion conditions (*in vitro* dynamic infant gastro-intestinal digestion, and juvenile animals), as well as the advantages of breast milk compared to commercially available infant formula. The research results can provide reference for the development and improvement of infant formula and functional delivery food.

Keywords: breast milk lipid, lutein; digestion and absorption, bioavailability, infant formula

Registration number: L049

Vitamin A5: Evidence, Definitions, Gaps, and Future Directions

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Abstract: With the emergence of a new vitamin concept—vitamin A5—it is essential to first clarify the basic definition of vitamins, particularly vitamin A. This article summarizes the foundational concepts and definitions of vitamins with particular relevance to the discovery, establishment, and categorization of new vitamin concepts. Vitamin A5 was discovered 80 years after the last vitamin was identified. It serves as an umbrella term for the dietary precursors 9-*cis*-β,β-carotene and 9-*cis*-13,14-dihydroretinol for the endogenous activator of the nuclear hormone receptor RXR, 9-*cis*-13,14-dihydroretinoic acid. However, several questions arise: Which criteria are typically used to identify a substance as a vitamin? How does vitamin A5 fit into the sometimes misleading definition of vitamin A? This review summarizes key findings and provides a comprehensive assessment of the current understanding, concluding that (a) vitamin A5 is a newly identified micronutrient that plays an important role in the prevention of diet-related diseases and (b) vitamin A5 is an important micronutrient that provides a plausible, mechanistic explanation for why a Western lifestyle diet low in vegetables and especially leafy vegetables can lead to a high prevalence of Western-lifestyle diseases, particularly neurological diseases and poor mental health.

Keywords: mental health, neurodegenerative diseases, healthy diet, leafy vegetables

Registration number: L050

Impact of the Consumption of Spirulina Produced in the Lake Chad Regions (Lake and Kanem) on the Vitamin A Status of "Mother-newborn" Couples: Chadian Approach to a Traditional Food *"Dihé"*

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Abstract: BACKGROUND: Vitamin A deficiency (VAD) is a real public health problem in Chad and in the Sahel countries. Indeed, VAD (Vitamin A<0.7 µmol/L) constitutes one of the main endemic causes of high morbidity and mortality following various attacks and infections, particularly in pregnant women, newborns and children. In other words, the early stages of life play a crucial role in shaping the determinants of health and disease. Understanding how nutritional interventions, such as spirulina consumption, affect newborns can provide valuable insights into improving their nutritional status and long-term health outcomes. However, spirulina *(Spirulina platensis)*, a natural source of β-carotene, is traditionally prepared under the name *"Dihé"* around the Lake Chad region. The main objective of this study is to evaluate the impact of spirulina consumption on the biological parameters of vitamin A (retinol) status in a cohort of "mother/newborn" couples. **METHODOLOGY:** This study funded by the Nestle Foundation was conducted at the Gozator hospital in Ndjamena (Chad) among pregnant women consuming spirulina(n=34) versus those who do not consume it (n=34) and follows them through to delivery in order to assess the impact of spirulina consumption on maternal and newborn nutritional outcomes. Vitamin A status is assessed by the HPLC method in maternal and umbilical cord blood. Plasma concentrations of RBP, TTR, albumin, orosomucoid proteins and CRP are measured by the VISTA Dimension System. Maternal characteristics of spirulina consumers (SP+, n=34) versus those who do not consume it (SP-, n=34) and the characteristics of babies born from women who consume spirulina (SP+, n=34) versus those who do not consume it (SP-, n=34) are also determined in this study. **RESULTS:** Serum retinol concentrations were significantly higher in pregnant women consuming spirulina (SPI+) (0.90±0.17µmol/l) versus those who did not consume it (SPI-) (0.67±0.16) (P= 0.006). Serum concentrations of retinol taken from the umbilical cord were significantly higher in SPI+ babies (0.72±0.15µmol/l) than in SPI- babies (0.54±0.19) (P= 0.047). On the other hand, serum beta-carotene concentrations are very low and statistically similar in SPI+ babies (0.020±0.009µmol/l) as in SPI- babies (0.021±0.003). Statistical differences were observed between the groups (SP+ # SP-) for BMI, which was significantly lower in the SPI- (P=0.006). This BMI result is perfectly correlated with the values obtained for birth weight in the two groups, which are statistically lower in babies born from (SP-) mothers. **CONCLUSION:** The results confirm that β-carotene in spirulina is an effective positive modulator of blood retinol status. "Dihé" (Spirulina) is a potential natural source of highly convertible β-carotene to

achieve good vitamin A status in healthy women living near Lake Chad. This study generally made it possible to improve knowledge on the potential beneficial effect of the consumption of "Dihé" in pregnant women and indirectly in newborns, in terms of vitamin A, an essential element for good fetal-maternal health.

Keywords: vitamin A deficiency (VAD), spirulina, mother-newborn couple, Chad

Acknowledgements: This research project was supported through funding from the Nestle Foundation.

Registration number: L051

From the Ocean to Health: Unveiling Jellyfish Man-of-War (*Physalia physalis*) Bioactive Components

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Abstract: The search for sustainable sources of bioactive compounds is a critical challenge for biomedical innovation and for addressing pressing health concerns, including the urgent global fight against antimicrobial resistance, recognized by WHO. Collagen as well as antioxidant and anti-inflammatory agents such as polyphenols are in high demand for their established benefits in human health. Marine organisms, particularly cnidarians, remain underexploited despite their remarkable biochemical diversity. *Physalia physalis* emerges as a largely unexplored marine bioresource, offering promising opportunities as a source of bioactive constituents with potential relevance across diverse biomedical applications. In this context, we have extracted pepsin-soluble collagen (PSC) from *P. physalis* pneumatophore and analyzed collagen by yield determination, whiteness index, SDS-PAGE, FTIR, and amino acid profiling. The PSC yield reached 32.2% (dry weight), with a whiteness index of 94.6%. Electrophoretic and spectroscopic analyses confirmed type I collagen with intact triple-helical conformation. Amino acid composition showed glycine (33%) as the predominant residue, alongside alanine, proline, and hydroxyproline, reflecting the structural and thermal stability of fibrillar collagens.
The phenolic composition of *P. physalis* was investigated by HPLC-HRMS leading to the identification of gallic acid, 4-hydroxybenzoic acid, chlorogenic acid, *p*-coumaric acid, epicatechin gallate, and ferulic acid. These polyphenols are known for their antioxidant and anti-inflammatory properties, further supporting the nutritional and health relevance of this species. Preliminary studies are also being conducted on nematocysts-derived fractions, which represent mixtures of toxin-associated compounds, indicating promising antibacterial potential and reinforcing the multifaceted biomedical interest of *P. physalis*. Altogether, these findings identify *P. physalis* as a multifunctional marine bioresource: an alternative collagen source, a reservoir of polyphenols, and a candidate for further investigation of its antibacterial activity.

Keywords: *Physalia physalis*, collagen, amino acids, polyphenols, marine bioresources

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Registration number: L052

Simultaneous Determination of Macronutrient Digestibility of Two Model Foods: Introduction of an Integrated Preparation Method Harmonized with the INFOGEST Protocol

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Abstract: There have been attempts for standardisation of INFOGEST-linked analytical protocols in order to provide more comprehensive data on nutrient digestibility. Centred around the commonly shared aspects of these methodologies, an integrated sample preparation method – based on the selective isolation of the Bligh and Dyer extraction – has been proposed, tested for several analytes on four matrices (blank digesta (water, protein-free biscuit), canned chickpeas, wholewheat cereal) using various analytical techniques and established to determine endpoint digestibility and kinetics of nutrient release of the two food matrices. Mechanistic considerations for determination of bioaccessible protein and carbohydrate content were evaluated using HPLC-SEC and HPLC-RID, respectively and data showed appropriate separation of the bioaccessible analytes. The results of the recovery experiments (70-120% yield for all bioaccessible analytes) have provided a valid ground for the use of the selective isolation. Canned chickpeas showed high protein (91-93%), and medium carbohydrate (35-47%) and lipid digestibility (48%), and wholewheat cereal showed high protein (83-107%) and carbohydrate (70-89%), and medium lipid digestibility (57-61%). Moreover, results showed that digestibility of cysteine and tryptophan are largely dependent on the food matrix however other amino acids show similar release which could be modelled by the release of leucine. Fatty acid (FA) specific results showed that despite the difference in the gastric release of saturated and unsaturated FAs overall release is not influenced by this effect.

Keywords: INFOGEST, macronutrients, analytical method development, Bligh and Dye method, Folch extraction, bioaccessibility, macronutrient release, interplay of nutrient digestion

Registration number: L053

Hemp Flour Enriched Bread: Effect on Metabolomic and Technological Profile Following *In vitro* Digestion

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Abstract: Hemp flour (HF) represents a promising functional ingredient for enhancing the nutritional quality of bread due to its content of bioactive compounds, particularly phenolics. The present study investigates the effects of HF enrichment at 0%, 10%, 15% and 25% on bread, with a particular focus on metabolomic changes and the bioaccessibility of polyphenols, alongside technological properties. Key technological parameters, including color, moisture, water activity, and texture were influenced by HF addition. Texture Profile Analysis (TPA) though double-cycle compression test revealed that higher HF levels, especially 25%, disrupted the gluten network through fiber–protein interactions, resulting in a denser, firmer crumb with reduced cohesiveness and adhesiveness. Increased fiber content also contributed to greater water retention, thereby reducing both moisture content and water activity.

Additionally, metabolomic fingerprinting of both cooked and digested HF-enriched breads was performed using ultra-high-performance liquid chromatography coupled with high-resolution mass spectrometry (UHPLC-HRMS). Untargeted profiling of free and bound phenolic fractions revealed a clear separation from the wheat control in hierarchical clustering analysis (HCA) and principal component analysis (PCA), particularly in the free phenolic fraction. Bread enriched with 25% HF showed a characteristic metabolomic profile in the free polyphenolic fraction compared to other levels, with flavonoids being the most up accumulated class. In contrast, the bound fraction exhibited fewer differentially accumulated metabolites (DAMs) and remained relatively stable across enrichment levels. Additionally, *in vitro* static digestion (INFOGEST protocol) revealed a marked reduction in detectable polyphenolic compounds post-digestion, suggesting limited bioaccessibility likely due to fiber–polyphenol interactions. Overall, HF enrichment at 10–15% offered the most favorable balance between improved nutritional value and acceptable technological performance, supporting its use in functional bakery applications.

Keywords: hemp flour, UHPLC/HRMS, *in vitro* digestion, bioaccessibility, technological properties

Acknowledgements: The research was supported by Doctoral School of the Agro- Food System (Università Cattolica del Sacro Cuore, Piacenza, Italy)

SESSION: WASTE MANAGEMENT AND SUSTAINABILITY

Registration number: L054

Upcycling of Apple Pomace in Gluten-Free Bakery Products: A Sustainable Approach to Food Industry By-products

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Apple pomace (AP) is a major by-product of apple juice production. One of the established industrial valorisations of apple pomace is using a source for pectin extraction. However, AP is also rich in polyphenols which constituents have been linked to beneficial antidiabetic properties via inhibiting starch digestion when incorporated into food products through mechanisms including inhibition of carbohydrate-digesting enzymes. In this research, we explored various options for the versatile valorisation of dried apple pomace from industrial apple juice production (consisting of mixed varieties) collected in the fall of 2024. We modelled typical pectin extraction and polyphenol extraction processes in a pilot scale in a laboratory setting. Using these adopted protocols, 7 different formulations were created from apple pomace. These were used in gluten-free bakery products, which were prepared in modified atmosphere packaging for longer shelf life. The shelf life of the prepared gluten-free bread rolls was assessed by examining relevant spoilage and pathogenic microbes. The effect of apple pomace preparations on carbohydrate digestion in the bread rolls was also studied, as well as the sensory and textural properties of the developed baked good prototypes. In the presentation, we will give an overview the current results of this research.

Keywords: apple pomace valorisation, sustainable food systems, gluten-free bread

Acknowledgements: This work was supported by the Flagship Research Groups Programme of the Hungarian University of Agriculture and Life Sciences.

Registration number: L055

Tracking Emerging Contaminants in Water-Soil-Plant System

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Abstract: According to EUROSTAT data, the consumption of environmentally hazardous chemicals over the past 20 years has ranged between 60 and 90 million tonnes annually. Among these chemicals are contaminants of emerging concern (CECs), defined as synthetic or naturally occurring chemicals that are not commonly monitored in the environment but have a known or suspected negative impact on human health and environment. They include various compounds from different chemical classes and mainly used in large quantities in everyday life such as pharmaceutically active compounds (PhACs), personal care products, illicit drugs, hormones, pesticides in current usage, per- and poly-fluoroalkyl substances (PFAS), micro- and nanoplastics, plasticizers, surfactants and many others. CEC reach the environment throughth various pathways. In agriculture key routes include direct pesticides and fertilizers application, irrigation with contaminated water and runoff or erosion from polluted surfaces. Since plants uptake both organic and inorganic substances, the presence of CECs in agricultural soils raises concerns about entry into the food chain. In this study three different types of samples were taken: agricultural soil irrigated with water from Danube-Tisa-Danube canal network for irrigation, water samples in the canal, and sugar beet cultivated on irrigated soil. For extraction of CECs from soil and sugar beet samples we were used QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe) extraction method and for surface water samples we were used solid phase extraction method. A homemade multi-sorbent SPE cartridge consisted of two distinct layers was used for the extraction. The upper layer contained 200 mg of Oasis HLB sorbent, while the lower layer was made up of a mixture consisting of 150 mg of Bond Elut PPL, 100 mg of WAX, and 100 mg of WCX. All samples were analyzed with ultra high performance liquid chromatography with high resolution mass spectroscopy UPLC-HRMS. For the detection, an Exactive Orbitrap mass spectrometer equipped with heated electrospray ionization (HESI) was used. The results were processed using Compound Discoverer software that allows suspected screening, and ability to identify presence of compounds suspected to be present. In surface water sample total number of detected CECs were 19 (5 pesticides, 8 pharmaceuticals, 5 industrial chemicals and 1 personal care product), in soil samples 17 (10 pesticides, 5 industrial chemicals and 2 pharmaceuticals) and in sugar beet only 2 compounds were detected (1 pesticide and 1 pharmaceutical) present in both other type of samples (surface water and soil sample). The obtained results indicate that agricultural soil can represent an important pathway for contaminants of emerging concern to enter the food chain, highlighting the need for further investigations and the development of measures to mitigate their impact on the environment and human health.

Keywords: sugar beet, soil, irrigation water, CECs

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Registration number: L056

The 2024 Report of The Lancet Countdown on Health and Climate Change: Facing Record-Breaking Threats from Delayed Action

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Abstract: The 2024 Lancet Countdown report underscores the worsening health impacts of climate change as the world approaches the 1.5°C warming threshold, with record-breaking heatwaves and extreme weather events driving up mortality rates, especially among vulnerable groups. Recent years have witnessed dramatic rises in heat-related deaths, as well as an increase in respiratory and cardiovascular diseases tied to air pollution. Meanwhile, extreme weather, including floods, droughts, and wildfires, is exacerbating food and water insecurity, increasing malnutrition rates, and enabling the spread of infectious diseases. The economic toll is staggering, with climate-driven losses costing hundreds of billions each year, primarily impacting low Human Development index (HDI) countries that often lack insurance to cover these damages. Greenhouse gas emissions continue to rise, with fossil fuel production and consumption reaching new heights. Alarmingly, while renewables are gradually being integrated, the pace falls far short of meeting climate goals. Funding for adaptation measures, critical for safeguarding health, remains inadequate and lags behind what is necessary to address the rising health threats effectively. Despite these challenges, there are positive developments. Nations are increasingly incorporating climate resilience into their healthcare systems and implementing health-focused adaptation policies. Some governments and organizations are pivoting toward cleaner energy and sustainable agriculture, showing that the shift toward climate resilience is underway, albeit too slowly to meet urgent needs. The report calls for greater global cooperation and financial investment in sustainable infrastructure, public health systems, and renewable energy to address climate-related health inequities. Prioritizing these initiatives is essential for building resilience, reducing economic strain, and ultimately protecting the health and well-being of communities worldwide as climate impacts escalate.

Keywords: climate change, public health, global warming, food security, net zero

Registration number: L057

Valorization of Beekeeping Industry By-products for Optimizing Culture Media in Edible Mushroom Production

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Abstract: The valorization of by-products from the beekeeping industry for optimizing culture media in edible mushroom production aims to develop innovative mycelium cultivation techniques for *Agaricus bisporus*, *A. bisporus* var. Portobello, and *Pleurotus ostreatus*. This study explores the integration of slumgum, a by-product of the beeswax-rendering process, is a nutrient-rich organic waste into culture media formulations. The primary objective was to optimize the nutritional composition of the growth media based on varying concentrations of these by-products, in order to enhance production efficiency, reduce costs, and support circular economy principles by revalorizing organic waste. Several culture media formulations were evaluated to determine their effects on mycelial growth and to identify the most effective nutritional combinations. Physicochemical parameters of solid and liquid slumgum were analyzed, incuding pH, moisture content, electrical conductivity (EC), total organic carbon (TOC), and elemental composition. The by-products were then utilized in two types of culture media - Mushroom Complete Medium (MCM) and Potato Dextrose Broth (PDB) - to support the growth of the selected fungal species. The concentration of the tested liquid slumgum ranged from 5% to 50%, replacing standard MCM/PDB media partially. In granular substrate- based cultivation, the addition of slumgum powder (10–20 g/kg) was also evaluated for its effect on fungal growth on wheat grains. Based on our findings, after a 14-day incubation period, the mycelial diameter of *P. ostreatus* on MCM medium without slumgum was 37.8 ± 2.0 mm, whereas on medium supplemented with 40% slumgum extract, it reached 67.2 ± 1.5 mm. On PDA medium, the diameter was 31.2 ± 1.5 mm, and increased to 73.6 ± 1.5 mm with 40% liquid slumgum, respectively. Notably, the growth of *A. bisporus* was not inhibited by the presence of liquid slumgum, indicating its potential for use at concentrations up to 40–50%. These results demonstrate the potential of apicultural by-products as sustainable, low-cost components in mushroom culture media, contributing to waste reduction and sustainable bioproduction systems.

Keywords: slumgum, beekeeping, mycelium, sustainable

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Registration number: L058

Extraction of Bioactive Compounds from Wild Berries Waste with Supercritical Carbon Dioxide Using a Pilot Scale Extractor

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Abstract: Fruit berries contain high amounts and variety of valuable bioactive substances (e.g. vitamins, antioxidants, fats). Despite most part of these phytochemicals are extracted during juicing process, a high amount of them remain in the by-products (pomace), and will be exploited in low efficacy. Their recovery could significantly contribute to economic efficacious and sustainable food processing. Supercritical fluid extraction (SFE) with carbon dioxide (CO_2) as a solvent is an effective method for extracting, mainly apolar compounds (e.g. seed oil), but in combination with other solvents such as ethanol, it is also suitable to recover water soluble compounds (e.g. anthocyanins) too. In our study, supercritical fluid extraction using pure carbon dioxide and ethanol as cosolvent was investigated to process two pressing residues (rosehips, blackcurrants). The extraction parameters (pressure, temperature, operation time) as well as the particle size distributions of crushed plant materials were also focused. The choose extraction parameters were p=32 MPa, and T=55 °C respectively. The rosehip waste extracts were investigated (density, refractive index, fatty acid composition, colour parameter), as well as the particle size distribution of the extraction residues. The measured values of the refractive index (n=1.4766) was close to the domain given by literature (n=1.478-1.4796), but the density (ρ=861.4 kg·m^{-3}) was lower (ρ=913.4-928.4 kg·m^{-3}), however the CIELAB colour parameters (L=96.79 a*=-14.23, b*=77.43), with colour distance of ΔE^*_{ab}.=2.1. This result was given probably by different water content of the cold presses and supercritical extracted oils. The main components of extract were linolenic ($C_{18:2}$) and linoleic ($C_{18:3}$) acids, approximately in equal ratio. The product yield was Y= 109g oil/kg seed, about 30% lower, than other reported results (153 g/kg). It was due to particle size of the residue was d_{av}=750 µm. The blackcurrant pomace was extracted using ethanol as co-solvent. The anthocyanins extraction from peel was not succeeded, probably due to high amount of oil content in the seed. To overcome this issue, sequential extraction method was proposed with firstly using pure CO_2 to extract the seed oil and then using ethanol as co-solvent for polar anthocyanins extraction. Our results are preliminary but provide very good base for development of technology to process wastes in fruit processing.

Keywords: supercritical fluid extraction, rosehip, blackcurrant, seed oils, anthocyanins

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Registration number: L059

Valorization of Carrot Peel Using Microwave- and Ultrasound-assisted Extraction

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Abstract: Food waste is a growing problem, and in many cases the discarded part could be used, even for food purposes. The polyphenols, antioxidants, and carotenoids found in carrots play an important role in maintaining health. Polyphenols have strong anti-inflammatory and cell-protective effects, helping to prevent chronic diseases such as cardiovascular problems.
Antioxidants – such as vitamin C – neutralize harmful free radicals, thereby slowing down the aging process and reducing the risk of cancer. Carotenoids, especially beta-carotene, are converted into vitamin A in the body, which is essential for good vision, proper immune function, and healthy skin. These compounds are already present in the carrot peel and in the flesh removed during peeling, so by extracting them, they can be used as ingredients in functional foods.
In this research, we dealt with carrot peel. The aim was to develop an energy-efficient process that could be applied in industry, so we worked with wet raw material instead of dried material. After washing, the carrots were peeled, and the skin was ground. Ethanol-water mixture was used as solvent. The solid solvent ratio was set to 1:40, including the moisture content of the sample.
Two series of experiments were carried out, one to optimize microwave-assisted extraction (MAE) and the other to optimize ultrasound-assisted extraction (UAE).
Three factors were varied for each of the two measurements. For MAE, the microwave power (100-450-800 W), the extraction time (4-8-12 min), and the ethanol concentration (10-35-60 V/V%) were varied. For UAE, we fixed the ethanol concentration at 10 V/V% and varied the power (180 W; 300W), the frequency (20 kHz; 40 kHz), and the time (4-8-12 min).
Total polyphenol content in the extracts was measured by Folin-Ciocalteu method, antioxidant capacity by FRAP method and carotenoid ratio of the samples relative to each other by colorimetry.
The polyphenol content, antioxidant capacity, and color components of the extracts will be compared using statistical methods to determine which extraction technique yields higher amounts of these compounds.

Keywords: carrot peel, extraction, microwave, ultrasound, ethanol

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Registration number: L060

Agroforestry and Nutrition: A Systematic Review Exploring Interconnections Between Agroforestry and Food Systems

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Abstract: Agroforestry is becoming more and more recognised for its role in developing sustainable food systems and mitigating climate change, although its direct contributions to human nutrition and welfare are still underexplored. This study provides a structured review of 112 peer-reviewed articles published between 2014 and 2024 that examine the relationship between agroforestry methods and nutrition-related linkages. This study found that, despite increased global interest in ecological approaches to food security, only three studies have directly investigated the influence of agroforestry on nutritional values of the products, which leads directly to sustainable food systems. Agro-ecology, silvopastoral systems, carbon sequestration, and macadamia nut trees were among the key thematic groupings. However, the literature reveals continuing challenges, such as a lack of multidisciplinary research linking tree-based systems to nutrient consumption and sustainable food systems, as well as geographic underrepresentation of Europe and the Western Balkans. Furthermore, systemic difficulties such as inadequate technical knowledge, especially among indigenous people who practice only traditional agroforestry without knowing the nutritional values of the products and environmental impact, weak educational frameworks, and low public awareness continue to hinder widespread implementation. This study suggests that future research should (1) increase empirical data on agroforestry-nutrition links, (2) expand studies in underrepresented locations, and (3) examine solutions that address knowledge, education, and policy gaps. This allows for a more effective integration of agroforestry into nutrition-sensitive and climate-resilient sustainable food systems.

Keywords: agroforestry, nutrition, food systems, sustainable food system

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Registration number: L061

Valorization of Low-Quality Tunisian Dates for Syrup Production and Carbon Nanodot Synthesis

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Abstract: Sugar is one of the most important agricultural products traded internationally. It provides considerable revenue and contributes to food security and nutrition. The sugar industry in Tunisia has no local sources, it is obtained fully from imports, which cost the republic millions of dollars per year. In addition, the Tunisian palm groves generate large quantities of dates of low quality, and thanks to various biotechnological processes, they open the way to the recovery and creation of products of high added value.
This study examines the valorization of low-quality Tunisian dates through the production of syrups and the synthesis of carbon nanodots (CNDs). Syrups extracted from three different date varieties (Deglet Nour, Kentichi, and Allig) exhibited distinct physicochemical and biochemical characteristics. Allig syrup showed strong antioxidant properties and a high sugar content, Kentichi syrup was rich in minerals and sucrose, while Deglet Nour syrup displayed favorable properties for industrial processing and storage.
Simultaneously, initial research on the production of CNDs from Kentichi date powder, utilizing pyrolysis at varying temperatures (180 °C, 220 °C, and 260 °C), yielded promising results. The resulting nanodots were characterized based on their fluorescence properties and organic structure through HPLC and FTIR analysis.
These findings underscore the dual potential of date-based products as natural sweeteners and functional nanomaterials, offering a sustainable pathway for agro-industrial development.

Keywords: dates, date syrup, carbon nanodots, HPLC

SESSION: NUTRITION AND HEALTH

Registration number: L062

The Relationship Between Health and the Fatty Acid Composition of Breast Milk

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Abstract: Introduction: Human milk is widely considered as the best nutritional source for infants, providing necessary nutrients, bioactive substances, and immunological components while also protecting the health of both the baby and the mother. Mature breast milk contains approximately 87-88% water, 7% (6.9%--7.2%) carbohydrate calculated as lactose, 4% (3%--5%) fat, 1% (0.8%--0.9%) protein, as well as numerous other bioactive compounds. The possible health benefits of fatty acids have attracted a lot of attention in recent decades. In addition to providing energy, breast milk fat performs structural and regulatory roles. Furthermore, fatty acids have anti-diabetic, anti-carcinogenic, immune-boosting, and central nervous system development properties. **Aim:** The purpose of our study was to examine the effects of various breastfeeding periods, delivery methods, newborn sex, and Holder pasteurization on the fatty acid content of breast milk. **Materials and Methods:** Breast milk samples were from University of Pécs, Hungary. The mothers were all healthy and of normal weight. Fatty acid profile was analyzed by GC-FID. The data were evaluated by statistical analysis using Statistical Package for Social Sciences software. **Results:** We have found significant differences in fatty acid composition of breast milk regarding different mode of delivery. In comparison to the vaginal delivery group, the breast milk from the caesarean section group had a lower omega-3 level and a greater omega-6 content. The PCA demonstrated that the fatty acid profile of breast milk samples from newborns of various sexes may be used to differentiate them. Certain fatty acid levels were changed by holder pasteurization, which must be considered while creating treatment procedures

Keywords: fatty acids, mother milk, gas chromatography

Ethical Committee Approval: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Regional and Local Research Ethics Committee of the University of Pécs, Pécs, Hungary (PTE KK 7072-2018).

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Registration number: L063

Role of Proteins in Clinical Nutrition

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Abstract: Clinical nutrition is a valuable tool for improving the nutritional status of patients with or at risk of malnutrition. Proteins are not stored in the human body, therefore, optimal quality and quantity of proteins in clinical nutritional products are of key importance for a successful clinical nutritional therapy. According to the recent trend in food industry and customer behaviour, plant-originated and even insect-derived proteins are seen as alternative protein sources to the traditionally used animal proteins. However, amino acid profiles and thus, biological values of these protein sources are different from the widely used milk-derived proteins and may have a negative influence on the success of the clinical nutritional therapy. Moreover, production and safety regulations are not yet completely developed for the use of alternative protein sources.

Keywords: malnutrition, patients, clinical nutrition, alternative protein sources, safety

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Effect of Surfactant-Mediated Solubility Enhancements on the In vitro Digestibility of Plant Protein Isolates/Concentrates

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Abstract: Protein isolates (PIs) and concentrates (PCs) are increasingly gaining usage in sports & clinical nutrition, infant foods among other applications due to their pro-sustainability properties. However, their low solubility limits their functionality and digestibility. While enzymatic, chemical and physical methods have been employed for the improvement of solubility, their impact on digestibility remains underexplored. This study investigates how surfactant-mediated solubility improvements affect the proteolytic accessibility of plant proteins derived from fava bean, pea and rice. Four surfactants, polyoxyethylene sorbitan 20 (PS20), quillaia, lecithin and stevioside, were tested at concentrations between 0.01 - 0.2% (m/m) to PI/PC dispersions. Measurements included solubility which was quantified by both Dumas nitrogen content analysis and dry matter content-based method. *In vitro* protein digestibility (IVPD) was assessed using the Infogest protocol 2.0; amino acids release patterns were determined by HPLC analysis; and protein fragmentation, both pre- and post-digestion were examined by SDS-PAGE. Our results show a universal increase in solubility with all surfactants, even at the lowest concentrations. The natural surfactants (lecithin, quillaia saponin and stevioside) performed on par with PS20, a synthetic, pharmaceutical-industry standard for protein modification, in enhancing IVPD. With all surfactants, there were concentration-dependent trade-offs, peaking at lower concentrations (0.01% and 0.05%), but regressing at higher doses. However, the amino acid release patterns proved to be surfactant independent. Our study validates that solubility gains corelate with proteolytic accessibility at slightly above critical micelle concentration limits, but higher surfactant loads cause micelles to sterically hinder enzyme access, and thus digestion.

Keywords: protein digestibility, plant protein isolates, *in vitro* digestion, protein solubility

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Registration number: L065

AITC from Cruciferous Foods: Natural Preservation Meets Therapeutic Promise

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Abstract: Aim: Allyl isothiocyanate (AITC) is a bioactive compound primarily derived from cruciferous vegetables such as mustard, horseradish, and wasabi. This compound has gained significant attention due to its diverse biological properties, including antioxidant, anti-inflammatory, antibacterial, and anticancer effects. Its effectiveness as a natural preservative alternative, potential therapeutic applications in managing chronic inflammatory conditions, and ability to induce apoptosis in cancer cells make it a valuable compound in both the food and pharmaceutical industries.
Method: Studies suggest that AITC can reduce pro-inflammatory cytokines and modulate key signaling pathways, which could make it valuable in managing chronic conditions such as arthritis, cardiovascular diseases, and other inflammatory diseases. In terms of its applications in the food industry, AITC serves as a natural alternative to synthetic preservatives. It has shown efficacy against a broad range of pathogens and spoilage microorganisms, positioning it as a valuable tool in food preservation and extending the shelf life of perishable foods.
Results: AITC provides an eco-friendly solution to synthetic preservatives. Furthermore, AITC holds significant potential in cancer prevention and treatment, as studies have shown that it can induce apoptosis and inhibit cell proliferation in various cancer cell lines, making it a promising agent for cancer prevention and treatment.
Conclusion: However, the use of AITC faces several challenges. AITC's volatility is one of the factors that may limit its stability and efficacy in certain formulations, so research is needed to develop methods to stabilize AITC and increase its shelf life without compromising its bioactivity. Additionally, further studies are required to determine the optimal dosages that maximize its therapeutic effects without causing any adverse side effects. Moreover, the use of AITC in commercial products requires regulatory approval from relevant authorities to ensure its safety and efficacy for human use.

Keywords: allyl isothiocyanate, horseradish, antioxidant, food preservation

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Registration number: L066

Overview of Organic Food Consumer Behavior in Hungary – Drivers, Barriers, and Incentives for Purchasing

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Abstract: The Hungarian market for organic food is showing steady growth. The aim of our research was to conduct a survey of Hungarian consumers' behavior in relation to organic products, during which we examined, for example, awareness of the definition of organic food, preferred product groups, distribution channels, factors motivating consumers, barriers and incentives to purchasing, and willingness to pay a price premium.
Consumer behavior regarding organic foods was assessed in 2024 using a combined method, including an online questionnaire survey and an online market research community. The sample of 1,000 respondents was representative of the Hungarian population in terms of settlement type and age; moreover, after weighting, it was also representative of gender and education level. The data was analyzed using the SPSS statistical program, applying descriptive statistics and relationship analysis methods, as well as factor analysis and cluster analysis.
Based on the assessment of consumers' awareness of organic food choices, it can be seen that the majority of respondents correctly identified products produced, inspected, and certified in accordance with the legal requirements of organic farming as organic products. However, some others considered uncertified chemical-free products to be organic. The most frequently purchased products were organic fruits and vegetables, and the most frequently used sales channels were discount stores and hypermarkets. Consumers were primarily motivated to buy organic food by health considerations (e.g., avoiding pesticide residues), naturalness, and sustainability values. The strongest driver of purchase was personal preference, followed by information and promotion from the producer. The main barriers to purchasing organic food were high prices, followed by limited availability and poor accessibility. The most substantial incentives included lower consumer prices and the demand for Hungarian organic products. According to the cluster analysis, it becomes clear that the behavior of consumer groups examined in relation to organic products differs between clusters, with purchasing habits, motivating factors, and obstacles varying by type. While the first cluster was hampered by geographical and supply constraints, the second was influenced by price and sensory characteristics, and the third by a lack of information.
The positive correlation between the frequency of organic food purchases and willingness to pay was a key finding, suggesting that educated, regular buyers were willing to spend more on organic food, so the use of loyalty programs and promotions could significantly increase sales. Segmented marketing communication would be crucial for successful market entry and sales growth, as it addresses each cluster group with targeted messages through various channels and in a suitable format.

Keywords: organic food, consumer behaviour, motivation
Acknowledgements: The research was supported by the MNVH (Hungarian National Rural Network) project, N°VP-20.2.-16-2016-00001

Registration number: L067

Exploring the Gluten-free Lifestyle: Eating Habits and Product Satisfaction

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Abstract: Several factors, including the growing consumer awareness of gluten intolerance, increasing health consciousness, the demand for allergy-free products, the expansion of product availability, and the rise of clean eating and plant-based diets, are driving the growth of the gluten-free food market. As a result, the popularity of the gluten-free diet remains strong worldwide, including in Hungary. It is estimated that approximately 1% of the population suffers from celiac disease, and an additional 2.8–6.6% are affected by non-celiac gluten sensitivity, meaning that several hundred thousand people in Hungary require a gluten-free diet. The market for gluten-free products is further expanded by the increasing number of health-conscious consumers eliminating gluten from their diets.

To effectively meet the needs and expectations of consumers following a gluten-free diet, it is essential to map shopping and consumption habits, as well as assess satisfaction with available products. To this end, the online survey conducted in 2017 was repeated during the period of May–June 2025.

The results are expected to provide valuable insights for manufacturers and retailers, enabling a more accurate understanding of consumer demands. This will help refine product development strategies and create more targeted product offerings. Additionally, the findings may offer useful insights for nutrition professionals, improving the effectiveness of personalized advice and contributing to the expansion of professional discourse, as well as laying the groundwork for future research.

Keywords: gluten free, questionnaire, consumer, food product, food industry

SESSION: CONSUMER SCIENCE

Registration number: L068

Next-Generation Methods in Consumer Research: Integrating Artificial Intelligence and Immersive Technologies

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Abstract: Artificial intelligence (AI) and immersive technologies are transforming the fields of consumer and sensory science as well as many other fields. This presentation examines the methodological and analytical implications of next-generation tools that enable a more comprehensive understanding of consumer perception, affect, and behavior. The rapid development of large language models (LLMs) has created new opportunities for automated text analysis and the generation of synthetic consumer responses. These advances enable researchers to create virtual consumers, design novel experimental stimuli, interpret qualitative data more efficiently, model consumer attitudes, and conclude predictive insights from complex datasets. At the same time, by incorporating biometric and behavioral tools - such as eye-tracking and facial expression analysis - the quantification of attention, engagement, and emotional response can be measured in real time. Immersive technologies, such as virtual reality (VR), augmented reality (AR), mixed reality (MR) and augmented virtuality (AV) further enhance experimental control and ecological validity by enabling the simulation of realistic consumption environments and interactive product experiences. The novel use of these methods represents a significant paradigm shift toward multimodal, data-rich, and context- sensitive consumer research. This presentation discusses current applications, methodological challenges, and future directions for integrating novel digital tools and techniques to advance theory and practice in sensory and consumer sciences.

Keywords: digital sensory, ecological validity, LLM, behavior

Registration number: L069

Enhancing Awareness of Ultra-processed Foods Through Immersive Study Methods

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Abstract: Ultra-processed foods (UPFs), as defined by the NOVA food classification system, are industrially formulated products often containing additives, emulsifiers, and artificial ingredients with minimal whole food content. Their growing presence in modern diets has been linked to serious health risks, yet public awareness remains limited. This study adopts an immersive research approach to engage consumers directly and enhance their understanding of UPFs. Using virtual reality (VR) simulations and interactive environments, participants were guided through a scenario in virtual grocery shopping and NOVA-based label interpretation. Data were collected through pre- and post-session questionnaires and in-simulation interactions to evaluate changes in knowledge, perception, and intention to modify food choices. The immersive experience proved to be an effective tool in raising consumer awareness of UPFs, improving comprehension of the NOVA scale, and encouraging more critical food selection behaviors. The findings highlight the potential of immersive technologies as impactful tools in public nutrition education and consumer empowerment.

Keywords: ultra-processed foods (UPFs), NOVA classification, immersive learning, consumer awareness, virtual reality (VR)

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Registration number: L070

Cooking with Codes: Can Public Kitchens Get Smart?

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Abstract: Institutional catering represents a critical intersection of public health policy, social infrastructure, and national economic strategy. In Hungary, approximately one-quarter of the population relies daily on meals provided through public catering services, making it a key focus area from a governmental perspective. Despite the presence of over 14,000 service providers and increasing availability of technological solutions and funding opportunities for equipment acquisition, digital transformation within the sector remains uneven and limited in scope. Core processes such as menu planning and food logistics continue to be highly dependent on human labor, resulting in systemic inefficiencies that manifest in perceived declines in meal quality, human resource attrition, and persistent overproduction of food leading to significant waste. Meanwhile, recent legislative changes strongly encourage the adoption of digital tools. This research provides an overview of the current digital maturity of the sector, focusing on barriers that hinder technological uptake and exploring how emerging sensory evaluation methods—including immersive technologies and artificial intelligence—might be integrated into daily catering workflows. To this end, qualitative interviews were conducted with stakeholders across multiple system levels, such as kitchen managers, municipal actors, and nutrition experts. In parallel, an initial experimental trial involving AI-assisted sponge cake recipe development was launched to assess the feasibility and acceptance of algorithmic co-creation in institutional food preparation.
Building on this, the investigation elucidates the potential of ChatGPT as a generative AI tool for structuring sensory evaluation protocols and forecasting multidimensional sensory attributes in food systems, demonstrating alignment with ISO standards and established sensory science methodologies. Despite its methodological robustness and predictive coherence, the absence of empirical validation highlights critical epistemological limitations, necessitating human oversight and experimental corroboration to ensure reliability and contextual fidelity. Nevertheless, the integration of large language models into sensory analysis paradigms offers a promising avenue for advancing methodological efficiency, scalability, and innovation within contemporary food research and gastronomy.

Keywords: public catering, artifical intelligence, immersive technologies, digital sensory science, large language modell, GPT-4

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Registration number: L072

Consumer Perception of Cultured Meat in Hungary: Attitudes, Risks, and Sustainability Aspects

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Abstract: The global pursuit of environmentally sustainable food systems is prompting the exploration of alternative protein sources. Cultured meat has emerged as a promising innovation in this context, yet consumer acceptance remains uncertain. This study aimed to assess public perceptions of cultured meat in Hungary, with a focus on perceived risks and alignment with sustainable consumption patterns.
A national survey was conducted by the National Food Chain Safety Office (Nébih), using a sample of 1,003 adults selected to reflect the Hungarian population in terms of gender, age group, and region (NUTS-2 level). The data were analysed using statistical tests and cluster analysis via SPSS software to uncover distinct consumer segments based on their attitudes.
Findings showed that 71.43% of respondents were aware of cultured meat, mainly through online platforms. However, the product was generally viewed with scepticism, scoring 1.74 on a five-point scale, compared to traditional chicken (4.53). Key objections included a preference for conventional meat, concerns about naturalness, and support for domestic food production. Three consumer profiles were identified: sceptics (35.29%), traditional meat supporters (24.83%), and open-minded consumers (39.88%). Demographic analysis indicated higher acceptance among younger adults (18–29), urban residents, and men. Although cultured meat is largely rejected by Hungarian consumers, openness among younger urban groups suggests the need for targeted communication in case of future market entry. The findings provide valuable insights to support evidence-based decisions by policymakers and strategic planning by innovative food enterprises aiming to introduce cultured meat or other alternative proteins to the market.

Keywords: cultured meat, consumer perception, sustainable food, cluster analysis

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Digital Short Supply Chain

Zsolt Maróti

LogBord 2010 Kft., Hungary

Registration number: L074

Bonduelle – The Importance of Plant-based Nutrition and Environmental Protection

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Abstract: The Bonduelle Group, founded in northern France in 1853, has grown into one of the world's leading vegetable processing and distribution companies. Operating in several countries, the group focuses on promoting plant-based nutrition and enhancing the sustainability of agricultural and industrial processes. Bonduelle's strategy is guided by the vision of "plant-based nutrition for all," emphasizing environmentally friendly farming methods, short supply chains, and production with low carbon footprint.

Bonduelle Central Europe Kft. has operated in Hungary since 1992 and is now one of the country's most significant vegetable processing companies. Its factories in Békéscsaba, Nagykőrös, and Nyírszőlős play a key role in supplying not only the domestic market but also the wider Central European region. The Hungarian subsidiary works closely with local producers, supporting rural economies and promoting sustainable agricultural practices. In addition, the company places strong emphasis on innovations that improve energy efficiency, reduce water consumption, and minimize waste.

The rise of plant-based diets is not merely a consumer trend but a key factor in creating a more sustainable food system. Reducing meat consumption and adopting more vegetable- and legume-based diets can help lower greenhouse gas emissions, preserve biodiversity, and improve human health. Bonduelle's example clearly demonstrates how corporate innovation, responsible sourcing, and conscious consumer choices can be connected within a global sustainability framework.

POSTERS

Registration number: P002

Stability Assessment of Polyphenol and Flavonoid Content in Fortified Sour Cherry Jams

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Abstract: Fruit-based food products, such as jams, can play a significant role in daily polyphenol and flavonoid intake, thus contributing to a healthy lifestyle. However, the processing methods, added ingredients, and storage duration can significantly influence the stability of these compounds. The aim of this study was to examine how the addition of various functional components – inulin, collagen, and glycine – affects the total polyphenol and flavonoid content of sour cherry jams, both freshly prepared and after 7 months of storage. Four types of jams were prepared for the experiment: a control sample with +10% sugar, and three fortified versions with +10% glycine, +10% inulin, and +10% collagen. The jams were prepared using a paddle-stirred jam cooker, and the enriching agents were added to the sour cherries after 10 minutes of cooking. The sample with 10% added sugar exhibited the highest dry matter content, reaching 67.42%, which was significantly higher than that of the other enriched samples. The sample containing 10% collagen showed the highest initial polyphenol concentration (411.18 mg GAE/100 g FW), although the difference compared to other samples was not statistically significant. After 7 months of storage, the collagen-enriched jam retained the most polyphenols, with a value of 227.99 mg GAE/100 g FW. Regarding flavonoid content, the most significant increase was observed in the jam with 10% inulin, reaching over 103 mg CE/100 g FW. After 7 months of storage, the inulin-fortified jam also maintained the highest flavonoid concentration (38.81 mg CE/100 g FW). These results suggest that inulin is the most effective additive for preserving flavonoid content, both in freshly prepared and stored products.In conclusion, storage conditions significantly affect the stability of polyphenol and flavonoid levels in all cases. Collagen proved to be particularly effective in preserving polyphenols over a longer period, while inulin showed outstanding performance in maintaining flavonoid levels. Our findings highlight the importance of choosing the appropriate additive, as it can greatly influence the long-term stability of these bioactive compounds. Further investigation into the polyphenol profile would be valuable to better understand the specific compounds affected by each additive.

Keywords: jams, polyphenol, flavonoid, collagen, inulin

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Registration number: P003

Determination of Sulfur-containing Amino Acid Content in Fattened Goose Livers Affected and Non-affected by Greening

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Abstract: The production of fattened goose liver - foie gras how it is called in French - has a long tradition, dating back hundreds of years. It has always been considered a premium product, and even today it is featured prominently on the cartes of fine dining restaurant. As the selling price of the product is extremely high it is important to investigate all factors and phenomena that may affect the quality.
In order to increase the shelf life, the livers are vacuum-packed and stored frozen. However it is a common problem that green spots appear on the surface of the products. It is hypothesized that the sulfation of hemoglobin of residual blood in the livers can be associated with the discoloration. Obviously, sulfur is required for the sulfation process, however its origin is uncleared. It is also assumed that it may derive from sulfur-containing amino acids (methionine, cysteine). The aim of this study was to determine whether there is a difference regarding the sulfur-containing amino acid content between the livers affected and non-affected by greening. A total of 20 livers (10 – affected by greening, 10 – non-affected by greening) were used to conduct the experiment. Samples were homogenized with SIRMAN C4 industrial cutter at 2.500 rpm for 5 minutes. Soxhlet extraction was applied to remove the lipids. The proteins from defatted samples were hydrolyzed. 40 mg of each liver was weighed into 12 cm^3 hydrolyzing tubes and 10 cm^3 of hydrochloric acid (molarity: 6M) was added. The hydrolysis was executed in a DTK200 dry block thermostat at 110 ºC for 24 hours. The pH of samples was neutralized with sodium hydroxide (molarity: 4M). Samples were transfused into 25 cm^3 flasks and filled with distilled water. Filtration was done in two steps. Whatman prepleated paper filter (diameter: 110 mm) was used in the first round then syringe filter (pore size: 0,2 µm) was utilized. Finally, samples were diluted with lithium citrate buffer solution (pH=2.2). Determination was executed using Ingos AAA 400 amino acid analyzer. Lithium citrate buffer solution (pH=2.2) was used, the flowrate was 0.3 cm^3/minute. OSTION LG ANB column was applied (200x3.7 mm) and the temperature was between 45 and 65 ºC. The temperature of the reactor was 121 ºC. The postcolumn derivatization was done with ninhydrin reagent. The detector was a double tunnel photometer (440-570 nm). The detection limit was 0,5 µmol/dm^3. The methionine content was 2.78% in livers affected by greening and 2.95% in livers non-affected by greening. The cysteine content was 1.21% in livers affected by greening and 1.00% in livers non-affected by greening. Significant difference was not found (methionine: P= 0.234, cysteine: P=0.212) in neither cases.
Based on the results, it can be stated that the origin of sulfur required to the occurence of the undesired surface discoloration is not to be found in the sulfur-containing amino acid content.

Keywords: fattened goose liver, amino acid content, surface discoloration, greening, sulfur

Registration number: P004

Regulation of Glucosinolates Biosynthesis in Brassica juncea via Targeted Foliar Inputs

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Abstract: *Brassica juncea* (L.) Czern is a leafy mustard increasingly valued for its culinary appeal and the presence of health-promoting bioactive compounds. Among these, glucosinolates are key secondary metabolites known for their potential anticancer, anti-inflammatory, and detoxifying properties. Biofortification through the application of foliar fertilizers offers a promising strategy to enhance the nutritional quality of edible plants by increasing the content of targeted phytochemicals. Therefore, the aim of this study was to evaluate the impact of foliar biofortification using iron-dominant and potassium-dominant conventional fertilizers, as well as a seaweed *Ecklonia maxima* (Osbeck) Papenfuss based biostimulant (*Kelpak*), on the glucosinolates composition of *B. juncea* cv. Frizzy Joe leaves. The plants were cultivated under greenhouse conditions, and following harvest, leaf samples were extracted with 80% methanol. Glucosinolates were identified and relatively quantified (%) using UHPLC-QToF-MS analysis. A total of five glucosinolates were identified, including both aliphatic and indole types, with notable differences in their presence and abundance across treatments. Across all groups, the dominant glucosinolate was sinigrin, representing the most abundant compound in the overall glucosinolates profile. The potassium-dominant fertilizer promoted the accumulation of key aliphatic glucosinolates such as sinigrin, while also supporting N-butyl glucosinolate and glucobrassicin. The iron-dominant treatment, similarly, enhanced glucosinolates content, favoring sinigrin. In contrast, the biostimulant led to a distinct glucosinolate pattern characterized by a reduced overall relative content, but with a pronounced induction of specific indole compound - neoglucobrassicin, which was absent in other treatments and the control. Certain glucosinolates, such as gluconapin, were detected exclusively in the control and iron-treated plants, suggesting that foliar biofortification may selectively influence the biosynthesis of individual glucosinolates rather than uniformly increasing total levels. These results highlight the potential of targeted foliar applications to modulate the phytochemical composition of mustard leaves, offering tailored strategies to enhance specific functional compounds.

Keywords: *Brassica juncea*, foliar treatment, glucosinolates, UHPLC-QToF-MS

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Registration number: P005

Green Synthesis of Silver Nanoparticles and Their Antibacterial Activity Against Udder Pathogens

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Abstract: The global spread of multi-drug resistant microorganisms caused the researchers to focus on nanotechnology-based approaches to use the benefits of nanomaterials to combat antimicrobial resistance. The study presents a novel process for synthesizing silver nanoparticles using dry lavender leaves (Lav-AgNPs) as both a reducing agent and stabilizer, and evaluates their inhibitory effect on udder pathogens of dairy cows. Using green synthesis, silver nanoparticles were obtained from the mixing of silver nitrate solution with reducing substances extracted from levander leaves in five different concentrations: 50 µg/l, 100 µg/l, 150 µg/l and 200 µg/l. Pure silver nanoparticles (Ag) were used as a control group at the same concentrations as Lav-AgNPs and penicillin (PEN) at a concentration of 10 µg/ml. Pathogens resistant to β-lactam antibiotics that were isolated from mastitis cows (*Staphylococcus aureus* and *Streptococcus uberis*) were tested for inhibitory activity by the disk diffusion method. Analysis of the obtained results shows that Lav-AgNPs at concentrations of 150 µg/l and 200 µg/l had an effect on the inhibition zone for resistant *Staphylococcus aureus* (9-13 mm) as well as for *Streptococcus uberis* (12-14 mm). For penicillin, the inhibition zone was 5 mm for both pathogens. In conclusion, green synthesis provides an anti-bacterial product that represents an alternative to antibiotic substances.

Keywords: nanoparticles, cows, mastitis, bacteria, resistance

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Mastitis in Dairy Cows and Its Impact on Reproductive Parameters

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Abstract: The aim of the work was to evaluate the incidence and etiology of mastitis and its impact on reproductive parameters of dairy cows. We included 112 dairy cows that were 10 days after calving with a history of intramammary infection in the previous lactation in the study. These were mainly dairy cows that had a positive California mastitis test (CMT) and an increased somatic cell count (PSB) value in the last three months before drying off. The dairy cows underwent mammary gland examination with subsequent CMT and microbiological examination of milk samples with positive results in 50 dairy cows (43%) with a subclinical form in 25 dairy cows and a clinical form in 25 dairy cows. In the subclinical form of mastitis, mainly *Aerococcus viridans*, *Staphylococcus xylosus*, *Staphylococcus aureus*, *Staphylococcus chromogenes* and *Staphylococcus warneri* were identified. In the clinical form, *Staphylococcus aureus*, *Staphylococcus chromogenes*, *Aerocosus viridans*, *Staphylococcus xylosus* and *Escherichia coli* were identified. Of the reproductive parameters monitored, 26 dairy cows (23%) had unsatisfactory values for the length of the insemination interval, 46 dairy cows (41%) for the insemination index value, 13 dairy cows (12%) for the length of the service period, 12 dairy cows (11%) for the length of the intercalation period and 26 dairy cows (23%) for the lactation period. Compared to optimal values of reproductive parameters, the results showed unsatisfactory reproductive values in dairy cows, especially with clinical mastitis.

Keywords: etiology, mastitis, mammary gland, lactation, reproduction

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Impact of Secondary Packaging on Temperature Stability of Vacuum-packed Meat

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Abstract: Ensuring the maintenance of cold chain conditions is crucial for preserving the quality and safety of vacuum-packed meat throughout the stages of retail storage and delivery to homes. This study examines the impact of various secondary packaging types, including paper, recycled PET, and polyethene bags, on temperature fluctuations in vacuum-packed chicken breast fillets and beef round cuts under varying refrigeration conditions.
Temperature fluctuations across multiple packaging levels are meticulously documented, enabling an evaluation of both warming and cooling rates. The objective of this research is to analyse how different packaging materials may influence the thermal environment surrounding the product, thereby enhancing the comprehension of packaging efficacy during distribution. The findings hold the potential to provide practical insights for food retailers and delivery services aimed at optimising packaging strategies and enhancing product stability throughout the supply chain.

Keywords: secondary packaging, temperature fluctuation, vacuum-packed meat

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Comparison of Rapid Cultivation Tests to Detection Mastitis in Dairy Cows

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Abstract: It is becoming increasingly desirable to be able to detect and identify the cause of mastitis directly at the farm when choosing the correct treatment protocol. The goal has lately been to introduce tests as effective and precise as the standard laboratory cultivation. Such tests can be performed directly at the farm by a trained person, saving time regarding sample evaluation and transportation. This study aimed to assess and compare two rapid cultivation methods for detecting udder pathogens: MicroMast rapid plates and the ClearMilk Test. These methods are laboratory-based techniques used on farms to detect both Gram-positive (such as staphylococci and streptococci) and Gram-negative bacteria. The study was conducted on 320 cows from two dairy farms in eastern Slovakia. A total of 144 milk samples from cows with a California mastitis test score of 1-3 were taken and analyzed using both rapid tests in the lab. The results showed that the MicroMast test identified 84.7% of positive samples, while the ClearMilk test identified 93.1%. After testing the bacteria, both methods found *Staphylococcus* spp. (*S. aureus* and *S. chromogenes*) and *Streptococcus* spp. (*Str. bovis*) as the main pathogens. Overall, both tests are similar and could be useful for quickly detecting udder infections on farms.

Keywords: cows, mastitis, bacteria, cultivation, identification

Acknowledgements: This work was supported by Visegrad Grant No. 22420065: Non-antibiotic approaches to control mastitis in dairy cows. The project is co-financed by the governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from the International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe. This work was also supported by the Research and Development Support Agency based on Contract no. APVV SK-PL-23-0066, APVV SK-HU-24-0022 and project VEGA 1-0162-23.

Registration number: P010

Effectiveness of Marination in Improving Venison Palatability

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Abstract: Venison differs from common livestock meat such as beef, pork, and chicken in that it has a distinctive odor and tough texture, making it difficult to eat as is. The primary cause of this odor, hexanal, can be removed through adsorption by casein, a protein found in dairy products, or through chelation by metal ions. Additionally, improving moisture retention and utilizing protease enzymes are known to be effective in enhancing texture.
In this study, we analyzed the effects of marinating deer meat with lemons, honey, yogurt, and bananas. Focusing on the deodorizing effects and meat-tenderizing properties of each ingredient, we marinated deer meat for 12 hours, then cooked it, and measured the pH, moisture content, tensile strength, odor, and taste.
The results showed that lemon and honey improved moisture retention and increased overall moisture content. Lemon marinade softened the meat by reducing tensile strength, whereas yogurt was most effective in reducing odor and decreasing the amount of hexanal—a major odor component. Additionally, lemon and yogurt increased the concentrations of inosine acid and alanine, enhancing the umami flavor of the meat. Honey prevented the degradation of inosinic acid, thereby suppressing the deterioration of the meat flavors.
Citric acid from lemons chelates metal ions and inhibits lipid oxidation, thereby preventing flavor deterioration in the meat. Furthermore, honey and lemons create an acidic environment, suppressing the activity of inosine acid-degrading enzymes and contributing to the retention of umami components. In contrast, the banana marinade treatment reduced the inosine acid concentration, suggesting that the bacteria present in bananas may have promoted its degradation.
In terms of texture, banana and yogurt treatments reduced meat hardness. Bananas contain ficin, a protease, which softens meat. The honey marinade showed the highest increase in moisture content, likely due to the caramelization of sugars during heating, which improved the moisture retention capacity.
Ultimately, the lemon marinade treatment was the most effective, improving meat tenderness, enhancing moisture retention capacity, optimizing taste components, and reducing odor. This study contributes to developing improved cooking methods for wild game meat, demonstrating its potential for broader food utilization. Future studies involving sensory evaluation and improvements in processing technologies are expected to expand deer meat's food applications.

Keywords: deer meat, meat quality, marination

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Effect of Chitosan Coating Properties on Shell Egg Quality and Non-destructive Freshness Evaluation Using Near-infrared Spectroscopy

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Abstract: Effective preservation of shell eggs is essential for reducing postharvest losses. Chitosan-based coatings have demonstrated potential as an alternative to conventional methods. However, studies exploring the effect of chitosan molecular weight on preservation performance remain limited. Furthermore, the application of non-destructive techniques for monitoring egg quality has not been comprehensively investigated. This study examined the effects of chitosan coatings with different molecular weights (low (106.99 kDa), medium (290.57 kDa), high (436.26 kDa)) and concentrations (1–3% w/v in 1% acetic acid) on egg quality during four weeks of ambient storage (25 ± 2 °C; 68 ± 2% relative humidity). Egg weight loss, Haugh unit, and eggshell morphology were evaluated. In addition, near-infrared spectroscopy (NIRS) coupled with multivariate models was employed for non-destructive quality assessment. ANOVA results indicated that molecular weight, concentration and storage time significantly influenced egg freshness ($p < 0.05$). Preservation performance improved as the molecular weight of chitosan decreased. Coating with 2% low-molecular-weight (low-MW) chitosan outperformed other treatments, maintaining acceptable freshness for up to three weeks. Scanning electron microscopy (SEM) confirmed effective coating coverage, with an average coating thickness of 7.008 µm. When combined with NIR spectral data, radial-SVM model achieved an accuracy of 100% in classifying eggs according to grades and freshness, while kNN model achieved the highest predictive performance for weight loss and Haugh unit (RPD = 7.5 and 11.5, respectively). Applying chitosan coating, in combination with NIRS and multivariate analysis, offers a promising strategy for maintaining egg quality and enabling rapid, non-destructive quality assessment.

Keywords: edible coating, non-invasive measurement, optical technique, spectroscopic method

Registration number: P012

Eco-friendly Stir Bar Sorptive Extraction Coupled with HPLC-PDA for Efficient Terpenes Analysis in Some Aromatic Plants

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Abstract: Naturally occurring bioactive compounds in plants have long served as a foundation for innovations in pharmaceuticals, nutraceuticals, and functional food products. The growing need for natural bioactive molecules highlights the importance of developing efficient and environmentally friendly extraction approaches. Terpenes and their derivatives, known as terpenoids, in particular, represent a wide range of compounds primarily derived from aromatic and medicinal plants that have numerous biological activities. However, due to their volatility and hydrophobicity, compounds such as thymol, carvacrol, eugenol, ρ-cymene, γ-terpinene, and α-pinene, which are found in plants like *Thymus vulgaris*, *Origanum vulgare*, *Rosmarinus officinalis*, and *Ocimum basilicum*, remain difficult to extract and quantify accurately, requiring sophisticated analytical techniques. In the present study, we optimized an eco-friendly microextraction technique using stir bar sorptive extraction (SBSE) with liquid desorption coupled with high-performance liquid chromatography-photodiode array detection (HPLC-PDA). SBSE optimization was carried out and the optimum conditions were extraction time 20 minutes, sample solution salt content 20% (m/v) NaCl, no pH adjustment, desorption solvent consisting of ACN: chloroform (40:60), desorption time 30 minutes, desorption solvent volume 500 µL and sample amount 0.05 g, corresponding to a solid: liquid ratio of 1:200. Method validation showed that SBSE technique demonstrated strong linearity ($R^2 \geq 0.9805$), low detection limits (0.22–17 µg/mL), and acceptable recovery rates (82–120%). When applied to actual plant samples like thyme, oregano, rosemary, and basil, SBSE consistently exhibited high extraction efficiency, particularly for hydrophobic and volatile compounds. Notably, α- pinene in rosemary was quantified at 6.89 mg/g, and eugenol in basil at 4.04 mg/g, which were higher than the levels typically reported using other extraction methods in the literature. This study is among the first to demonstrate the practical application of SBSE for solid plant matrices without organic solvent pre-treatment combined with liquid desorption and HPLC analysis of terpenes and terpenoids. This application advances terpene analysis for food and pharmaceutical applications by providing a sensitive, environmentally friendly substitute for conventional techniques.

Keywords: stir bar sorptive extraction (SBSE), terpenes, HPLC-PDA, eco-friendly extraction

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Registration number: P013

Evaluation of the Technological Quality of Canned Red Kidney Beans

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Abstract: Red kidney beans play a particularly important role in the global food supply, both economically and nutritionally points of view. These raw materials are a widely available and highly popular ingredients, and in addition to being tasty, they are a foodstuffs rich in nutrients and vitamins. However, preparing the dried beans at home is an extremely time-consuming task, as they require a long soaking time, so consumers prefer the canned product, which needs a significantly shorter home preparation time and can be used as a quick and delicious ingredient or side dish for a meal.
The production of high-quality canned goods requires appropriate raw materials, which is not an easy task due to their diverse quality. Significant differences can be observed in the processing quality of raw materials from different origins, and a practical question arose: whether there is a test to detect these possible differences amongst the red beans from different origins, with which we can predict their canning quality before processing, facilitating the determination of technological parameters. In our study we also tested that how the different soaking times (8, 12 and 16 hours) and soaking conditions (water, 0.3 and 0.6% $CaCl_2$) used during the dissolution of each different raw material affect the quality of the end products.
Significant differences were observed in the technological behaviour of beans from different origins. Soaking tests yielded results consistent with the literature, in all cases the firming and hardening ability of $CaCl_2$ on the shell was clearly observed, which reduced the degree of bean cracking and improved the quality of the end products. In the case of the net weight change observed after soaking, we confirmed that in addition to the presence of $CaCl_2$, soaking times also play a major role in the quality of the finished canned goods.
The texture test of raw beans could be the key test that can be used to preliminarily evaluate the structure, hardness and the homogeneity of different batches of beans, thus facilitating the determination of technological parameters. With tests conducted with the TA-XT Plus texture analyser, we found that the linearity of the curve obtained during the pressure test predicts a homogeneous, non-softening and non-disintegrating finished product with a suitable texture, while in the case of poor-quality raw materials, a shorter linear section and premature rupture of the core structure can be observed with the inspection of the breaking force-distance curve. The results obtained are promising for use in the quality assessment of red kidney samples, but further validation of the method with a larger sample size is still necessary.

Keywords: red kidney bean, canning quality, texture analysis

Registration number: P014

The Effect of Different Lighting Conditions on Mealworm Larvae Growth

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Abstract: The growing world population is driving up demand for nutritious foods and high-biological-value proteins. The agricultural sector is responsible for meeting this demand, which already presents a significant challenge today. In 2023, it was estimated that 8.9-9.4% of the global population experienced food insecurity, with 28.9% facing moderate to severe levels of this problem. To address this issue, it is essential to explore alternative sources of protein. Edible insects are one example of a new food source.

Tenebrio molitor (mealworm) is classified as an edible insect, and the marketing of this species as a food product has been permitted in the European Union since 1 June 2021, following Commission Implementing Regulation (EU) 2021/882. The larvae of *Tenebrio molitor* have been utilised as a source of nutrition for birds and reptiles kept as pets, owing to their advantageous dietary properties. Several studies have demonstrated the suitability of the subject as a protein feed for farm animals and aquaculture species. Although not yet widely accepted by the public, mealworm larvae provide excellent nutritional value and are therefore regarded as a potential alternative for common protein sources.

Numerous publications examine the optimal conditions for larval rearing, analysing different factors such as temperature, humidity, light cycles, feed quality, and nutrients to optimise larval growth. Regarding light, most studies employ various photoperiods. Most of the literature suggests that complete darkness is ideal for larval development, but there is limited information available regarding the effects of different coloured lights on this process. This study aims to determine whether the implementation of different illuminations using light in the red, green, and blue wavelength ranges has an impact on the development of larvae.

The larvae utilised in the experimental setup were sourced from a commercial supplier. The experiments were conducted at a temperature of 26 °C, as specified in the literature, under various light conditions (blue, red, green, and white) and light cycles (complete darkness, 12 hours of light and 12 hours of darkness, and 24 hours of light). The experimental cycles were conducted over four weeks and were in three parallel replicates. The objective of the present study was to ascertain the light conditions under which the larvae exhibited the most rapid growth and reached the stage of development at which they could be processed as feed or food. The effect of light was examined based on the larvae's weight, mortality and pupation rate, as well as differences between larvae identified using the near-infrared spectrum.

Keywords: *Tenebrio molitor*, mealworm, photoperiod, light conditions

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Registration number: P015

Investigation on Polyphenol and Antioxidant Extraction from Hops

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Abstract: This study aims an investigation on solvent extraction of polyphenols and antioxidants from hops. Applications of this plant is known since prehistoric times; therefore, the hop has an untapped resource and a valuable purpose in dietary supplements and other precious health-promoting products, due to the fact, that this plant contains some secondary metabolites having significant biological activities, e.g. Xanthohumol, 6-Prenylnaringenin, 8-Prenylnaringenin, Resveratrol. Recently, hops have the most significant role in the beer industry; this plant is best known for use in brewing owing to its floral aroma and bittering flavour.
In present work, different solvents and their combination has been tested and the total polyphenol contents and antioxidant capacities of the extracts were measured and evaluated. Pelleted dry hop cones were under investigation as raw material. In the experiment, the hop extracts were prepared with addition of water and ethyl-alcohol in different ratios as solvent (0:1, 1:1 and 1:0), the extraction time and temperature has been adjusted between 40 – 60 °C and 30 – 60 minutes respectively. After that polyphenol yield and antioxidant activity of the samples were measured by UV-VIS spectrophotometry. Through our experimental design, empirical unit process model for the extraction was established and the best yield of hop extraction regarding polyphenols and antioxidants has been successfully determined based on the measured data.

Keywords: hops, extraction, polyphenols, antioxidants

Acknowledgements: The authors acknowledge the Hungarian University of Agriculture and Life Sciences's Doctoral School of Food Science for the support in this study.

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Effect of CTAB and Heat Treatment as Inactivation Methods on the Antimicrobial Activity of Probiotic-based Parabiotics

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Abstract: Probiotics are well-known for their beneficial effects. However, these are frequently attributed to specific cellular compounds and fragments rather than their living state. These positive effects can include immunomodulation, antioxidant, anticancer, and antimicrobial activities. Paraprobiotics -including inactivated bacterial cells and lysates rich in cell wall molecules- have recently gained attention for their stability, safety, and health benefits. This study compares the effect of chemical and physical inactivation methods on the antimicrobial properties of probiotic-based parabiotics against pathogenic and test bacteria.

Three probiotic lactic acid bacteria strains were incubated in 1% trehalose-containing medium for 18 hours, followed by physical (100 ℃; 15-60 minutes) and chemical (cetyltrimethylammonium bromide - CTAB) cell inactivation methods. The antimicrobial activity of different parabiotics against test microorganisms during co-cultivation was monitored by measuring density at 600 nm.

Our results indicate that the methods used for cell inactivation significantly affect the inhibitory properties of parabiotics. Antimicrobial effects were obtained in all cases, but these effects varied depending on the parabiotic source. Heat treatment at 100 °C for 15 minutes effectively produces parabiotics, except for *Ligilactobacillus salivarius*, which required 30 minutes for proper inactivation. Overall, chemical treatment generally showed enhanced antimicrobial effect. The most obvious effect was observed with parabiotics from *L. helveticus* using CTAB cell lysis. In contrast, while *L. crispatus* parabiotics also displayed antimicrobial properties, its effectiveness was drastically lower than that of the other two strains. Among the microbial targets tested, *Enterococcus faecalis* was most notably inhibited, with immediate effects observed under all conditions.

The study demonstrates that the inactivation method has a significant influence on the antimicrobial properties of parabiotics. The inhibitory effects were most effective in case of chemical treatment. As a conclusion, parabiotics can successfully inhibit the growth of Gram-positive and Gram-negative bacteria, highlighting their potential for food safety applications.

Keywords: parabiotics, cell-inactivation, antimicrobial, bio-preservatives

Acknowledgements: The research was supported by the Flagship Programme of MATE and TKP2021-NVA-22 projects.

Registration number P017

Non-destructive Testing of Foods Using Spectral Ultrasound Technology

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Abstract: The high volume of production following continuous population from continued population growth, increasingly higher consumer expectations and the key importance of food safety all define the current food industry. Thanks to advances in technology and and research, ultrasound measurements are now used in many areas, including the food industry. This non-destructive method of measurement allows the characterisation of the phase transformation of foodstuffs without any change. It also provides information on the condition and physical characteristics of the raw material, semi-finished and finished products during the manufacturing process.
Thanks to its favourable properties, ultrasonic technology is increasingly used in food processing. However, due to the complexity of multivariate data processing, many opportunities remain untapped. Ultrasound characterisation is based on the assumption that the physico-chemical properties of the food to be measured, such as its composition, are related to the measurable properties of the ultrasound, such as the speed of sound or attenuation. This relationship can be estimated by mathematical methods or characterised empirically by plotting a calibration curve between the property and the ultrasound measurement result. The aim of this research is to develop a new method for evaluation of the ultrasonic measurement results of a model material. The data from the measurements are analysed using multivariate statistical methods and then processed using various model building techniques, mainly machine learning algorithms.

Keywords: ultrasound, phase transformation, statistic method

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Registration number: P018

Safety and Durability of 3D-printed Food-contact Materials After Dishwashing

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Abstract: The aim of this study was to investigate the dishwasher exposure effects on bacterial reduction, mechanical properties, and heat deflection temperature (HDT) of 3D-printed objects (FCMs) fabricated from Polymaker PETG and NonOilen filaments which can get in contact with food materials. As 3D-printers gradually become involved in creating custom kitchen tools, containers, tubes, joints, utensils, packaging and food-related items, it becomes crucial to understand how these materials perform in cleaning conditions. Samples were subjected to hand washing as simulation of the well-known everyday kitchen cleaning procedure and regular dishwasher cycles for bacterial reduction. The efficiency of the bacterial reduction was tested by comparing microbial performance between samples that received hand washing and samples cleaned by the dishwasher, the results indicating that the treatment of dishwasher was superior in reducing bacterial load. Mechanical property evaluations (tensile strength, layer adhesion, bending and impact resistances) and HDT was evaluated for samples subjected to dishwasher cycles and compared with the non-washed as the control samples. The results revealed a significant impact of the dishwasher on the mechanical properties and the HDT with respect to both materials-polymaker PETG and NonOilen. The results showed that dishwasher cleaning is more effective in bacterial load reduction, however, it can affect positively and negatively the mechanical performance and thermal stability of 3D printed food contact materials, Therefore, it should be taken into consideration of cleaning efficiency and material durability in aspects of food safety applications.

Keywords: 3D-Printing, microbial safety, mechanical properties, heat deflection temperature

Registration number: P019

Bioconversion of Agricultural Waste Into Functional Xylooligosaccharides Using Novel Endoglucanase A and Endoxylanase B from *A. tubingensis* FAT35

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Abstract: Production of Antioxidant Xylooligosaccharides from Agricultural Waste Using Novel Endoglucanase A and Endoxylanase B from *Aspergillus tubingensis* FAT35
Functional food ingredients derived from lignocellulosic biomass are gaining increasing attention due to their health-promoting effects and sustainability. In this study, two enzymes – endoglucanase A and endoxylanase B – were obtained from *Aspergillus tubingensis* FAT35 growned on SSF on corn cob as the sole carbon source and purified. LC-MS/MS analysis confirmed their protein sequences, which were successfully matched to the *A. tubingensis* FAT35 genome, confirming their identity. The enzymatic activity of both enzymes was tested on different xylans isolated from various agricultural residues, including chamomile straw, wheat straw, and corn cobs. Both enzymes efficiently hydrolyzed the substrates, producing a range of xylooligosaccharides (XOS) with different degrees of polymerization. The product profiles were analyzed by thin-layer chromatography (TLC) and high-performance liquid chromatography (HPLC). Antioxidant properties of the resulting XOS were evaluated using FRAP and DPPH assays. The results demonstrate that both endoglucanase A and endoxylanase B possess strong potential for the sustainable production of bioactive XOS from agro-industrial residues. These findings contribute to the development of value-added functional ingredients suitable for use in the food, feed, and nutraceutical industries.

Keywords: agrowaste, xynB, eglA, xylooligosacharides

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Biochemical Separation of Myofibrillar and Sarcoplasmic Proteins from African Catfish Fed Black Soldier Fly Meal

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Abstract: The increasing demand for sustainable and alternative protein sources in aquaculture has driven research into novel feed ingredients that can maintain or enhance the nutritional quality of cultured fish. One promising candidate is black soldier fly (*Hermetia illucens*) meal, which has gained significant attention due to its high protein content, favorable amino acid profile, and low environmental footprint. As an insect-based feed ingredient, it offers a viable substitute for traditional fishmeal in aquafeeds, particularly for species like African catfish (*Clarias gariepinus*), a widely cultured freshwater fish valued for its rapid growth and high market demand. The study aims to evaluate the effects of incorporating insect meal on muscle protein composition and its potential ramifications for fish quality and feed formulation strategies.

Fish were maintained in a Recirculating Aquaculture System (RAS). There were three test groups: control (Haltáp Ltd. catfish breeding feed), 33% (33% black soldier fly meal + 67% catfish feed), 50% (50% black soldier fly meal + 50% catfish feed) Following the completion of the feeding procedure, ten samples were randomly collected from each of the three treatments. After the slaughtering and the evisceration, A little quantity of fish meat was excised and homogenized using a hand chopper until uniform. Five grams of homogenized meat were weighed on an analytical scale and placed in 50 mL centrifuge tubes. After then, each sample received 10 mL of 0.05 M NaCl. An Ultra-Turrax T25 homogenizer at 13,500 rpm for 3 minutes with 30-second intervals homogenized the mixture while keeping the beaker on ice near 0°C. For 20 minutes, the homogenized suspension was centrifuged at 6,000 rpm. A funnel and filter paper were used to filter the sarcoplasmic protein-containing supernatant into test tubes, which were kept in cuvettes at –20°C until analysis. Sarcoplasmic protein extraction precipitation was rinsed twice with 10 mL of 0.05 M NaCl and centrifuged again at 6,000 rpm for 20 minutes. Supernatant was discarded. The residual precipitate was homogenized for 1 minute with the Ultra-Turrax homogenizer after adding 10 mL of 0.7 M NaCl. Myofibrillar proteins were found in the supernatant after homogenization and centrifugation under the same circumstances.

Sarcoplasmic protein levels varied, with the 33% black soldier fly (BSF) meal supplementation group having the highest amounts. In contrast, the control (0%) and 50% BSF meal groups had the greatest myofibrillar protein concentrations.

Thus, whereas a 33% BSF meal may increase sarcoplasmic protein content and metabolic activity, the control and 50% groups prefer structural myofibrillar protein preservation. BSF meal affects protein composition at different levels, and an ideal balance may be between 33% and 50% inclusion to promote metabolic and structural protein functions in African catfish.

Keywords: African catfish, black soldier fly meal, SDS-PAGE, myofibrillar proteins, sarcoplasmic proteins

Registration number: P021

Phosphate Replacing Potential of Apple Pomace in Sausages

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Abstract: In recent years, consumers have shown growing interest in clean-label meat products that are free from synthetic additives. Among the most commonly used additives in processed meats are phosphates, such as sodium tripolyphosphate (STPP), which serve important technological functions including improving water-holding capacity (WHC), reducing cook loss, enhancing texture, and extending shelf life. Despite these advantages, the use of phosphates is increasingly questioned due to their E-number classification and potential health concerns, particularly for individuals with kidney disease. Consequently, the meat industry is actively seeking natural, multifunctional alternatives that maintain product quality while aligning with consumer preferences for more natural and sustainable ingredients.
Apple pomace (AP), a fibrous by-product of apple juice production, has emerged as a promising phosphate replacer due to its high dietary fibre content, water-binding properties, and potential to improve textural and nutritional attributes. In this study, the ability of AP to replace STPP in sausages was investigated. Sausages were formulated with varying proportions of AP 0 to 4 % in relation to the quantity of meat.
Technological properties were evaluated, including WHC and cook loss. Texture profile analysis (TPA) was conducted on cooked sausage cores using a two-cycle compression test to assess hardness, chewiness, gumminess, and springiness. The colour of the samples was determined using a handheld digital colorimeter, which is based on the CIE L*a*b* theoretical colour space. Sensory parameters of the sausages were evaluated by using a 9-point hedonic scale for attributes including flavour, smell, colour, taste, texture, juiciness, and overall acceptability.
Results demonstrated that apple pomace (AP) can improve water-holding capacity (WHC) and reduce cook loss in phosphate-free sausage formulations. Although complete replacement of TSPP with AP (0–4%) leads to a slight but potentially acceptable decline in WHC, other tested rheological parameters show more pronounced changes. These findings suggest that while AP alone may not fully replicate the functional properties of TSPP, it offers promising technological benefits and represents a valuable step toward cleaner-label formulations in meat product development.
In conclusion, apple pomace may serve as a partial phosphate substitute in sausage production, enhancing fibre content and promoting sustainability through the valorisation of fruit-processing by-products. However, further optimization—potentially through the combination with other functional ingredients—is needed to maintain desirable textural properties.

Keywords: apple pomace, phosphate replacer, clean-label, dietary fiber

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Comparative Analysis of Sensory Attributes and Sensor Data in Edible Insects: *Tenebrio molitor, Acheta domesticus*, *Locusta migratoria, Alphitobius diaperinus*

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Abstract: Edible insects are gaining recognition as a nutritious and environmentally sustainable alternative to traditional animal protein sources. In the European Union, four species—*Acheta domesticus* (cricket), *Tenebrio molitor* (mealworm), *Alphitobius diaperinus* (buffalo worm), and *Locusta migratoria* (locust)—are now authorized for human consumption. Despite this, there remains limited research on how to detect these insects in processed foods and on consumer perceptions. In this study, 132 participants blindly evaluated biscuits made with 19.6% insect powder from each of the four species, assessing them for appearance, aroma, flavour, texture, and overall liking. Samples containing cricket powder received the highest overall scores, followed by the buffalo worm sample, locust, and finally mealworm. Notably, participants over 30 showed a stronger preference for cricket-based biscuits. Interestingly, both cricket and buffalo worm biscuits were rated higher than the non-insect control sample. To support species identification, we used gas chromatography-ion mobility spectrometry (GC-IMS) and an electronic nose. Both methods, when combined with linear discriminant analysis, successfully distinguished between all insect types. However, GC-IMS results revealed that cricket samples shared a similar volatile compound profile with both the control and buffalo worm samples. A unique compound, 2-ethylphenylacetate, was identified in mealworm biscuits and may be linked to their lower acceptance. Overall, our findings show that biscuits with substantial insect content, particularly those made with cricket and buffalo worm powder, were surprisingly well-accepted. Moreover, aroma profiling shows promise as a method for both classifying and verifying insect content in food products.

Keywords: edible insects, GC-IMS, electronic nose, cricket, buffalo, mealworm, locust

Registration number P024

Application of Starch Base Coating for Paper Packaging Using a Feature Engineering Approach

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Abstract: Most of the packaging used worldwide are produced form petroleum derivatives because they are cheap and have good functionality properties. Nonetheless other innovative solutions that are environmentally friendly are being created which includes paper packaging. These solutions have their own flaws, and to overcome them, coatings from agricultural or food waste can be applied to improve the desired properties according to the packaging requirements. Starch is an abundant natural polymer, with great gelation properties. The objective of this work was using starch extracted from food waste and create formulations capable to improve paper packaging properties.
A protocol for the extraction of starch from cookie excesses was developed. This involves grinding the cookies, dispersing them in water and mixing them for 90 min. Subsequently, the samples are washed successively by centrifuging at 4000 g for 10 min. The samples are then dried at 40 ºC for 24-48 hours, where the extracted starch is milled and sieved to 100 µm. Then, several solutions were tested and starch mixed with sorbitol (1º layer) and polyvinyl alcohol (2º layer) was chosen for coating the paper. A Design of Experiments (DOE) was implemented to test these variables and water vapor permeability was used as an independent variable.
The DOE indicated that the coatings reduced significantly the water vapor permeability. The partial least squares regression indicated that sorbitol and starch were more important, and the principal component analysis (PCA) confirmed this result and the PCA1 explained 38,4 % of the variance. These results showed that this coating could be an interesting solution for paper packaging, while the feature engineering approach revealed the most re important elements in the process.

Keywords: packaging, polyvinyl alcohol**,** starch, sorbitol

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Study on X-20 Reverse Osmosis Membrane Performance in White Wine Processing

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Abstract: Nowadays, the high demand for reduced and non-alcoholic beverages has raised interest in membrane-based wine dealcoholization processes. This study aims to evaluate the efficiency and effectiveness of a reverse osmosis (RO) membrane under various operating conditions. The X-20 membrane (TRISEP, USA, active surface area 0.18 m²) was used to selectively separate ethanol and other low-molecular-weight compounds while monitoring key compositional and sensory attributes. Diafiltration mode experiments were conducted using white wine (Hárslevelű 2024 from Fitomark Kft, Hungary) as feed, processed at pressure of 20 bars and on ambient temperature (22 °C). The process result indicated that a significant reduction in ethanol content in the permeate, while retaining desirable volatile compounds in the retentate. This study demonstrates that the application of X-20 RO membrane as an effective solution for alcoholic beverage producers seeking a gentler processing technology with promising potential for industrial-scale partial dealcoholization.

Keywords: reverse osmosis, ethanol removal, wine dealcoholisation, low-molecular-weight compounds

Registration number: P026

Comparative Effects of Oyster and Button Mushrooms in Meat Substitution

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Abstract: Proteins of animal origin, particularly meat, are well suited to meet the amino acid needs of the human body as they provide high amounts of protein. Moreover, their essential amino acid composition is superior to that of plant-based proteins. However, meat may also contain a high level of fat, which can be associated with cardiovascular diseases, diabetes and obesity. Mushrooms are low in fat, relatively high in protein and are a good source of vitamins, minerals, fiber and potential sources of bioactive compounds. An increasing amount of evidence suggests that the consumption of different types of mushrooms, either as food or in extract form, can improve mental and physical health, due to anti-cancer, anti-diabetic, cholesterol-lowering, blood pressure-lowering, liver-protective and antioxidant effects. With the number of studies, the global mushroom market is also growing, driven by a shift in consumer behavior towards health-consciousness and the health benefits of mushrooms.
Therefore, the aim of this study was to investigate the effects of mushroom addition as a partial meat substitute. Meat patties with two types of mushrooms – oyster (*Pleurotus ostreatus*) and white button mushroom (*Agaricus bisporus*) - were prepared, 20% fat content meat was substituted with 20%, 35% and 50% mushroom. For the control sample, beef patties made from 20% fat content meat was used. All patties were oven cooked under standardized conditions to ensure uniformity and reproducibility. Post-cooking measurements included cooking loss, color measurement using CIELab* color system, texture analysis, and sensory evaluation to assess consumer acceptance.
Oyster mushroom reduced cooking loss, while button mushroom increased it compared to the control. Color changes were minimal with oyster mushroom but pronounced with button mushroom. Measured texture softened with both mushrooms, though button increased hardness in one case. Sensory score of smell for oyster mushroom was lower and similar smell for button mushroom substitution compared to control. Texture and juiciness differed significantly, while flavor and overall acceptability improved with both mushroom types.

Keywords: oyster mushroom, button mushroom, meat substitution, functional properties, physical measurements, sensory evaluation

Registration number: P027

Effect of Refrigeration and Freezing Storage on the Quality of Sous Vide Cooked Turkey Breast and Beef Meat

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Abstract: Sous vide cooking has become a remarkable method in meat processing due to its capacity to enhance tenderness, juiciness, and overall product consistency. However, the quality of sous vide cooked meats can be significantly affected by pre-cooking storage conditions, which affect physicochemical and sensory attributes critical for consumer acceptance. This study examined the effects of refrigeration and freezing storage prior to sous vide cooking on the weight loss, pH, color, texture, and lipid oxidation of beef and turkey meat. In beef meat, refrigerated samples exhibited a weight loss of 16.90%, while frozen samples showed a slightly higher weight loss of 17.94%. In turkey, during refrigeration, the weight loss (4.12%) significantly decreased compared to freezing (11.6%). The pH of beef increased slightly from 5.95 under refrigeration to 6.06 under freezing, while turkey showed a similar trend, with pH rising from 6.05 to 6.17 following freezing. The color of beef under refrigeration in lightness L* (56.79) and showed a slight decrease in freezing (55.84) and redness (a* from 17.58 to 16.73), with a minor increase in yellowness (b* from 9.65 to 10.74) after freezing, suggesting minimal visual impact. In turkey, freezing increased lightness (L from 80.68 to 82.19) and significantly reduced redness (a from 7.96 to 4.73) compared to refrigeration, indicating substantial color deterioration. Texture properties in beef remained similar between storage methods, while in turkey, frozen samples exhibited slightly higher force and work values. Lipid oxidation in beef decreased notably from refrigeration (6.24 mg MDA/kg) to freezing (3.96 mg MDA/kg), indicating improved oxidative stability, whereas turkey showed a modest increase in TBA values (from 3.92 to 4.49 mg MDA/kg) with freezing. Overall, this study showed that pre-cooking freezing is beneficial for improving oxidative stability in sous vide cooked beef, despite causing slightly higher weight loss compared to refrigeration. In contrast, refrigeration is more effective than freezing for preserving moisture and color in turkey meat, as freezing significantly increased weight loss and led to undesirable color change. These results indicate that while freezing may be advantageous for beef quality, it has detrimental effects on turkey, highlighting the need for species-specific pre-cooking storage strategies in sous vide meat processing.

Keywords: turkey, beef, storage condition, sous vide, lipid oxidation

Acknowledgements: The research was supported by the Doctoral School of Food Science of the Hungarian University of Agriculture and Life Sciences.

Registration number: P029

Properties of Hard Cheese Soaked and Matured in Blackcurrant Wine

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Abstract: The aim of our research was to combine the numerous beneficial effects of cheese and wine to create a new functional food: a hard cheese that is soaked and aged in blackcurrant wine. This cheese differs in both organoleptic and physicochemical properties from conventional hard cheeses, which are typically aged for a specific duration.
Three different versions of the cheese were produced: first, a blackcurrant-wine-free curd was soaked in blackcurrant wine and then matured. Next, curd mixed with blackcurrant wine was matured. Finally, blackcurrant-wine curd was soaked in blackcurrant wine and then matured. The addition of blackcurrant wine not only imparts unique organoleptic properties, characterized by its reddish-purple color and fruity flavor, but also enhances the biological value of the cheese, providing a high antioxidant capacity.
In addition to producing a functional food, the physicochemical, microbiological, and organoleptic properties of the resulting cheese were characterized. Changes in dry matter content, antioxidant capacity, and microbiological properties were monitored during both the soaking and aging processes.
All three cheese samples can be considered significant sources of antioxidants, as indicated by their total polyphenol content, iron-reducing capacity, and root-binding capacity. Each of the cheese varieties made with blackcurrant wine contains alcohol, with levels ranging from 0.128 mg/100 g to 871.89 mg ethanol/100 g. This alcohol content is slightly lower than that found in kefir, making these cheeses safe for consumption.
From a sensory perspective, the cheese made by mixing blackcurrant wine with curd proved to be the most popular.

Keywords: dairy, antioxidant capacity, ethanol content, functional food

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Stability of Oleogels Based on Their Rheological Properties

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Abstract: An important question in the food industry is what other, healthier and more ecologically beneficial fats should replace palm fats. Oleogels – gelled oils – may be suitable for this task.
Based on our previous work, monoglycerides, beeswax and their mixtures in different proportions can be used to gel sunflower oil with a high oleic fatty acid content. According to our observations, in the case of a 1/3 beeswax/monoglycerides gelling agent, monoglycerides and beeswax form common crystals and this apparently results in a more stable oleogel.
In the present work the mixture of monoglycerides and beeswax with 1/3 weight ratio as gelling agents was used for preparation oleogel from high oleic sunflower oil.
The sunflower oil was heated to 90 °C and then the 1/3 monoglycerides/beeswax gelling agent was dissolved in it, so that the gelling agent concentration was 5, 7 and 9 wt %, respectively. To achieve complete dissolution, the samples were stirred at 10,000 rpm for 20 minutes. Then, they were cooled to 10 °C for 24 hours and stored at 20 °C.
The flow curves, and the amplitude and frequency scanning curves of the oleogels were determined using an Anton-Paar MCR-302 oscillation rheometer in cone-plane geometry. The Herschel-Bulkley and Windhab models were fitted to the flow curves. The flow point was determined from the amplitude scanning curves. The measurements were taken at the time of sample preparation (after one day of storage) and weekly for four weeks thereafter. The yield stress from the flow curves in oleogel of 5% gelling agent concentration increased after the first week and remained practically constant during the one-month period. In samples of 7 and 9% gelling agent concentrations, the yield stress increased continuously during the first two weeks and then remained constant until the end of the study. The yield point parameters from the amplitude scanning curves showed a good correlation with the yield stresses obtained. The viscosity parameters increased after one week for samples of 5 and 7% gelling agent concentrations and then remained practically constant. In samples of 9% gelling agent concentration, however, the initial value of the viscosity parameter decreased after one week of storage and remained constant during further storage. The flow index decreased at 5 and 7% gelling agent concentrations after the first week and remained practically constant thereafter, while at 9% gelling agent concentration it increased after the first week and remained constant thereafter.

Keywords: oleogel, stability, rheological properties

Acknowledgements: The research was supported by the Hungarian Government through project No. KDP-2023 and by the Doctoral School of Food Science.

Registration number: P031

Study of the Effects of Ultrasonic Treatment on Canned Products

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Abstract: Legumes play an important role in the diets of many regions around the world. Soaking is a time-consuming step in the food processing of legumes. The required soaking time varies depending on the variety of the dry product, typically varying from 5 to 12 hours. Soaking dry legumes is the bottleneck in the production process and determines the speed of the production line. Ultrasound treatment during soaking reduces the required soaking time, increasing the hydration speed of dry products.
Materials and methods
soaking was provided at room temperature (25 °C) for both the control and ultrasonically treated groups. An ultrasonic bath (HBM Machines, The Netherlands) was used for the ultrasonic treatment. The treatment parameters were 40 kHz and 300 W. The polyphenol-content of the resulting soaking water samples was determined using the Folin-Ciocalteau reagent and the antioxidant capacity was measured by spectrophotometry using the Benzie and Strain method. The differently soaked legumes were sterilized in cans according to industry practice. The texture of the finished products was also tested.
Results
When we look at soaking, we obtain a reduction of 1.79% in ultrasonic soaking compared to control soaking. There was no significant difference in polyphenol content or antioxidant capacity between the control and ultrasonically treated soaking waters. However, the texture of the finished product obtained from ultrasound-assisted soaking was softer, than the control's texture. Compare to the control, the finished product had a higher filling mass when the raw material was treated with ultrasound during soaking.
Conclusion & Significance
Ultrasonic treatment can significanty reduce soaking time and speed up industrial processing. After soaking, there was no significant difference in the polyphenol content or antioxidant capacity of the soaking water.
After sterilisation, the finished product stock became softer, suggesting that shorter blanching times could be sufficient, which would be result in significant energy savings.

Registration number: P032

Rapid Method for Detecting Food Colour Adulteration in Yellow "Gari" Using Near Infra-red Spectroscopy

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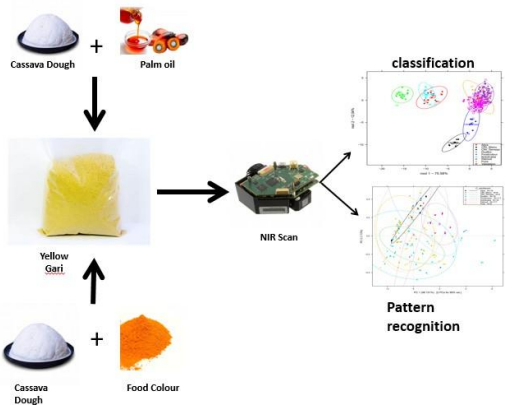
Abstract: This study was conducted to detect the adulterants in yellow gari and to develop rapid models using NIRS for detecting adulteration in yellow gari. This was necessitated by reports of the use of food non-nutritive food colours in processing of yellow gari.



Both Beta-carotene and Total carotenoids measured were seen to have increased as the amount of palm oil was increased but remained low in yellow gari samples made with food colour and the market samples. The use of NIRS revealed peaks at 1200 nm and 1450 nm. Chemometric techniques, PCA and LDA were used to visualize, classify the spectra with recognition of 98.66 % and prediction 98.02 %. PLSR was used to develop models that predicted colour, concentration of adulterants and the fat content. Module used for the prediction of fat content was the best with R^2 of 0.8621, R^2CV of 0.7906 and RMSEC and RMSECV below 1.7 and 2.0 respectively. The Savitzky-Golay smoothing with filter @2-17-2 was seen to be the best pretreatment module. NIR coupled with chemometrics has good potential as a technique for detecting adulterated gari.

Keywords: adulteration, cassava flakes, chemometrics, food colour, beta carotene

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Registration number: P033

Investigation of the Effect of Ultrasound During Dry Curing of Pork Loin

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Abstract: Curing is a centuries-old technique used for the preservation of meat. During dry curing, meat cuts are rubbed with curing salt, which is a mixture of salt (NaCl) and sodium-nitrite ($NaNO_2$). The curing salt penetrates into meat tissue by diffusion, which is inherently slow, especially in larger cuts, making the process time-consuming and often economically inefficient. This study investigates the potential and effect of ultrasound treatment to accelerate salt diffusion during dry curing, an area where its application has been minimally explored due to technical constraints.

In this experiment, deboned pork loin (m. longissimus dorsi) slices with 30 mm thickness were dry cured with curing salt (99,5% NaCl + 0,5% $NaNO_2$) and treated the following methods: (1) dry cured only, (2) dry cured and vacuum-packed, and (3) dry cured, vacuum-packed, and subjected to ultrasound. Ultrasound treatment was conducted in a water bath at 14 °C using a 20 kHz, 100 W sonication device. To ensure comparability, the amount of curing salt was standardized at 10% curing salt (based on meat weight), and ultrasound treatments were applied for 10, 20, 30, 45, and 60 minutes. The effects of ultrasound were evaluated based on salt diffusion, salt and moisture content, pH, color parameters (L*, a*, b*), and texture (Warner-Bratzler shear force). The data were evaluated by analysis of variance (ANOVA) ($p<0.05$) and the Tukey HSD test.

The results showed that ultrasound treatment significantly enhanced salt diffusion in pork loin during dry curing. At each time point, the ultrasound-treated samples (dry cured + vacuum-packed + ultrasound) showed a higher salt content compared to both the dry cured only or the dry cured and vacuum-packed. Additionally, moisture content decreased more rapidly in the case of ultrasound-treated samples, which suggests intensified osmotic activity. Texture analysis using Warner-Bratzler shear force indicated a statistically significant hardening in ultrasound-treated samples, likely due to enhanced salt effects on muscle fibers. The color measurement results showed a decrease in lightness (L*) values over time, regardless of the curing method. The ultrasound-treated samples showed notably higher redness (a*) values compared to both the dry-cured or dry cured and vacuum-packed samples, which may be consistent with higher dehydration and pigment concentration. pH measurements did not differ significantly among the curing methods, suggesting that ultrasonic treatment did not change the biochemical state of the meat during the short curing period.

Ultrasound treatment accelerated salt diffusion and moisture loss, highlighting its potential to shorten curing time and enhance the efficiency of curing technology.

Keywords: dry curing, ultrasound, meat, salt diffusion

Registration number: P034

Elevating Dietary Fiber and Phenolic Contents in Muffins Through Coffee Silver Skin and Almond Skin Integration

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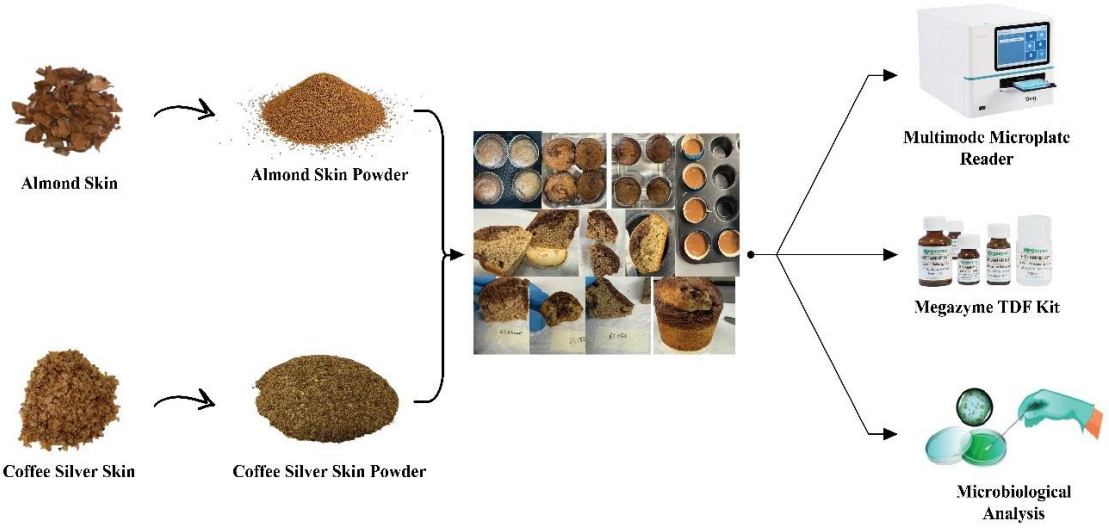
Abstract: The processing of coffee beans results in the generation of a significant amount of waste materials that are produced by the coffee supply chain. Coffee Silver skin (CSS) has a low-fat content, a good quantity of protein, and total dietary fiber, making it suitable for use in the food industry. Similarly, almond skin has a high content of fiber and antioxidants. The objective of our research was to evaluate the feasibility of substituting flour with powder from 5% CSS along with 7% almond skin, and 7% CSS with 5% almond skin powder to develop muffins. The formulated muffins were examined for microbial count, total phenolic content (TPC), total dietary fiber (TDF), and total antioxidant capacity using DPPH and FRAP assays (expressed as Trolox equivalents). According to our research findings, muffins containing 7% CSS with 5% Almond skin exhibited the highest TPC values (1.597 mg GAE/g), followed by 5% CSS with 7% almond skin (1.262 mg GAE/g) and control (0.743mg GAE/g). Our results showed that muffins with a combination of 7% CSS and 5% almond skin had high values for dietary fiber (9.43%), followed by muffins with 5% CSS and 7% almond skin (9.20%), and the control (2.90%). Total antioxidant capacity values were 15.68 TEAC mg/g for DPPH and 2.86mg/g for FRAP in the 7% CSS with 5% almond skin formulation, 11.46 mg/g from DPPH and 2.19 mg/g FRAP in 5 %CSS with 7% almond skin, and 8.06 mg/g for DPPH and 0.96 TEAC mg/g of wet sample for FRAP in control. There was no microbial count in baked products.

Keywords: muffins, Breads; coffee silver skin, functional foods; almond skin



Registration number: P035

Exploring the Functional Role of Chia Mucilage for Fat Reduction in Muffin

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Abstract: Functional foods encompass two fundamental aspects of life i.e., diet and health, rendering relationship of food and disease prevention as cornerstones of modern nutritional and preventive health strategies. Primeval grains are gaining popularity in many countries' contemporary diets due to their health benefits. Chia, *Salvia hispanica*, is an excellent source of omega-3 fatty acids, dietary fiber, antioxidants mineral and essential vitamins. These often serve as functional food ingredients, having ability to combat various non-communicable diseases such as cardiovascular diseases, obesity and diabetes *etc*. Chia mucilage (CM) is globally used in food recipes as stabilizer, thickening agent, and emulsifier. It is increasingly used in food formulation as it imparts fat-like functional characteristics. Bakery products are equally popular among individuals of all age groups. Urbanization, sedentary and busy lifestyle greatly shift consumer interest to bakery items. Keeping in view the array of benefits, this project has been designed to develop functional muffins using chia mucilage as fat replacer. Chia mucilage was prepared and evaluated for its physico-chemical composition. The results depicted a good fiber content (27.65%), crude protein (10.34%) and ash (6.56%) while a minute crude fat content (2.09%). It also showed an excellent water and oil holding capacity of 97 and 7.21g/g of mucilage, respectively. Later, five formulations of functional muffins were prepared by substituting fat with CM at the rate of 10, 20, 30, 40 and 50%, respectively. The proximate parameters of developed product revealed a 22% fat reduction from 23.47 to 18.12%, however other parameters ranged between 36.07-37.49% for moisture, 4.84-7.06% for crude protein, 2.35-3.08% for ash, 0.48-1.63% for crude fiber, 31.54-32.84% for NFE. The mineral profile depicted the range for Ca, Na, K, P, Mg and Fe as 24.08-79.45, 395.72-402.69, 71.44-109.04, 69.63-144.64, 8.16-38.06 and 0.31-1.74 mg/100g of sample, respectively. The phytochemical assay showed an increment from 11 to 18mg GAE/100g for TPC, 1 to 12mg RE/100g for TFC and 10.13 to 23.81% for DPPH. The lightness (L*) increased from 49.74 to 61.34 while a* and b* values were noted between 12.75-17.46 and 13.83-15.36, respectively. The calorific value dropped from 371.31 to 243.61 Kcal/100g of sample. Lastly, the best formulation was selected after organoleptic evaluation of the product for different parameters such as color, aroma, taste, texture, mouthfeel and overall acceptability. The best formulation was selected keeping in view the composition and sensory analysis. Functional muffins developed by 30% replacement (T3) of fat with chia mucilage were well received and considered as best treatment giving the score of 8.21 for overall acceptability. Thus, chia mucilage supplemented functional muffins will present a good opportunity to be commercialized as healthy snacks with low fat and cholesterol to promote health.

Keywords: chia mucilage, fat replacer, functional foods, muffins

Registration number: P036

Enhancing Nutritional and Functional Properties of Cookies Using Microalgae (*Chlorella vulgaris*): Impacts on Nutritional Value, Shelf Life and Sensory Profile

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Abstract: The application of *Chlorella vulgaris* microalgae in bakery products presents an opportunity to enhance nutritional quality while contributing functional and preservative benefits. This study evaluated the effect of incorporating varying levels of *C. vulgaris* into cookies on proximate composition, physical properties, antioxidant stability, and sensory characteristics over a 12-week storage period. Microalgae enrichment led to increases in protein, ash, and lipid content, with higher inclusion levels producing more pronounced changes. Physicochemical analyses revealed darker colour, reduced water activity, and firmer texture in algae-enriched cookies, changes that stabilized early in storage and contributed to improved shelf stability. Antioxidant capacity and total polyphenol content were significantly enhanced by microalgae inclusion and remained elevated throughout storage, suggesting a protective effect against oxidative degradation. Sensory profiling indicated that microalgae altered the flavour and aroma profile, introducing marine and vegetal notes at higher inclusion levels, while moderate addition maintained a closer resemblance to conventional cookies. Across all parameters, a consistent trend emerged: higher microalgae levels improved shelf-life indicators but introduced stronger sensory deviations. These findings highlight the potential of *C. vulgaris* as a multifunctional ingredient in baked goods, with its successful application depending on careful formulation to balance health benefits and consumer acceptability.

Keywords: microalgae-enriched cookies, *Chlorella vulgaris*, antioxidant capacity, sensory profile

Acknowledgements: The authors are grateful to the Doctoral School of Food Sciences at the Hungarian University of Agriculture and Life Sciences.

Registration number: P037

Leech Saliva-mediated Synthesis of Silver Nanoparticles and Their Antibacterial Effects

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Abstract: The increasing resistance of udder pathogens to conventional antibiotics necessitates the development of novel and sustainable antimicrobial strategies. This study investigates the green synthesis of silver nanoparticles (AgNPs) using biologically active components derived from the saliva of medicinal leeches (*Hirudo medicinalis*) and evaluates their antibacterial efficacy against selected mastitis-associated bacteria. Leech saliva was isolated by centrifugation (9000 rpm, 10 min), and the obtained supernatant served as a source of reducing and stabilizing agent. For nanoparticle synthesis, 10 ml of a 2 mM silver nitrate ($AgNO_3$) solution was mixed with 1 ml of the leech saliva extract, and the reaction mixture was exposed to natural sunlight to initiate photochemical reduction of Ag^+ to AgNPs. Characterization of the synthesized nanoparticles by FTIR spectroscopy revealed characteristic absorption bands corresponding to functional groups involved in nanoparticle stabilization, such as amide, hydroxyl, and aliphatic chains. The antibacterial activity of the AgNPs was evaluated using the well diffusion method against *Staphylococcus haemolyticus* and *Streptococcus uberis*. Wells of 2 mm in diameter were filled with 6 µl of AgNPs at a concentration of 2 mM. The leech-derived AgNPs demonstrated measurable antibacterial effects, with inhibition zones of 10 mm for *S. haemolyticus* and 11 mm for *S. uberis*. These findings suggest that silver nanoparticles synthesized from leech saliva represent a promising alternative antimicrobial agent for the prevention or treatment of mastitis in dairy cows.

Keywords: silver nanoparticles (AgNPs), green synthesis, mastitis, antimicrobial resistance, *Staphylococcus haemolyticus*, *Streptococcus uberis*

Acknowledgements: This work was supported by the Research and Development Support Agency based on Contract no. APVV SK-HU-24-0022: Evaluation of the Antibacterial Properties of Nanoparticles Against Multidrug-Resistant Bacteria.

Registration number: P038

Structural Divergence and Catalytic Conservation in GH2 and GH42 β-galactosidases

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Abstract: β-Galactosidases from bacterial sources play a critical role in lactose hydrolysis and are widely applied in food and biotechnology. Although enzymes from glycoside hydrolase families GH2 and GH42 catalyze the same reaction via a retaining mechanism, they differ substantially in sequence, domain structure, and evolutionary origin. In this study, a comparative sequence and structural analysis was conducted on 14 bacterial β-galactosidase proteins to investigate the extent of conservation and divergence between GH2 and GH42 families. Multiple sequence alignment and pairwise identity scoring revealed high intra-family conservation but low inter-family similarity (~46–47% identity). Functional residues, including the catalytic glutamate nucleophile and proton donor, were identified and structurally mapped using UniProt annotations and AlphaFold/PDB models. Despite sequence divergence, the spatial arrangement of the catalytic glutamates was conserved across both families, with an average inter-residue distance of ~5.7 Å, supporting the retention of catalytic mechanism. Conserved sequence motifs were also analyzed. While most motifs displayed structural displacement between GH families, the Motif D showed partial spatial alignment. Further domain annotation confirmed that GH2 β-galactosidases possess complex multi-domain architectures, whereas GH42 enzymes form compact trimeric assemblies with distinct domain organization. Additionally, GH42 enzymes exhibited a conserved Zn^{2+}-binding site coordinated by cysteine residues, a structural feature absents in GH2 enzymes, which instead contains Mg^{2+} at the active site. These findings are consistent with existing literature and support the concept of functional convergence through structurally divergent solutions. The results provide insight into how β-galactosidases from distinct GH families maintain catalytic function despite extensive structural divergence, with implications for industrial enzyme design and application.

Keywords: β-galactosidase, glycoside hydrolase families, structural bioinformatics, GH2, GH42

Acknowledgements: The research was supported by the Flagship Research Groups Programme of the Hungarian University of Agriculture and Life Sciences, GINOP_PLUSZ-2.1.1-21-2022-00048 and TKP2021-NVA-22 projects, as well as by Doctoral School of Food Science.

Registration number: P039

A Comparative Crosslinking Strategy for Tailoring Starch-based Biofilms for Sustainable Packaging

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Abstract: The environmental degradation caused by petroleum-based packaging, coupled with growing consumer demand for sustainable packaging for fresh food, has intensified the need for high-performance biodegradable materials. Starch-based biopolymers have gained popularity as a promising alternative; however, their inherent hydrophilicity and inferior mechanical properties necessitate modification for practical application. This study investigated the efficacy of two crosslinking agents—citric acid (CA) and sodium trimetaphosphate (STMP)—in enhancing the functional properties of starch-based biofilms for packaging. The films were plasticized with glycerol, and the impact of crosslinker type and concentration on biofilm key performance was evaluated. Results indicated that both modifiers significantly improved tensile strength and water resistance compared to native starch films. Notably, STMP crosslinking produced a rigid, densely networked structure, resulting in high stiffness but reduced elongation. In contrast, CA modification yielded a more flexible film with greater elasticity, attributed to its simultaneous crosslinking and chain-scission mechanisms. Soil biodegradation studies confirmed that all films remained biodegradable, albeit at rates modulated by the crosslinking density. These findings highlight the critical structure-property relationships imparted by different crosslinking chemistries and provide valuable insights for tailoring starch-based films to meet specific packaging requirements, thereby advancing their commercial viability.

Keywords: biodegradable polymer, citric acid, crosslinker, starch modification, sodium trimetaphosphate

Registration number: P040

Optimized Processing Technology of Aronia Juice into Concentrate: Effect on Bioactive Compounds, Antioxidant Capacity, and Colour

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Abstract: Fruit concentrates are semi-finished juice products from which most of the water content has been removed to increase shelf life, enrich the valuable components of the solution, reduce storage and transportation costs, and facilitate their use in various food and beverage applications. *Aronia melanocarpa*, commonly known as black chokeberry, is a small dark berry known for its exceptionally high content of polyphenols, particularly anthocyanins, which can be used as a natural food colouring agent, an alternative to artificial food colourants. The production of Aronia juice concentrate involves several processing steps that may influence its functional properties and colouring ability.
The study monitored changes in total phenolics, anthocyanins, antioxidant activity, and colour parameters at different stages of processing (grinding, mash heating, enzyme treatments, clarification, filtration, evaporation) Based on previous experiments, the enzymatic treatment using Pectinex Ultra Colour at a medium concentration (150 µL for 60 minutes) was selected for its ability to improve juice extraction and preserve key compounds. Similarly, novel plant-based clarifying agents Klar Super Litto Fresh and Klar Super Flora Claire were chosen due to their performance in maintaining phenolic compounds especially anthocyanins and antioxidant content during earlier trials. These optimized treatments were applied during the production of Aronia juice concentrate to evaluate their influence throughout the processing chain. The results showed that the applied enzymatic and clarification treatments and other technology steps had a noticeable effect on the stability of bioactive compounds and the visual properties of the juice during concentration. These findings underline the importance of understanding how individual processing steps can influence the overall quality of Aronia juice concentrate.

Keywords: aronia, concentrate, polyphenols, anthocyanins, antioxidants

Acknowledgements: The research was supported by the Stipendium Hungaricum Sholarship at the Hungarian University of Agriculture and Life Sciences.

Registration number: P042

Combined Effects of Independent Variables on the Yield of Pectin Extracted from Banana Peel by Using Ultrasound Assisted Extraction

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Abstract: Banana is one of the most produced, traded, and consumed fruits worldwide. A significant amount of peel is a byproduct of banana processing technologies (e.g. puree, dried products), and it is often discarded as waste or used as cattle feed or fertilizers. Nonetheless, banana peels are abundant in essential nutrients and natural compounds. These include antioxidants, as well as polysaccharides such as cellulose and pectin.
The banana peels were cut into small pieces, immersed in 0.5% citric acid solution, dried in oven at 60 °C, grounded into a fine powder, and sieved to maintain a uniform particle size. Pectin was extracted from banana peel powder using ultrasound assisted extraction (UAE). Extraction temperature (30, 40, 50 °C), sonication time (10, 25, 40 min), and solvent to solid ratio (10, 25, 40 ml/g) were considered as independent variables. The combined effects of the independent variables (extraction temperature, sonication time and solid to liquid ratio) on the pectin extraction yield was investigated by response surface methodology (RSM).
Results showed that the extraction temperature and solid to liquid ratio had significant combined effect on the pectin extraction rate. In contrast, the interaction between extraction temperature and sonication time, as well as the interaction between solid-to-liquid ratio and sonication time, did not demonstrate a significant combined effect on the pectin extraction rate. Moreover, the optimum conditions were established for the extraction of banana peel pectin: temperature 40 °C, sonication time 25 min, and solvent to solid ratio 25 ml/g.

Keywords: pectin, banana peel, ultrasound assisted extraction, food waste

Acknowledgements: This work was supported by Food Science Doctoral School of Hungarian University of Agriculture and Life Sciences.

Registration number: P043

High-protein Vegetable Creams Enriched with Chickpea Protein Isolates Extracted via Alkaline and Enzyme-assisted Alkaline Methods

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Abstract: In recent years, considerable research efforts have been directed towards the formulation of vegan cream products utilizing plant-based protein ingredients. Driving forces for this are the growing global population, increasing demand for healthier eating habits, and the need for sustainable, nutritious, and functional alternatives to traditional creams. One of the most widely consumed pulses worldwide - chickpea (*Cicer arietinum* L.) contains a high protein content ranging from 18 to 22%. Chickpea protein is regarded as a high-quality protein and a functional ingredient in the global food industry due to its low allergenicity, well-balanced amino acid profile, high bioavailability, and excellent functional properties, including solubility, water and oil holding capacity, emulsifying ability, and foaming properties.
The objective of this study was to develop high-protein vegetable creams by incorporating chickpea protein, to characterize them in terms of their physicochemical and sensory properties, and to compare them with a control sample without protein. The vegetable creams were based on a mixture of red pepper, eggplant, onion, and carrot. Proteins were extracted from chickpea by different protocols - conventional alkaline extraction and alkaline extraction assisted with α-L-arabinofurosidase and combination of cellulase and xylanase. The quality of the final products was evaluated in terms of physicochemical properties (pH, color, water activity), texture and storage stability. Additionally, the sensory properties of the obtained creams were analysed to evaluate their flavour, aroma and overall acceptability, providing valuable insights into consumer perception and potential market success.
The results indicated that the incorporation of chickpea protein isolates into vegetable cream formulations improved the textural properties of the final products compared to the control sample without added protein. Furthermore, the protein-enriched creams exhibited higher sensory acceptability, as evaluated by study participants, in comparison to the non-protein formulations.
Obtained results highlight chickpea protein as excellent source for the preparation of vegetable creams, enabling the formulation of a sustainable plant-based alternative that meets growing consumer demand for high-quality, plant-derived products.

Keywords: chickpea, protein, vegetable cream, physicochemical properties

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Registration number: P044

The Development and Characterization of Novel Cookies Enriched with Raspberry Seed Flour

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Abstract: The growing awareness of healthy eating habits in recent years has led many people to seek for healthier food alternatives. Conventional cookies typically contain refined sugar, flour and margarine, so they are considered to have poor nutritional profile and potential adverse health effects. With respect to the benefits of plant-based foods rich in fiber and antioxidants, this study investigated the development of novel formulation of functional cookies by replacing traditional ingredients with nutritious plant-based alternatives. Even more, valorization of food industry by-product as a source for these alternative ingredients should bring additional value to novel products.
Raspberry seed as a by-product of fruit juice processing industry that is naturally rich in antioxidants, fiber, and essential fatty acids was introduced as an ingredient for the preparation of novel functional cookies. Control cookies were prepared using oat flour, date paste, and margarine, whereas in the novel cookies' formulation margarine was entirely substituted with peanut butter, while oat flour was partially replaced with raspberry seed flour. A 3×3 factorial design was employed, with raspberry seed flour incorporated at three substitution levels (16.67%, 33.33% and 50%, based on the total flour mixture) and peanut butter at three different levels (15%, 20% and 25%, based on the weight of the cookie dough), resulting in nine novel cookie formulations. All novel cookie samples, including control, were analyzed for water-holding capacity, oil-holding capacity, antioxidant activity and proximate composition. The results showed that novel cookie formulations exhibited higher antioxidant activity, water- and oil-holding capacities compared to the control sample. Produced cookies were fiber-rich, gluten-free and vegan, providing a nutritious and fiber-rich snack suitable for individuals of all age groups practicing vegan and/or gluten free diet.

Keywords: cookies, functional food, fruit waste, valorisation

Acknowledgements: The financial support by the Ministry of Education, Science and Technological Development, Republic of Serbia (Project no: 451-03-136/2025-03/200134 and 451-03-137/2025-03/200134) is greatly acknowledged.

Registration number: P045

The Effect of Peeling on the Dough-forming Properties of Purple Wheat

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Abstract: Purple wheat is one of the wheat varieties that has received increasing attention in the food industry in recent decades, due to its rich nutrient content, especially its high antioxidant and polyphenol content. Products made using purple wheat are increasingly popular among health-conscious consumers. The aim of this research was to investigate the static dough rheological properties of two different purple wheat genotypes in two vintages, in order to determine how the dough-making properties of these wheat varieties differ compared to common wheats and how the vintage effect is manifested in the rheological properties. During our research, we investigated the static dough rheological properties of two common and two purple genotypes in the 2023 and 2024 vintages. We used alveograph and promilograph equipment for the tests, which allowed for the precise measurement of the dough behavior during different mechanical effects.
We determined the resistance to deformation, the extensibility and the energy required for deformation of the doughs. Our studies have shown that seasonal effects, such as the number of hours of sunlight, temperature and rainfall, greatly influence the dough-making properties of flours, because they affect the amount of proteins in the wheat, including gluten proteins. Flours with a high gluten content produce stronger, harder dough, while flours from wheat samples with a lower protein content produce softer, less strong dough. Extensibility and elasticity are important parameters because they determine both the processing properties of the dough and the quality of the baked goods. The peeling of the wheat bran layers improves the dough-forming properties of the flour. By removing part of the bran and aleurone, more endosperm rich in gluten-forming proteins is retained, resulting in a stronger and more elastic dough. Enzymatic activity from bran components is reduced, which stabilizes the gluten network. Overall, the flour becomes lighter, more manageable, and better suited for breadmaking. A better understanding of the differences between the different color genotypes will allow the selection of the most suitable varieties for baking applications, especially in the development of health-conscious products.

Keywords: purple wheat, gluten, peeling

Registration number: P046

Sustainability of New Generation Waste Feedstocks in Biodiesel Production

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Abstract: The global shift towards renewable energy sources has positioned biofuels as a critical component in the transition to sustainable energy systems. The pursuit of sustainable energy alternatives has intensified the development of biodiesel as a renewable, eco-friendly substitute for fossil diesel. Central to the sustainability of biodiesel production is the choice of feedstock, which profoundly influences the environmental, economic, and social impacts of the fuel. The production of biodiesel from waste-based feedstocks, such as used cooking oil and Palm Oil Mill Effluent (POME), plays a pivotal role in the global energy transition towards sustainability. These feedstocks valorize waste streams that would otherwise require disposal or pose environmental hazards. In the recent study, Life Cycle Assessment (LCA) was used for assessment of the full environmental impacts of biodiesel production from waste-based feedstocks focusing on greenhouse gas (GHG) emissions, energy consumption, and other environmental indicators.

Biodiesel derived from used cooking oil demonstrates significant GHG emission reductions, typically between 80-90% compared to fossil diesel, due to recycling previously processed biomass and reducing waste management impacts. In contrast, POME-based biodiesel, while involving more complex treatment to address organic load and methane emissions, can still achieve 70-85% GHG savings when properly managed, effectively reducing pollution while enabling waste valorisation.

The European Union's directives, notably RED III, alongside national regulations such as Hungary's 36/2010 NFM and 68/2021 ITM decrees, impose strict sustainability and carbon footprint assessment requirements. These mandate thorough life cycle analyses and traceability throughout production chains, ensuring environmental responsibility and social acceptability for waste-derived biodiesel.

In conclusion, waste-based biodiesel, particularly from used cooking oil and POME, represents a scientifically validated sustainable alternative to fossil fuels. Supported by robust LCA methodologies and regulatory frameworks, these biofuels contribute significantly to reducing greenhouse gas emissions, promoting circular economy principles, and advancing sustainable development goals.

Keywords: sustainable biodiesel production, POME, UCO, RED III, waste-based feedstock, Life Cycle Assessment, greenhouse gas (GHG) emissions

Acknowledgements: The research was supported by Rossi Biofuel Zrt and the Doctoral School of Food Science.

Registration number: P047

Development and Application of Plant-based Proteins for Apple Juice Clarification

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Abstract: The clarification of fruit juices is essential for both product quality and consumer acceptance. However, the fining agents most commonly utilized—particularly gelatin—are derived from animal sources, a factor that gives rise to substantial ethical, religious, economic, and environmental concerns. Gelatin is incompatible with vegetarian and vegan dietary restrictions. It is also not in alignment with halal or kosher dietary laws, which limits its market accessibility. Furthermore, the environmental impact of animal-based proteins is considerable. In contrast, plant-based fining agents—particularly those derived from local food processing by-products—present a more sustainable, cost-effective alternative that is aligned with circular economy principles. Legume proteins, such as those derived from green pea pods and red beans, have been shown to exhibit favorable solubility and aggregation properties, making them promising candidates for use in colloidal beverages like fruit juices. Furthermore, beyond the clarification process, plant-derived, which could enhance the nutritional value of the final product. This research therefore aims to contribute to the development of sustainable technologies, valorization of agro-industrial by-products, and adaptation to evolving consumer preferences.
While there are already commercially available vegan fining agents (e.g., FloraClair, LittoFresh) that have proven effective in reducing turbidity and enhancing the stability of wines and juices, the innovation presented in this study lies in the utilization of protein sources that have not been extensively explored, such as green pea pods and red beans.
This work pioneers the application of underutilized legume-derived proteins for juice clarification, offering a dual benefit of sustainable processing and potential nutritional enhancement.

Keywords: plant-based proteins, juice clarification, green pea pod, red bean, by-product

Acknowledgements: We would like to thank the Doctoral School of Food Science for their support. This work was carried out with the help and cooperation of the Department of Fruit and Vegetable Processing Technology and the Department of Nutrition Science at the Hungarian University of Agriculture and Life Sciences.

Registration number: P048

Study on Factors Affecting Fermented Guava (*Psidium guajava* L.) Juice and Polyphenol Enrichment for Fermented Liquid from Guava Leaves

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Abstract: Pink guava (*Psidium guajava* L.) is a tropical fruit that is loved by many people for its delicious, sweet taste and high nutritional value. Guava leaves, an often overlooked part of the guava tree, are actually a rich source of health-promoting natural compounds, notably polyphenols. This study aimed to create an antioxidant-rich fermented fruit drink supplemented with guava leaves. Polyphenol compounds were investigated in young and mature guava leaves. The highest efficiency of tannin removal in guava leaves was 25% using 0.2% gelatin at 40°C for 2 hours. Guava will be used for low alcohol fermentation with *Saccharomyces cerevisiae* strain with guava leaf extract ratios of 5%, 7.5% and 10%. The product is tested for parameters: alcohol content, pH, solids content, total acid content, vitamin C, reducing sugars, polyphenols and antioxidant capacity (ABTS). The content of these substances is quantified by titration method: NaOH determines total acid, Iodine determines vitamin C, DNS determines reducing sugar, Folin-Ciocalteu spectrophotometric method determines polyphenol. Finally, sensory evaluation is performed using a 9-point scale for fermented products supplemented with leaf juice. This study not only creates a fermented beverage product from guava fruit rich in natural polyphenols, but also optimizes the extraction process to add active ingredients from guava leaves to the fermentation liquid. This result not only opens up a new direction for fully exploiting the value of guava trees but also creates a functional, healthy beverage with high antioxidant content, contributing to meeting the growing market demand for natural and healthy products.

Keywords: guava, guava leaves, polyphenols, antioxidants, vitamin C

Acknowledgements: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P049

Study on the Conditions Affecting Low-alcohol Fermentation from Cashew Apple (*Anacardium occidentale*) Supplemented with Butterfly Pea (*Clitoria ternatea*) Extract

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Abstract: This study investigated the conditions influencing yeast performance during low - alcohol fermentation of cashew apple juice supplemented with *Clitoria ternatea* extract. The cashew apple - the fleshy pseudofruit of Anacardium occidentale - is often discarded during nut harvesting yet is rich in polyphenols, vitamin C, natural sugars, and antioxidants, making it a promising substrate for functional fermented beverages with health and economic value. The juice was treated with pectinase and cellulase to increase extraction yield and decrease viscosity. Tannins were reduced using gelatin (0.05 - 0.65%) at 40 - 50 °C for 2 h. Fermentation employed a selected yeast strain under controlled conditions (30 - 40 °C, pH 5, 20 °Brix) with ternatea extract at a 95:5 ratio to enhance color stability and supply anthocyanins and other bioactives. Monitored parameters included reducing sugars (DNS), ethanol (distillation - chromatography), total acidity (titration), pH, total polyphenols (Folin - Ciocalteu), anthocyanins (spectrophotometry), and viable yeast counts (plate count). Sensory evaluation used a 9 - point hedonic scale for color, clarity, aroma, flavor, taste, and aftertaste over time. Results showed pectinase afforded the highest juice recovery, while tannin reduction was most effective with 0.2% gelatin at 40 °C. The fermented product reached 4 - 6% (v/v) ethanol after 4 - 5 days, with a balanced sweet - sour profile, stable color, and high antioxidant activity. These findings support valorization of *Anacardium occidentale* cashew apples combined with *Clitoria ternatea* extract to produce low - alcohol functional beverages, adding value to agricultural by- products and benefiting public health.

Keywords: *Anacardium occidentale*, *Clitoria ternatea*, pectinase, cellulase, low - alcohol fermentation

Acknowledgments: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam

Registration number: P050

Investigation of Antioxidant Activity and Product Development from Roselle (*Hibiscus sabdariffa* L.) and Sophora Flower (*Sophora japonica* L.)

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Abstract: This study aimed to optimize the extraction process and develop a functional product from roselle (*Hibiscus sabdariffa* L.) and sophora flower (*Sophora japonica* L.), two natural sources rich in bioactive compounds, including anthocyanins, phenolics, and flavonoids. These compounds were quantified using standardized spectrophotometric methods: the pH-differential method for anthocyanins, the Folin–Ciocalteu assay for phenolics, and the aluminum chloride colorimetric method for flavonoids. Through seven optimization experiments, the most effective extraction conditions were determined. For roselle, maximum anthocyanin yield was obtained with 0.1% pectinase at 55°C for 75 minutes. For sophora flower, extraction at 50°C for 45 minutes yielded the highest phenolic and flavonoid levels. Further experiments examined the blending ratio of roselle and sophora flower, the influence of vacuum concentration on antioxidant activity (evaluated by DPPH and ABTS assays), and the sensory properties of the concentrated extracts using a 9-point hedonic scale. This study not only established optimal extraction parameters but also demonstrated the potential of developing functional herbal products from roselle and sophora flower, thereby contributing to public health improvement.

Keywords: roselle, sophora flower, antioxidant activity, pectinase, extraction conditions

Acknowledgements: The research was supported by the Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P051

Study on Factors Affecting Low-alcoholic Fermented Beverage from a Mixture of Acerola Cherry (*Malpiphia glabra* L.) and Soursop (*Annona muricata* L.)

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Abstract: Acerola cherry (*Malpiphia glabra* L.) and soursop (*Annona muricata* L.) are two tropical fruits rich in antioxidants, vitamin C and many other beneficial compounds. This study was conducted to develop a new low-alcohol fermented beverage using a mixture of acerola and soursop juices, fermented with *Saccharomyces cerevisiae* yeast strain with the main objective of contributing to the diversification of low-alcohol fermented fruit beverages. In this study, the parameters monitored over time included dry matter content, pH, alcohol content, vitamin C content, polyphenols, total acidity, reducing sugars and antioxidant capacity. The research results show that the ability to ferment low alcohol with *Saccharomyces cerevisiae* strain after 2-3 days reaches an alcohol level of 4-6, pH and dry matter content gradually decrease over the fermentation days, along with the total acid content, antioxidant capacity, vitamin C, reducing sugar content all have changes increasing and decreasing during the fermentation time. The final product will be evaluated by sensory evaluation method on a 9-point scale to see the level of consumer acceptance of the product. This result not only contributes to providing an important scientific basis for the development of low alcohol fermented beverage products from fruits but also opens up a new direction in utilizing the combination of different fruits to create nutritious drinks.

Keywords: *Malpiphia glabra* L., *Annona muricata* L., fermentation, *Saccharomyces cerevisiae*, low alcohol

Acknowledgments: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P052

Study on Producing Banana Peel Powder with Antioxidant Activity for Food Application

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Abstract: This study was conducted to develop a process for producing banana peel powder with antioxidant activity, with the aim of supplementing functional foods beneficial to consumer health while also enhancing economic efficiency. The raw materials used were the peels of Cavendish banana (*Musa acuminata* AA) and plantain (*Musa paradisiaca*). Banana peel is a rich source of phenolic compounds with high polyphenol concentration. After being cut into small pieces, the banana peels underwent pretreatment to prevent enzymatic browning. Different pretreatment methods were investigated to minimize browning and obtain banana peels with the highest phenolic concentration. The peels were dried by convection at temperatures ranging from 60–80 °C for 5–15 hours. After drying to a moisture concentration of <10%, the samples were ground and sieved. Packaging materials tested included zip-lock bags and two-layer aluminum laminate film. The results determined the optimal conditions: drying at 70 °C for 10 hours. The resulting banana peel powder had a characteristic brown color, pleasant aroma, and acceptable-to-good sensory quality. The total polyphenol concentration (TPC) was well retained. This study contributes to diversifying powdered food products on the market while promoting the utilization of by-products from banana-based industries

Keywords: powder, *Musa acuminata* AA, *Musa paradisiaca*, polyphenol, antioxidant

Acknowledgements: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P053

Research on Lekima Powder Production Process

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Abstract: The study was conducted to develop a process for producing Lekima powder (*Pouteria lucuma)* a fruit rich in antioxidants, polyphenols, vitamin C and natural sugars - serving the food industry, contributing to increasing the economic value of this fruit. The selected raw material was ripe Lekima, pre-processed, convection dried at the investigated temperatures of 70 – 90 ˚C and time of 270 to 330 minutes. After drying to a moisture content of <10%, the sample was ground and sieved. Preservative packaging was tested with 2-layer aluminum laminated films. The research results determined the optimal conditions: drying temperature 80 ˚C, time 300 minutes. Lekima powder products have a characteristic yellow color, fragrant taste, and good sensory quality. Total polyphenol content (TPC) and vitamin C remain high, and total sugar is stable. This research contributes to diversifying powder products on the market.

Keywords: Powder, *Pouteria lucuma*, polyphenol, antioxidant

Acknowledgements: The research was supported by the Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P054

Study on the Antioxidant Activity of Lactic Fermented Pomegranate and Apple Juice Using *Lactobacillus plantarum* 299v

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Abstract: This study aimed to evaluate the antioxidant activity, physicochemical characteristics, and sensory properties of lactic-fermented pomegranate (*Punica granatum* L.) and apple (*Malus domestica*) juice. Pomegranate and apple are natural raw materials rich in bioactive compounds, particularly antioxidants such as polyphenols, flavonoids, anthocyanins, and phenolics. In this research, a blend of pomegranate and apple juice was fermented using *Lactobacillus plantarum* 299V. The fermentation process was monitored for changes in pH, total soluble solids, titratable acidity, reducing sugars, vitamin C, and polyphenols, with special emphasis on antioxidant capacity assessed by the ABTS assay. The results indicated that optimal antioxidant activity was achieved under fermentation conditions with a pH of approximately 4.0 - 4.5 and a fermentation duration of 5 - 6 days. During fermentation, titratable acidity increased over time, while vitamin C and polyphenol contents showed a slight decline. Antioxidant activity, as measured by the ABTS assay, varied after six days of fermentation. Sensory evaluation using a nine-point hedonic scale demonstrated consumer acceptance of the product. This study not only contributes to the diversification of fermented fruit-based products but also highlights the potential development of a functional beverage rich in antioxidants, which may help promote consumer health.

Keywords: *Lactobacillus plantarum*, pomegranate, apple, lactic fermentation, antioxidant activity

Acknowledgments: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P055

Study on the Lactic Fermentation of Pink Guava Juice (*Psidium guajava* L.) with the Supplementation of Passion Fruit Peel (*Passiflora edulis*) by *Lactobacillus plantarum* 299v

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Abstract: This study was conducted to develop a lactic fermented beverage from pink guava (*Psidium guajava* L.) and passion fruit peel (*Passiflora edulis*), while also evaluating the potential prebiotic role of passion fruit peel in the fermentation process with *Lactobacillus plantarum* 299v. To optimize juice recovery and reduce turbidity, guava and passion fruit peel were treated with pectinase under appropriate conditions for 2 hours at 50°C. Physicochemical parameters monitored throughout the fermentation process included: total soluble solids, pH, total titratable acidity (titrated with NaOH using phenolphthalein as an indicator), total phenolic content (Folin–Ciocalteu method), vitamin C (iodometric titration with starch indicator), reducing sugars (DNS method), and viable bacterial counts determined by the spread plate technique on MRS agar. In addition, the product was subjected to sensory evaluation using a 9-point hedonic scale, with criteria including color, aroma, taste, aftertaste, and texture. Results from seven trials indicated that the product reached optimal quality after three days of fermentation, characterized by a balanced sweet–sour flavor, stable lactic acid content, slight fluctuations in polyphenols and vitamin C, good growth of *L. plantarum* 299v, and high consumer acceptability scores. This study provides a novel approach to valorizing agro-industrial by-products for the diversification of lactic fermented beverages, while contributing to public health improvement.

Keywords: Pink guava, passion fruit peel, lactic fermentation, *Lactobacillus plantarum* 299v, prebiotic.

Acknowledgements: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh City, Vietnam.

Registration number: P056

Study on the Effect of Supplementing Extract from *Cordyceps militaris* Cultivation Substrate on Fermented Yogurt Products

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Abstract: This study was conducted to optimize the extraction process and explore the potential application of the cultivation substrate of *Cordyceps militaris*. This is a valuable medicinal mushroom containing numerous important bioactive compounds such as polysaccharides, cordycepin, and adenosine, which have been demonstrated to possess remarkable biological activities, particularly immunomodulatory and antioxidant properties. Among them, polysaccharides are the major component, playing a crucial role in immune enhancement, oxidative inhibition, and prevention of certain diseases. However, studies on the influence of extraction conditions on polysaccharide yield from the cultivation substrate remain limited.
In this research, factors including solvent ratio, extraction temperature, and ultrasonic-assisted extraction time were investigated for their effects on polysaccharide recovery from *Cordyceps militaris* cultivation substrate. The polysaccharide content in the extracts was determined using the phenol–sulfuric acid method. Results indicated that the optimal extraction conditions for maximum polysaccharide yield were achieved at 80 °C and 60 minutes of ultrasonic treatment. Furthermore, the study evaluated the impact of supplementing the extract from *Cordyceps militaris* cultivation substrate on fermented yogurt products. Investigated parameters included supplementation ratio, fermentation time, and fermentation conditions. The antioxidant activity of the yogurt was assessed via the ABTS radical scavenging assay. In addition, sensory evaluation was carried out using a 9-point hedonic scale to determine consumer preference.
The findings revealed that supplementation with an appropriate concentration of *Cordyceps militaris* extract significantly improved the antioxidant capacity of yogurt, thereby opening promising prospects for the development of functional yogurt products enriched with herbal bioactives of high nutritional and therapeutic value.

Keywords: *Cordyceps militaris*, fermented yogurt, antioxidant activity, ultrasound-assisted extraction, bioactive enrichment

Acknowledgements: The research was supported by the Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Vietnam.

Registration number: P057

Study on Selected Factors Influencing the Fermentation of Yacon (*Smallanthus sonchifolius*) Using the Yeast *Saccharomyces boulardii*

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Abstract: Yacon (*Smallanthus sonchifolius*) is a plant cultivated for its tuberous roots, which contain many nutrients. However, yacon tubers are easily spoiled and difficult to preserve when exposed directly to air. In this study, yacon was used to produce a low-alcohol fermented product with the yeast strain *Saccharomyces boulardii*, a beneficial yeast for human health that is especially used in the treatment of gastrointestinal disorders such as diarrhea symptoms. Because the product is prone to color changes upon exposure to air, experiments were conducted by supplementing vitamin C (ascorbic acid) at various concentrations to determine the optimal supplementation level. During the study, parameters such as alcohol content, pH, dry matter content, color, and yeast count were monitored throughout the fermentation days. In particular, triterpenoid saponin content was determined using UV-Vis spectrophotometry (colorimetric method), and reducing sugars were measured by -colorimetric methods using the DNS reagent (3,5-dinitrosalicylic acid assay). The results showed that low-alcohol fermentation with *Saccharomyces boulardii* reached 5% alcohol after 3–4 days, while pH and dry matter content gradually decreased during fermentation. Color and yeast count also changed over time. Notably, triterpenoid saponin content, total acidity, and reducing sugars also varied during the fermentation process. This study contributes to identifying the optimal conditions for yacon fermentation, thereby creating a new fermented product with high nutritional value, diversifying consumer choices, and enhancing the economic value for yacon growers.

Keywords: Yacon, *Smallanthus sonchifolius*, *Saccharomyces boulardii*, alcoholic fermentation

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Initial Evaluation of Antioxidant Properties in Food Materials Derived from the Culture Substrate of *Cordyceps militaris*

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Abstract: This study investigates the potential use of the culture substrate of *Cordyceps militaris* (*C. militaris*), remaining after fruiting body harvest, as a promising food material enriched with bioactive compounds. The substrate was extracted with 98% ethanol, and its chemical constituents were identified using gas chromatography–mass spectrometry (GC–MS), which revealed 7 out of 78 compounds with antioxidant activity. The free radical scavenging capacity, evaluated by the DPPH assay, showed an IC_{50} value of 472 µg/ml, while the total polyphenol content was 58.5 mg GAE/g. The crude material was ground to a particle size of 0.15 mm and dried at 60 °C for 6 hours to obtain the final powder, in which proximate compositions such as including protein, carbohydrates, lipids, and ash were determined. These findings highlight the potential of utilizing low-cost local by-products, such as *C. militaris* culture residues, to develop functional food ingredients that support human health and contribute to the advancement of a circular bioeconomy.

Keywords: *Cordyceps militaris*, total polyphenol, DPPH, GC-MS, medium culture

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Research on Kale Powder (*Brassica oleracea var. acephala*) and its Application in Making Smoothie Powder

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Abstract: Kale (Brassica oleracea var. acephala) is a leafy green vegetable rich in nutrients and natural bioactive compounds, but it has not been applied in the processing of powdered foods. Blanching is a pretreatment step to inactivate enzymes and stabilize color, but the effect of this process on bioactive compounds in kale has not been clarified. The objective of the study was to evaluate the effect of blanching on total polyphenol content (TPC), total flavonoid content (TFC) and color of kale, and to develop a smoothie powder product. In addition, the influencing factors (citiric acid soaking, drying temperature) on the color of green banana powder were evaluated. Kale was blanched at 70-100 °C for 30-120 s, which is a common condition for green leafy vegetables, to inactivate enzymes and reduce the loss of bioactive compounds. TPC content was determined by the Folin–Ciocalteu method and TFC by colorimetric method with $AlCl_3$. The results showed that blanching temperature increased TPC (7.88-10.76 mgGAE/g) and TFC (18.87-23.16 mgQE/g), while prolonging blanching time decreased both parameters. Compared with the unblanched sample, most of the treatment conditions reduced the bioactive compound content and L* brightness. Green banana was used to improve the texture. Before drying, green banana powder was treated by soaking in 0.5-2% citric acid and drying at 50-70 °C. Acid concentration of 0.5% and drying at 60 °C are suitable conditions to ensure the color of the powder and the product's sensory characteristics. Then proceed to build the formula and evaluate the product's indicators such as viscosity and sensory characteristics. The study has completed the production process of kale smoothie powder containing bioactive compounds and high nutritional value.

Keywords: kale, green banana, smoothie powder, blanching

Acknowledgements: The research was supported by Institute of Biotechnology and Food Technology, Industrial University of Ho Chi Minh city, Viet Nam.

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Research on the Process of Producing Lactic Fermented Noni Leaf *(Morinda citrifolia)* Juice from the Strains *(Lactobacillus Acidophilus)*

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Abstract: Noni leaves (Morinda citrifolia) contain biologically active chemical components that have antioxidant properties, play an important role in supporting the digestive system and good health. The objective of the study was to evaluate the impact of convection drying on total polyphenol content (TPC), total flavonoid content (TFC) and at the same time develop a process for processing lactic fermented Noni leaf juice from Lactobacillus Acidophilus strain. In addition, the factors affecting (drying temperature, raw material/solvent ratio) on total polyphenol content (TPC), total flavonoid content (TFC) of Noni leaf powder were also evaluated. Fermented drinks with many biological activities beneficial to health are a current trend. The analysis results determined the optimal drying parameters as follows: 50 ^{0}C at 24 hours, the humidity reached 7.8±0.08 (%) giving TPC and TFC contents of 0.648^b±0.001 (mg GAE/g) and 0.494^a±0.01 (mgQE/g). The extraction results of the ratio of raw materials to water solvent 1/60, extraction temperature 500C, for 60 minutes, obtained the highest TPC and TFC contents of 0.55^a±0.006 (mgGAE/g) and 0.58^b±0.02 (mgQE/g). During the fermentation process, the total acid content increased from 1.98 to 4.05, the pH decreased from 4.70 to 2.93 with Brix=18°Bx within 7 days. The process of processing fermented noni leaf juice from Lactobacillus Acidophilus strain to produce a product with the best sensory value has been determined.

Keywords: noni leaf, *Lactobacilus Acidophilus*, drying, flavonoid, polyphenol

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Registration number: P061

Comparative Analysis of Physicochemical Properties of Walnut Pastes from Different Brands and Production Batches

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Abstract: Walnuts are economically important crops for the food industry. The kernels are consumed fresh or roasted, either on their own or as an ingredient in other foods. In recent years, demand for pure nut butters has increased, including walnut butter. Consuming walnuts has numerous positive physiological effects. In our research, we compared three different brands of Hungarian walnut paste, each with three different production dates. Our samples were Grapoila gourmet walnut cream, Nébar natur pro 100% walnut cream, and Valentine's 100% gourmet walnut cream. During the comparative analysis of a total of nine nut butters made from presumably different raw materials, produced at different times, and from different brands. The following tests were performed as moisture content measurement, oil spread, color measurement, measurement of oil separation during storage, amplitude sweep, viscosity measurement, and particle size determination.
Based on the results the Valentine's brand samples with lower moisture content had higher oil spread values, while Nébar nut butters with high moisture content had the lowest oil spread. The color of the nut butters of the same brand was almost identical, however, the V1 sample differed significantly from the other Valentine's brand nut butters, which were much more yellow than the other two samples. All three brands released oil at different rates and in different quantities during storage for the three nut butters tested, but this was observed most slowly and to the least extent in Valentine's products.
The flow point values of amplitude sweep were highest for samples Grapoila1 and Grapoila2, while the lowest values were observed for the Valentine's product. It is important to note that the Nébar products showed very different values from each other. The Nébar products had the highest viscosity, while in the case of Valentine's brand nut pastes, one sample differed significantly from the other two samples tested. No significant differences were found in the particle size of the pastes; however, the maximum diameter of the particles differed between products of the same brand.
Based on our results, we concluded that none of the brands examined were able to ensure consistent particle size and other physical characteristics during production, which is presumably due to the varying quality of the walnuts used as raw material. We also found that any heat treatment of the walnuts prior to grinding - which does not have to be indicated on the packaging - may have an impact on the parameters examined.

Keywords: nut butter, rheology, amplitude sweep, viscosity

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Registration number: P062

Handheld Near Infrared Spectroscopy as a Tool for Assessing Fruit Extract Enrichment in Juices

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Abstract: Due to the growing demand for nutrient-rich products, effective methods are needed to ensure consistent quality and composition of fortified food. The fortification of fruit juices with plant extracts like cranberry (CBE), grapeseed (GSE) or pomegranate (PGE), provides valuable antioxidants, vitamins, and minerals, while also enhancing sensory properties and supporting adequate fluid intake. However, traditional quality control methods based on empirical traits (e.g., colour properties, acidity, soluble solid content) are limited in accurately qualifying fortified products.

This study explores the use of near infrared spectroscopy (NIRS), as a rapid, non-destructive analytical technique, to detect plant extract fortification in sour cherry juices. CBE, GSE or PGE extracts were added to sour cherry juices in six concentration levels (ranging from 0 to 2.5 g/100 mL), in simple, binary, and ternary combinations. Spectral data were recorded using a handheld transreflectance NIR instrument. Chemometric models, including partial least squares regression (PLSR) focusing on the 1350–1850 nm range, were developed to predict extract addition and concentration. The models were tested using "leave-one-sample replicate-out" validation.

The modelling of fruit juice enrichment resulted in high prediction accuracies. All considered, in the juice blends, CBE was predicted with Rcv^2 of 0.89-0.98 and RMSEcv of 0.04-0.19 g/100 mL, GSE with Rcv^2 of 0.94-0.98 and RMSEcv of 0.04-0.15 g/100 mL, and PGE with Rcv^2 of 0.91-0.98 and RMSEcv of 0.04-0.16 g/100 mL during model validation. The study confirms the potential of near infrared spectroscopy as an efficient tool for evaluating fortified juices, facilitating healthier beverage innovations and addressing consumer demand for safe, high-quality products.

Keywords: near infrared spectroscopy, fruit juices, fortification, chemometrics

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Registration number: P064

Studying Cascara as a New Ingredient in Alcoholic Beverages

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Abstract: Since February 2022, *Coffea arabica L.* and/or *Coffea canephora Pierre* ex *A. Froehner* (also known as cascara) and its infusion are considered novel foods, and as a result, they have been added to the EU list of authorized foods established by Commission Implementing Regulation (EU) 2017/2470. According to Commission Implementing Regulation (EU) 2022/47, this by-product of coffee processing originating in third countries (coffee-producing countries) may be used as an infusion (including ready-to-drink beverages) and as an ingredient in flavored beverages.
I intend to use cascara as a new ingredient in a range of spirits, fermenting it together with fruit juice and then distilling it to produce spirits. The applied fruit juices, made from concentrate, were based on apple and sour cherry, with cascara serving as a kind of flavoring agent. The dry matter content of fruit juices was 12.5 m/m%. The amount of cascara in each setting was 5%, 10%, and 20%. Controlled fermentation technology was used. After fermentation laboratory distillation system was applied to gain heart fraction of distillate. In the case of apple juice, we achieved better yields. The amount of cascara did not affect the yield. Its sensory significance increased proportionally with the amount of cascara. Based on sensory assessment, a 10% addition is sufficient.

Keywords: cascara, spirits, alcoholic beverage ingredient

Acknowledgements: The research was supported by Horticultural Science Doctoral School.

Registration number: P065

Investigation of Egg White Based Gummy Candies

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Abstract: Egg white is considered one of the most bioavailable protein sources; however, its functional properties can be further enhanced when combined with other protein sources. In this study, we aimed to investigate the effects of protein enrichment on the physicochemical and sensory properties of a gummy candy-like product formulated with egg white protein as the primary ingredient. Textural attributes were evaluated using a TA.XT texture analyzer applying the Texture Profile Analysis (TPA) method, while color parameters were measured in the CIELab color space using a Konica Minolta CR-400 colorimeter. Sensory evaluation was conducted by a 12-member untrained panel assessing five attributes on a 10-point hedonic scale. Results indicated a statistically significant relationship between increasing protein content and changes in textural parameters, which could be described using mathematical modeling. Moreover, protein content significantly influenced the lightness (L*) value of the product. Sensory analysis showed that the type and amount of added protein had a notable effect on perceived taste and texture. Overall, the findings demonstrate the feasibility of producing a protein-enriched gummy product with 10–15% protein content without adversely affecting consumer-relevant quality attributes.

Keywords: protein enrichment, functional food

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Hydroxypropyl Cellulose-mediated Chitosan Bilayer Coatings with Improved Post-harvest Preservation Performance via Enhanced Wettability and Interficial Adhesion

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Abstract: To enhance the interfacial adhesion between polysaccharide films and fruit surfaces, this study utilized hydroxypropyl methylcellulose (HPMC) as an intermediate layer to systematically investigate its regulatory mechanism on the wetting and spreading behaviors of chitosan (CS) films on fruits with distinct surface properties (mandarin oranges, loquats, and cherry tomatoes), as well as their preservation effects. The study first characterized the surface properties of the fruits, then evaluated the impact of HPMC treatment on the wetting and spreading performance of CS film solutions. Finally, the effects of the films on fruit quality maintenance were comprehensively assessed. Results demonstrated significant differences in surface roughness and chemical composition among the three fruits, with surface free energy ranked as follows: mandarin oranges > cherry tomatoes > loquats. HPMC treatment reduced the contact angle of CS film solutions on all three fruit surfaces to below 50°, enhancing the spreading coefficient by up to 81.2%, thereby markedly improving wettability and interfacial adhesion strength. The dual-layer membrane structure effectively suppressed delamination and peeling of CS films, prolonging preservation duration: after 18 days of storage, the decay rates of loquats, mandarin oranges, and cherry tomatoes were reduced to 16.7%, 33.3%, and 48% of the control group, respectively. Concurrently, fruit firmness, ascorbic acid content, and soluble solids were better preserved. The findings confirmed that HPMC improves the interfacial adaptability of polysaccharide films to fruits with diverse surface characteristics via amphiphilic molecular interactions, offering an innovative technical pathway for the large-scale application of natural film coatings in postharvest preservation of fruits and vegetables.

Keywords: hydroxypropyl methylcellulose, chitosan, coating preservation, wettability, interfacial adhesion

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Effect of NaCl Stress Germination on Microstructure and Physicochemical Properties of Wheat Starch

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Abstract: Germination can enhance the nutritional properties of wheat and improve its bioavailability, while simultaneously altering the microstructure of wheat starch, which further impacts its physicochemical characteristics. This work investigated the synergistic effects of germination and NaCl on the microstructure and physicochemical properties of wheat starch by applying a 60 mmol/L NaCl solution. The results indicated that germination significantly influenced both the chemical composition and microstructure of wheat starch, as evidenced by cracks and pores, variations in size, crystallinity, lamellar order, hydrogen bond disruption, branching degree, and molecular weight distribution. These changes affected the pasting and gel properties of the starch. The NaCl treatment enhanced enzyme activity, resulting in a higher phenolic content at 48 h, rougher and irregular surfaces, smaller dimensions, and increased degree of heterogeneity. Over time, the NaCl-induced treatment led to a greater structural disruption, including reduced crystallinity, damage the lamellar structure, and the breaking of hydrogen and glycosidic bonds. The germinated starch exhibited improved solubility and swelling power, thereby altering its pasting, gel, and thermal properties. Overall, this study provides valuable insights for the application of germinated wheat in food.

Keywords: NaCl stress, germination, starch, multiscale structure, gel properties

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Registration number: P069

Modulating the Interfacial Structure of Peanut Oil Body Emulsions Through Different Extraction Methods: Implications for Curcumin Delivery

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Abstract: Recently, the growing consumer demand for natural and sustainable food has driven significant research interest in oil bodies (OBs)—plant-based lipid storage organelles. However, there have been few studies compared the delivery related properties of OBEs obtained by different extraction methods. This study investigated the microstructure, interfacial properties, and curcumin (Cur) delivery performance of peanut oil body emulsions (OBEs) prepared via aqueous, enzyme-assisted, heat-treated, water-washed, and $NaHCO_3$ methods. Peanut OBEs extracted by enzyme-assisted (E-OBE) and heat-treated (H-OBE) methods exhibited loose three-dimensional network structures with high protein contents (1.56% and 1.65%) and apparent viscosity. $NaHCO_3$-extracted OBE (N-OBE) showed a tightly packed structure featuring high lipid content (75.56%), elevated storage modulus, and the smallest particle size (3.91 μm). Exogenous proteins-rich E-OBE and H-OBE (lipoxygenase, Ara h1, arachin, and conarachin) and oleosin-rich N-OBE achieved higher Cur encapsulation efficiencies (EEs 87.38%, 84.33%, 86.35%) than aqueous-extracted OBE (62.10%). $NaHCO_3$ method promoted β-sheet structure formation (15.18 %) in oleosins, enhancing hydrophobic interactions between the lipid or phospholipid and oleosins. Furthermore, N-OBE demonstrated superior environmental stress resistance (77.94 % retention after 48-h UV irradiation, 96.06% and 93.57% retention after 2-h heating at 60 ℃ and 90 ℃, respectively) and high Cur bioaccessibility (32.40%). These findings provided valuable theoretical foundations for developing peanut OBE-based delivery systems.

Keywords: peanut oil body, extraction methods, microstructure, interfacial properties, curcumin delivery

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Physicochemical Properties of Wheat Granular Flour and Quality Characteristics of the Corresponding Fresh Noodles as Affected by Particle Size

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Abstract: Wheat granular flour (GF) is highly nutritious due to low machining precision but the large particle size leads to poor processability. By reducing the particle size from 224 μm to 62 μm without sifting in the present study, flour chemical compositions, dough rheology, and fresh noodle qualities were tracked, and the underlying mechanism was preliminarily explored through the changes in corresponding dough's gluten quality, water–solid interaction, and microstructures. Results indicated that only moisture significantly decreased and damaged starch signally increased with the reduction in particle size. Compared with refined flour, all the GF samples had higher ash, dietary fiber, beneficial lipids, and intact endosperm cells. Noticeably, the GF samples with particle size from 91 μm to 68 μm developed higher gluten quality and quantity, stronger water-solids interplay, and optimal gluten networks; therefore, the resultant doughs displayed a super balance between viscosity and elasticity. Accordingly, the noodles possessed excellent consumer acceptability with higher water absorption, lower cooking loss, and higher smoothness and chewiness after optimum cooking. These observations provide a theoretical basis for wheat flour processing and the development of healthier wheat-based noodles using the GF as raw material.

Keywords: wheat granular flour, particle size, viscoelasticity, gluten networks

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Non-invasive Analysis of Artificial Light Exposure Effects on Potatoes

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Abstract: During the postharvest storage period of potatoes, direct exposure to sunlight or artificial light has been demonstrated to have a negative effect on the quality of the tubers. Light exposure results in the formation of chlorophyll within the tubers, as observed on the surface of the crop in the form of greening. However, this change is not only a difference in colour, but also the formation of alpha-chaconine and alpha-solanine. These substances are toxic glycoalkaloids that are harmful to human health when consumed.
The main objective of our experiment was to examine the greening of potato samples associated with solanine formation using non-destructive methods. The potatoes were exposed to different light conditions: they were illuminated with a high-intensity photo lamp and a conventional ceiling LED lamp, while the control group was stored under dark conditions. The alterations in quality were observed using non-destructive chlorophyll fluorescence imaging and acoustic and impact stiffness methods during more than three weeks of storage.
Based on the results of the experiment, significant differences were found between the quality parameters of the control group and the two groups treated with different light intensities. The chlorophyll fluorescence characteristics (F_0, F_m, F_v, F_v/F_m) showed less alteration during storage in the control group than in the illuminated samples. Additionally, the growth in all chlorophyll fluorescence parameters showed clearly and sensibly the chlorophyll formulation related greening phenomenon development if compared to control, but with a dependence of the applied light intensity. The stiffness of the samples decreased continuously during storage in all three groups unaffected by the illumination method and the applied light intensity.

Keywords: solanine, chlorophyl fluorescence, illumination, greening, postharvest

Registration number: P073

Evaluation of Dietary Supplements, the Role of Micronutrients in Pregnancy

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Abstract: In some specific conditions, such as during pregnancy, the need for many micronutrients is increased. In such cases, the proper intake of vitamins and minerals has an impact on the health of the expectant mother and the newborn, because it can profoundly influence embryonic and foetal development and the outcome of pregnancy. For this reason, supplementation of certain nutrients from conception to birth is essential importance, as optimising the intake of vitamins and minerals is the most effective way to prevent micronutrient deficiencies. Among the solutions for hidden hunger during pregnancy, the use of prenatal vitamins and fetal protection supplements can be particularly crucial. However, limited information is available regarding the different chemical forms of nutrients in dietary supplements, their bioavailability, and whether the nutrients quantities contained within them align with local recommendations.
In our study, we collected multiple micronutrient supplements from the Dietary Supplement Label Database (DSLD) was developed by the Office of Dietary Supplements (ODS) at the National Institutes of Health (NIH) and from products notified in Hungary and currently available on the market. We then evaluated those containing vitamin B12, folate, iron, calcium, and vitamin D contents. Additionally, we used questionnaire method to assess dietary supplement consumption habits among pregnant women. This allowed us to gather information on the estimation of daily intake of vitamins and minerals from supplements and whether the dosages align with national recommendations, as well as the forms of vitamin and mineral substances in supplements commonly used during pregnancy.

Keywords: pregnancy, dietary supplements, micronutrients, bioavailability, online questionnaire

Registration number: P074

Comparison of Zearalenone-induced Changes in Hypothalamic Estrogen, Thyroid, and PPARγ mRNA Receptor Expression with Concurrent Mitochondrial Respiration Rates *in vivo* in Mice

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Abstract: Endocrine-disrupting chemicals (EDCs), including certain mycotoxins, interfere with neuroendocrine regulatory pathways, disrupting metabolic and hormonal homeostasis. Most current knowledge of these effects stems from studies involving prolonged EDC exposure—ranging from days to weeks or more. In this *in vivo* study, we investigated the effects of zearalenone (ZEA) on the mRNA expression of estrogen receptors (ERα, ERβ), thyroid hormone receptors (TRα, TRβ), and peroxisome proliferator-activated receptor gamma (PPARγ) in the hypothalamus of mice following a very short exposure period (6 hours), aiming to detect immediate cellular responses and concurrent morphological changes in mitochondrial dynamics.

We further assessed whether ZEA exposure rapidly affects mitochondrial respiration, a key indicator of cellular metabolic activity. Mice were given a single intraperitoneal injection of ZEA at three environmentally relevant doses. Six hours post-treatment, no significant changes were observed in the expression of ERα, ERβ, TRα, or TRβ. However, PPARγ expression was markedly affected by the lowest dose (40 µg). Although changes in receptor mRNA levels did not directly correlate with mitochondrial respiration states (St3–4), the observed dose-response trends suggest that early metabolic alterations in the hypothalamus may arise from integrated signaling effects, rather than direct transcriptional modulation of ER and TR genes.

Mitochondrial morphology analysis showed a dose-dependent reduction in mitochondrial number in AgRP neurons, while POMC neurons remained unaffected. All tested doses led to rapid mitochondrial swelling, indicated by an increased matrix-to-total mitochondrial cross-section ratio. These results underscore a rapid, functionally linked mitochondrial response to ZEA, suggesting that even brief EDC exposure can alter hypothalamic energy metabolism within hours. This metabolic disruption likely contributes to the well-characterized endocrine effects seen with prolonged EDC exposure and appears to involve early changes in PPARγ expression and mitochondrial dynamics.

Keywords: endocrine disruptor, nuclear hormone receptor, mitochondrial respiration, hypothalamus, zearalenone

Acknowledgements: This work was funded by the Hungarian Scientific Research Fund, OTKA K-115613 (to Attila Zsarnovszky) and was partly funded by the Ministry of Human Resources, EFOP-3.6.3-VEKOP-16-2017-00005. This work was also supported by the Agribiotechnology and Precision Breeding for Food Security National Laboratory, Institute of Physiology and Nutrition, Department of Animal Physiology and Health, Hungarian University of Agriculture and Life Sciences, 7400 Kaposvár, Hungary) no. RRF-2.3.1-21-2022-00007 (to Attila Zsarnovszky). Project no. RRF-2.3.1-21-2022-00001 has been implemented with the support provided by the Recovery and Resilience Facility (RRF), financed under the National Recovery Fund budget estimate, RRF-2.3.1-21 funding scheme.

Registration number: P076

Exploring Potential of Enhancing Sweetness in Oat-based Cereals with Spices and Natural Flavourings

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Abstract: Oat-based breakfast cereals are valuable part of the balance diet offering many nutritional benefits. One of the challenges in breakfast cereal industry is the reduction of white sugar content as well as the formulation of new products considering health and sustainability aspects. For many consumers it is important to consume tasty products with clean label. In this regard, dried dates are considered a promissory source of natural sugars to be used in the production of healthier options of breakfast cereals, with added benefit of containing essential nutrients and dietary fibres. Aim of the study was to explore potential sweetness enhancing properties of spices and natural flavourings in oat-based breakfast cereals with dates prepared with conventional cow-milk and low-sugar plant-based milk.
Four samples of Oatmeal and 5% date were prepared as follows: 1) Control; 2) with Cinnamon; 3) with Vanilla; 4) with Cinnamon and vanilla combination. Sugar content in all the samples was 5 g/100 g. To analyse the intensity of sweetness and its acceptability sensory evaluation was performed by methods of Flavour profile (ISO 6564) and Consumer liking test. Sensory panel consisted of 8 trained panellists, and consumer panel consisted of 32 heavy user consumers (88% F). Samples were prepared with plant-based almond milk (sugar content 0.1 g/100 mL) and cow milk (2.8 % mf, sugar content 4.6 g/100 mL). Samples were coded and randomized, data was collected in Eye Question v. 5.12 (2025) and analysed by EyeOpenR.
Sweetness of the tested samples was in the range of medium intensity. When compared to Control addition of flavourings and spices significantly intensified the sweetness in both types of milk. Samples with cinnamon and cinnamon and vanilla combination however had higher sweetness intensity then vanilla sample. Consumers rated all samples relatively high on liking scale, without significant differences. How ever cinnamon and cinnamon-vanilla combination were rated higher than other samples, and samples prepared with cow milk are slightly more liked than plant-based milk.
Addition of cinnamon or the combination of cinnamon and vanilla can be successfully used for enhancing perception of sweetness in the oat-based cereal products contributing to reduced sugar intake in the diet. Oatmeal prepared with plant-based milk with low sugar content retains high acceptability while offering healthier and sustainable alternative.

Keywords: breakfast cereals, sugar reduction, spices, flavour profile, consumer testing

Acknowledgements: The research was supported by Podravka Ltd.

Registration number: P077

Investigation of Biogenic Amine Formation in Oyster Mushrooms under Different Treatments

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Introduction: Edible mushrooms like *Pleurotus ostreatus* (oyster mushroom) offer promising potential as sustainable protein source due to their rich content of nitrogenous compounds such as amino acids (AA). In addition to protein-building amino acids, free amino acids (FAA) and biogenic amines (BA) enhance nutritional value and sensory qualities; however, BAs can constitute a food safety problem. Understanding the factors that promote or inhibit the conversion of FAA to BA is critical for regulating BA production during mushroom processing and fermentation.
Aim: This research aimed to investigate the relationship between precursor amino acids and the corresponding BAs in differently treated oyster mushrooms.
Materials and Methods: *Pleurotus ostreatus* (oyster mushroom) were purchased from a local market in Hungary. Different pre-treatments were done, such as blanching (3 min, 100 °C); steaming (3 min, 100 °C); oven cooking (3 min, 100 °C); microwave (3 min, 85 °C, 100 W); HHP (3 min, 300 MPa, 20 °C); ultraviolet (15 min, 20 °C, 30 W, 312 nm). Amino Acid Analyzer was used to analyse FAA and BA content for both fermented and non-fermented samples. Correlation analyses were performed in SPSS.
Results: The free amino acid and biogenic amine content of fermented and non-fermented oyster mushrooms varied significantly due to different pre-treatments. We have found significant positive correlation only between tyrosine and tyramine (Spearman's rho = 0.41, $p < 0.05$), indicating that higher tyrosine levels tend to be associated with increased tyramine formation in oyster mushrooms. Tyramine formation correlates strongly with its precursor in the fermented samples, compared to non-fermented samples, indicating that microbial activity has a dominant influence on precursor abundance. Strong correlations ($\rho = 1.00$) were found in high hydrostatic pressure and oven-cooked treated samples, while UV-treated and fresh samples had strong negative correlations ($\rho = -1.00$). The lack of significant correlations between the other precursor AA and biogenic amine pairs indicates that precursor abundance alone is not a good predictor of BA formation. These findings highlight the complex and treatment-dependent nature of BA formation, which is influenced by microbial dynamics, enzyme activity, and treatment-specific effects. Optimizing these factors is critical to reducing BA risks in mushroom-based foods.

Keywords: oyster mushroom, biogenic amines, free amino acids, tyrosine–tyramine, fermentation

Acknowledgements: The authors acknowledge MATE University's Doctoral School of Food Science and the Hungaricum Scholarship for support.

Registration number: P078

Assessment of Drinking Water Quality and Identification of Pollution Sources in a Region of Peja in Kosovo

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Abstract: Groundwater sources near inhabited areas and lands are often sensitive to pollution by toxic elements including changes in physical, chemical and microbiological parameters. This study was conducted in the Peja region at 5 sampling sites in three seasons during the years 2024 and 2025. The results show that groundwater is polluted by bacteria *Escherichia coli*, *Streptococcus*, *Enteroccocus*, coliforms 37 °C, coliforms 22 °C and *Pseudomonas*. This indicates that they are outside the normal local and international legal norms, also based on the Pollution load index (PLI) it was proven that the water is polluted, the main pollutants are agricultural activities, wastewater. This study requires urgent mitigation measures and advice to local populations to take measures to reduce pollution.

Keywords: bacteria, water quality, analysis, physical-chemical

Registration number: P079

Pigment Profile and Color Characteristics of 93 Honeys from Diverse Botanical and Geographical Origins

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Abstract: Color and pigment content are important quality indicators of honey and are often associated with botanical origin and bioactive compound profiles. This study aimed to evaluate the relationship between color (measured in mm Pfund), lycopene, and β-carotene content in 93 honey samples of different botanical and geographical origin. The honeys were analyzed spectrophotometrically in 2024, and data were expressed in mg/kg for carotenoids.
The color of honey samples ranged widely, from –19.9 to 327.5 mm Pfund, covering nearly colorless to very dark honeys. Lycopene levels ranged from 0.81 to 4.45 mg/kg, and β-carotene from 1.22 to 6.73 mg/kg. A strong and highly significant correlation was observed between lycopene and β-carotene contents ($r = 0.96$, $p < 0.001$), indicating a co-occurrence of these carotenoids in pigmented honeys. In contrast, neither lycopene nor β-carotene showed meaningful correlation with honey color ($r < 0.1$), suggesting that pigments other than carotenoids—such as phenolic compounds or Maillard products—are more likely responsible for color variation.
Botanical origin appeared to influence both color and pigment content, whereas geographical origin (local vs. imported) showed no major impact on these parameters. Certain floral types (e.g. chestnut, honeydew) tended to produce darker honeys, while lighter honeys such as acacia showed consistently lower pigment levels.
These results indicate that honey color alone is not a reliable indicator of carotenoid content. However, the co-occurrence of lycopene and β-carotene suggests common botanical sources or shared floral traits. This pigment profile analysis contributes to the understanding of honey composition and supports further studies on the role of botanical origin in determining honey's nutritional and antioxidant properties.

Keywords: honey color, lycopene, β-carotene, botanical origin, pigment analysis

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Registration number: P080

Nutritional Potential and Safety Challenges in Rye Cultivation and Consumption

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Abstract: Rye (*Secale cereale* L.) is among the most significant cereals and, thanks to its good adaptability, is successfully cultivated and in areas with unfavorable climatic conditions for other cereals. However, rye cultivation faces the problem of contamination by mycotoxins produced by fungi of the genera *Fusarium* and *Aspergillus*, as well as ergot alkaloids produced by the fungus *Claviceps purpurea*, which pose a significant risk to human and animal health. Therefore, strict quality control and the application of preventive agronomic measures during cultivation, harvesting, and storage are crucial to prevent contamination and ensure food safety. Rye grain is rich in various nutrients that significantly contribute to its nutritional value. Among the important components are carbohydrates (especially starch), proteins, fats and dietary fibers, with complex polysaccharides like arabinoxylans being particularly notable. It also contains numerous vitamins, minerals, and other beneficial plant compounds and antioxidants. Due to its rich composition, incorporating rye into a regular and balanced diet, combined with a healthy lifestyle, may help reduce the risk of certain chronic diseases such as obesity, diabetes, inflammatory bowel diseases, cardiovascular diseases, and some types of cancer.
To increase the availability of nutritious rye-based products, further research and development of new products and are technologies needed, along with promoting rye as an important part of a balanced diet. Involving agricultural, nutrition and health experts is crucial to ensure food safety and raise awareness of rye's nutritional benefits.

Keywords: rye production, mycotoxins, arabinoxylanes, health benefits

Registration number: P081

Health Effect of Plant-based Diet in Overweight and Obesity

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Abstract: *Background* Nutrition is particularly important in the management of chronic diseases, especially among people living with overweight or obesity, and there has recently been growing interest in the health benefits of plant-based diets.
Objective The main aim of this systematic review and meta-analysis was to investigate from randomized control trials on the health effects of plant-based diet compared to omnivorous diet in people living with overweight and obesity.
Methods We searched the Medline, Embase, Cochrane CENTRAL databases and two clinical trial registries (WHO ICTRP, ClinicalTrials.gov) from inception to January 3, 2024. We included randomized controlled trials (RCTs) involving people with overweight or obesity. Any plant-based diet lasting at least 7 days was an eligible intervention if it was compared with an omnivorous or usual diet or with other plant-based diet.
Results Of 2663 studies, we included 10 RCTs. We found five ongoing studies and two abstracts. A total of 732 participants aged 15–75 years were included. A plant-based diet significantly reduced BMI (MD: -0.97; 95% CI -1.93 to 0.00, n = 700, $p < 0.0001$, $I^2 = 78.9\%$, very low certainty evidence) and LDL levels (MD: -7.11; 95% CI -12.74 to -1.48, n = 637, p = 0.6492, $I^2 = 0.0\%$, low certainty evidence). No significant differences were seen in the effects of different diets on body fat mass, systolic blood pressure and diastolic blood pressure, total cholesterol, triglyceride, glycated haemoglobin, insulin level, insulin sensitivity. We observed significant subgroup effects in favour of low fat vegan diet compared control diets. Dietary interventions lasting 14 weeks or more showed better results in reducing body weight, BMI, LDL cholesterol levels and glucose levels.
Conclusion The included studies defined plant-based diets in broader or narrower contexts. Plant-based diets are an option that may have a positive effect on weight change, BMI, and certain lipid and glucose parameters in people living with overweight or obese, especially when followed for longer periods of time.

Keywords: plant-based diet, obesity, health effect, systematic review and meta-analysis

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Registration number: P083

Insight into the underlying mechanism of functional Pediococcus acidilactici SWU-HX39 in alleviating hyperuricemia

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Abstract: Hyperuricemia (HUA) is a major challenge in the field of public health, and long-term use of traditional drugs can easily lead to addiction and some side effects such as hypersensitivity syndrome and liver and kidney damage. While several studies have proved that some probiotics are able to reduce serum uric acid (UA) level. In this study, we found Pediococcus acidilactici SWU-HX39 (HX39) has superior anti-HUA ability in vitro, and the therapeutic potential of HX39 in a HUA model of a high purine diet was also evaluated in vivo, focusing on its regulatory effects on liver xanthine oxidase (XOD) activity, serum proinflammatory cytokines and lipopolysaccharides (LPS) content. The results of the HUA mice model showed a significant reduction of 49.8% in serum UA and 46.76% XOD activity by HX39 compared with the control group. Moreover, HX39 regulated the composition of the intestinal flora in mice, with significant decreases of the Bacteroides abundances and Parabacteroides. While Eubacterium_brachy_group and norank_f_Ruminococcaceae abundances were increased. Further analysis showed that it helped to alleviate inflammation and improve kidney metabolism. It was noticed that significantly reduced kidney damage in mice with HUA. These results may explain the potential mechanism of functional probiotics in alleviating HUA symptoms. Also, probiotic HX39 has promising applications in the treatment of HUA complications.

Keywords: hyperuricemia, probiotics, uric acid, gut microbiota, metabolomics

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Pediococcus acidilactici XZ106 Mitigates type 2 Diabetes Through Gut-Brain Axis Modulation via AMPKSignaling Pathway

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Abstract: Probiotics show significant potential in type 2 diabetes mellitus (T2DM) management, yet their limited bacterial strain diversity and unclear mechanisms of action constrain clinical translation. This study isolated three *Pediococcus acidilactici (P.acidilactici)* strains exhibiting hypoglycemic potential from traditional Xinjiang yogurt and subsequently evaluated their efficacy in T2DM mouse model. Through multi-omics analyses, mechanisms of action were elucidated. Notably, experimental results demonstrated that strains XJ335 and XZ106 reduced fasting blood glucose levels by 12.20% and 29.29%, respectively (p<0.01). Furthermore, XZ106 significantly elevated plasma concentrations of glucagon-like peptide-1 (GLP-1) (65.31%, p<0.01) and interleukin-10 (IL-10) (94.03%, p<0.01), indicating superior regulatory efficacy. Mechanistic investigations revealed that XZ106 ameliorates hyperglycemia by remodeling gut microbiota composition, modulating metabolite expression, and regulating brain-gut axis-associated metabolic pathways. Specifically, these effects are mediated through activation of the AMPK/IRS2/AKT2 signaling pathway. This study presents a intervention approach using XZ106 for T2DM, providing novel microbial resources for probiotics-based therapeutic strategies against diabetes.

Keywords: Type 2 Diabetes Mellitus, *Pediococcus Acidilactici*, Gut Microbiota, Insulin Resistance, Brain-Gut Axis

Acknowledgements: This work was supported by the National Key Research and Development Program of China (2024YFE0213900 and 2022YFE0120800).

Registration number: P085

Determination by HPLC of Vitamin C and Flavonoids in Fresh Tomatoes Available in Large Shopping Centres of the Hungarian Capital Budapest

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Abstract: Functional properties of fruits and vegetables are due to occurrence of bioactive phytonutrients, which has high antioxidant activity. Anong bioactive compounds, vitamin C and polyphenols received special interest from human nutrition point of view because they are highly reactive antioxidants. Fresh tomatoes are available in the markets all the year, but their content of bioactive compounds differ depending on the climate of the season, genetic factor, and horticultural technology. In Hungary, during winter period, fresh tomatoes are produced locally and imported from different countries with higher prices than that of those produced in summertime with outdoor technology.
The main objective of the present work is to determine and evaluate the content of vitamin C and polyphenols in most of tomatoes available in the biggest markets at different periods of wintertime using recently developed HPLC protocols that provided simultaneous determination of L-ascorbic acid and polyphenols.
The variation between local and imported tomatoes as well as between the different types was analysed and tabulated. The cocktail tomatoes from some EU countries such as Italy was found to be the richest in the level of both vitamin C and polyphenols. As a recommendation, the prices of wintery tomatoes should coincide with the real content of bioactive compounds.

Keywords: tomatoes, bioactive compound, liquid chromatography

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Physico-chemical Analysis of Honeys from Transylvania

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Abstract: Honey is a sweet, viscous liquid produced by bees from plant nectar or the sugary secretions of sap-sucking insects. The production of commercially available honey begins with the bees, which collect nectar into the hive frames and partially ferment it. Beekeepers then extract the honey during the uncapping and centrifugation process. After storage, while honey naturally crystallizes, it is usually heated before being packaged for sale. The methods applied during these steps all influence the quality of honey that reaches the consumer.
According to statistics from the Romanian Ministry of Agriculture and Rural Development, approximately 30,000 tons of honey are produced annually in Romania, with an average consumption of 1.2 kg per person per year. Commercially marketed honey must comply with the limits established in the SR 784-3/2009 Romanian quality standard and the European Union's Regulation 2001/110/EC.
The aim of this study was to determine how 100 honey samples collected from local markets conform to the quality parameters specified in these standards. The sensory properties, moisture content, invert sugar content, hydroxymethylfurfural (HMF) content, diastase activity, electrical conductivity, and possible adulteration with industrial glucose were analyzed.
The results indicate that most of the samples met the quality criteria set by the standards; however, industrial glucose was detected in 13 samples, and in one sample the HMF content exceeded the permitted concentration of 5 mg/100 g.

Keywords: honey, quality, HMF, standards

Registration number: P087

Pesticide Detection on Citrus Peel by a Fluorescence-based Biosensor

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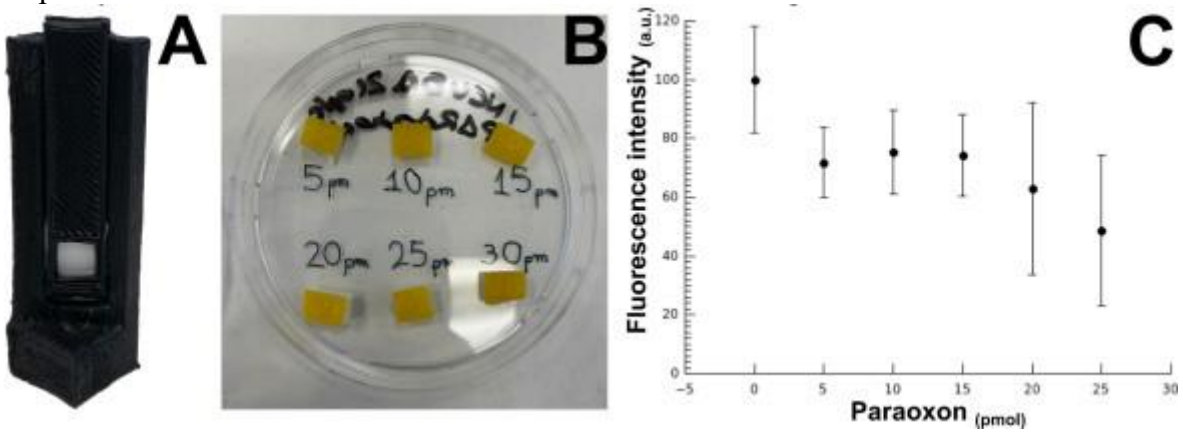
Abstract: Food safety is a primary challenge in modern societies, as both biological and chemical contaminants can pose serious risks to human health, ranging from mild illness to life-threatening conditions. Among chemical hazards, pesticides are of particular concern since their use in agriculture remains unavoidable and their residues can be found in crops and derivatives. Over the past decades, conventional analytical techniques such as LC- and GC-MS have significantly advanced, enabling the identification of multiple pesticides within minutes. Nevertheless, these methods still rely on complex sample preparation, costly instrumentation, and highly trained personnel. In this context, biosensors represent a promising alternative: portable, fast, sensitive, low-cost, and user-friendly, also allowing real-time monitoring. We developed a biosensing device based on esterase 2 from A. acidocaldarius (EST2) engineered to bind a fluorescent probe, such as IAEDANS, for the direct detection of organophosphate pesticides (OPs). A 3D-printed poly(lactic acid) (PLA) adapter, compatible with different analytical devices, and a membrane support were designed to accommodate a nitrocellulose membrane onto which the bioreceptor is immobilized (Fig. 1A). The development of a specific support assured the stability and the accuracy of the nitrocellulose membrane location into the adapter.



The system was tested on citrus peel samples spiked with paraoxon (Fig. 1B), monitoring fluorescence quenching of EST2-IAEDANS complex upon OP binding. Quenching was observed at concentrations as low as 16,7 nM, with a LOD and LOQ of 1,44 pmol and 4,37 pmol, respectively (Fig. 1C). These results demonstrate the potential of the proposed biosensor and open the way to further studies involving more complex matrices.

Keywords: Biosensors, organophosphate pesticides, citrus peel, fluorescence, 3D-printing

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Registration number: P088

Regulating the Quality and Starch Digestibility of Buckwheat-dried Noodles Through Steam Treatment

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Abstract: Pregelatinized buckwheat flour is often used to improve the quality of buckwheat noodles. However, the effect of steam treatment of buckwheat flour on noodles quality and starch digestibility is still unclear. In this paper, the quality and starch digestibility of buckwheat noodles were modulated by the addition of partially gelatinized white buckwheat flour (WBF) treated with steam. The degree of gelatinization (DG) in starch increased (11-78%) with the increase of moisture content during steam treatment. As DG increased, the solubility and swelling power of WBF increased at room temperature, while the swelling power decreased at 100 °C. Meanwhile, the enthalpy decreased, the gelatinization temperature increased, and all pasting viscosities decreased. The supplement of 60% pregelatinized starch to wheat flour significantly improved the strength and stability of dough, as well as the cooking and texture characteristics of buckwheat noodles. As DG increased, the digestion degree of WBF increased. However, the lowest digestion degree (35.81) of noodles with WBF addition appeared at DG 40, indicated the trend for the digestibility of noodles was inconsistent with that of WBF. In summary, the addition of partially gelatinized starch can significantly reduce the digestibility of starch in buckwheat noodles by strengthening the structure of noodles.

Keywords: buckwheat, gelatinization degree, structure, noodle quality, starch digestibility

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Improvement of In vitro Digestibility of Rice Protein Isolates/Concentrates with Natural Surfactants.

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Abstract: Animal-based proteins are getting scarcer as consumer demand increases. Plant-based proteins, such as rice, serve as excellent alternatives with good nutritional properties and are also more environmentally friendly. Rice protein is dominated by glutelin, alongside albumins, globulins, and prolamin; but its poor solubility and digestibility due to its complex structure as well as hydrophobic interactions, crosslinking, and aggregation of glutelin limits its wider use. Our study demonstrated that addition of natural surfactants, lecithin and quillaia, at 0.01–0.2% (m/m) significantly improved solubility and in vitro protein digestibility (IVPD) of rice protein isolates and concentrates as they prompt the unfolding and changing of the protein structures, making it more accessible to digestive enzymes. These improvements were concentration-dependent, with the highest levels of surfactant yielding the greatest effect. This increase in rice protein digestibility is beneficial for making it easier to be absorbed in the human body, as well as improving the quality and characteristics (flavour, texture, mouthfeel) of food products. These findings suggest the adoption of natural surfactants as a promising strategy for enhancing nutritional and functional properties of rice protein for food applications.

Keywords: rice protein, protein digestibility, in vitro digestion, protein solubility, natural surfactants

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Registration number: P090

Development of a Functional Food Package Using Fonio (*Digitaria exilis*) Produced in Chad and Hungarian Ingredients

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Abstract: BACKGROUND: Fonio *(Digitaria exilis)* is a cereal grain grown in Chad, like millet and sorghum. In Chad, two main species are cultivated: White fonio is more common and has a slightly sweet taste, while black fonio is rarer and has a more pronounced flavor.

Figure 1 : White Fonio of Batha region (Chad)

Black Fonio of Guera region (Chad)

Fonio is an important food security crop in Chad because it is drought-resistant. It can be grown with little water, making it particularly suitable for arid regions like Chad. In short, fonio is a hardy cereal that can be grown year-round with a suitable irrigation system. It also represents a source of income for many farmers. Furthermore, fonio straw is generally used as fodder, which is highly valued by animals.

CHEMICAL COMPOSITION AND NUTRITIONAL VALUE OF FONIO: Fonio is an excellent source of energy as it contains approximately 80% carbohydrates (complex carbohydrates), 9% protein, and 3% fat. Fonio is rich in iron, containing approximately 8 mg of iron per 100 g, which is very high compared to other grains. Fonio contains carotenoids, particularly provitamin A. It is an important antioxidant for vision, skin, and the immune system. Fonio is a nutritious grain as it is rich in essential amino acids and calcium, and is particularly rich in fiber, making it an interesting feed supplement for livestock. Culinary

practices for fonio vary from region to region in Chad. In the southern part of the country, it is often eaten as a porridge with sauce, while in the northern part, it is preferred as couscous with dried meat.

Figure 3 : Harvesting fonio straw in Chad

CONCLUSION: Fonio can be grown on a large scale in Chad. There is strong potential for the development of this crop, which could contribute to improving food security for the population by conception of a functional food and also constitute an essential fodder in livestock feed and substantially increase farmers'.

Keywords: Chad fonio, chemical composition, nutritional value.

Acknowledgements: This research project is a consortium project between Hungarian institutions (MATE University, NEBIH) and Chadian Institutions (CECOQDA, IRED).

Registration number: P091

Assessing Consumer Acceptance and Market Opportunities for the House Cricket (*Acheta domesticus* Linneus) in the Food Market

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Abstract: The global pursuit of sustainable food production increasingly emphasizes alternative protein sources and circular economy principles. Within this framework, the house cricket (*Acheta domesticus* Linnaeus) represents a promising species due to its high nutritional value and its potential contribution to the valorization of food industry by-products. This study analyzes the controlled feeding of house crickets with such by-products, particularly spent coffee grounds, to enhance sustainability and resource efficiency. During the feeding experiment, the crickets' growth was monitored at defined intervals, and their weight and body size were measured. Furthermore, the research examines the integration of insect farming into circular food systems by converting organic waste streams into high-quality protein. Beyond biological and nutritional evaluations, the study assesses the environmental implications of utilizing coffee waste as a feed component, contributing to the advancement of sustainable circular insect production models. Ultimately, the findings aim to demonstrate the feasibility and potential advantages of valorizing food industry by-products through insect farming, thereby promoting the development of circular and sustainable protein sources for future food systems.

Keywords: alternative protein sources, house cricket, organic waste valorization, insect farming

Acknowledgements: The research was supported by Cornexi Food Ltd., and by Agricultural and Food Sciences Doctoral School of Hungarian University of Agriculture and Life Sciences

Registration number: P092

Molecular Identification and Biocontrol Activity of *Metschnikowia pulcherrima* Strains Isolated from Grapes (*Vitis vinifera*) Against Three Filamentous Fungal Species: *Aspergillus niger, Botrytis cinerea,* and *Penicillium expansum*

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Abstract: Mould, as it was stated by Craven et al. (2024), is a type of fungus that grows into thread-like multicellular structures called hyphae. These hyphae become visible on spoiled foods The moulds can produce mycotoxins – toxic metabolites posing health hazards in humans and other vertebrates (Das et al., 2025; Frisvad et al., 2018). Pesticides are considered the main route for preventing and combating fungal infections in plants; however, those chemicals are known to cause environmental and human developmental toxicity (Gupta and Gupta, 2025). Beneficial microorganisms have been demonstrated to effectively promote plant growth and development while providing protection against both biotic and abiotic stress, process known as biological control (Ramírez-Pool et al., 2024). Among them, *Metschnikowia pulcherrima* has been listed (Liu et al., 2025).

Our study aimed to identify the strains isolated from grape (*Vitis vinifera*) berries, leaves, and must, and to analyse their interactions with relevant mould species.

The strains isolated were grouped according to their morphological characteristics and pre-identified by MALDI-TOF MS, followed by molecular identification (sequencing of the ITS region rDNA). To observe the potential fungal growth inhibition of the isolates, the contact method was applied, however the effect of the cell-free supernatant (extracellular fraction) and the intracellular fraction was also investigated against three mould species: *Aspergillus niger, Botrytis cinerea,* and *Penicillium expansum.*

By means of MALDI-TOF MS analysis, it was found that the isolated strains belong to the species *Metschikowia pulcherrima*. Analysing the ITS sequences of the isolates they showed allelic character and only 3 of them could be identified with 99% homology (NCBI Blast) as *M. pulcherrima*. A phylogenetic tree was created using MEGA12 software, including the ITS sequence of several reference *Metschnikowia* species (downloaded from the UNITE database). All yeast strains isolated in this study could inhibit the growth of the three filamentous fungal species via direct contact. One of the strains demonstrated a higher inhibition capacity, therefore further studies were conducted with this strain to elucidate the mechanism of the inhibitory effect. No inhibition was seen when interaction was done solely with the extracellular or intracellular fractions, nor when cells and cells components were submitted to the 80 °C heat treatment. Further experimental steps are planned to understand the complex inhibitory process among *M. pulcherrima* and the mould species mentioned in this study.

Keywords: biological control; *Metschnikowia pulcherrima*; moulds

Acknowledgements: The research was supported by Stipendium Hungaricum Program, Tempus Foundation.

Registration number: P093

Antibiotic Resistance of *Escherichia coli* Isolated from Poultry: Future-oriented Solutions for Food Safety and Public Health

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Abstract: The poultry sector holds a vital place in the global food supply by providing an affordable and accessible source of animal protein. The increasing global consumption of chicken meat is largely attributed to its favourable nutritional profile, particularly its high protein, mineral, and fiber content, along with its low-fat levels. However, poultry production is also linked to the growing emergence and spread of antibiotic resistance (ABR). The therapeutic and unregulated use of antibiotics, including their incorporation into animal feed, has contributed to the development of antibiotic-resistant pathogens in meat products. In particular, the frequent use of antibiotics in poultry farming has led to a rise in resistance among *Escherichia coli* strains, posing a serious threat to food safety and public health.

This review focuses on the ABR of *E. coli* strains isolated from poultry and highlights the possible solutions related to this issue. To support this analysis, relevant articles containing the keywords "*E. coli*," "chicken meat/poultry," and "antibiotic resistance" were searched in the Scopus and ScienceDirect databases.

Recent studies reveal a high prevalence of antibiotic-resistant *E. coli* in poultry sources such as faeces, caecal content, litter, and meat. Resistance was most frequently observed against tetracycline (27%–98%), sulphonamides (8%–84%), ciprofloxacin (up to 66%), and streptomycin (29%–71%), with multidrug resistance reported in approximately 70% of isolates. Resistance genes such as *tetB*, *tetD*, *sul1*, and *groEL* were identified, often carried on plasmids. Key contributing factors included the overuse and easy accessibility of antibiotics, along with limited awareness of ABR among poultry farmers. These findings point out the urgent need for regular monitoring, controlled antibiotic use, and coordinated interventions aligned with the One Health approach.

In conclusion, adressing ABR requires a comprehensive and cooperative strategy, as highlighted by the One Health perspective. This approach emphasizes the interconnection between human, animal, and environmental health, highlighting that antibiotic misuse in one domain can adversely affect the others. The findings of this review demonstrate the importance of continuous monitoring of ABR in poultry, along with tighter control and more responsible antibiotic use in the sector. Effective control of ABR depends on multisectoral collaboration. In addition to surveillance, it is essential to implement strong regulatory frameworks, educate farmers on responsible use, restrict over-the-counter antibiotic access, and extend monitoring beyond end-product testing to ensure food chain safety.

Keywords: antibiotic resistance, food safety, food chain, pathogens, poultry

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Registration number: P094

Traditional Cheeses from Albanian and Kosovan Regions: A Reservoir of Novel Probiotic Lactic Acid Bacteria

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Abstract: Expanding the sensory and functional repertoire of cheese through novel microbial consortia is an exciting frontier in food microbiology. In this study, we explored traditional white cheeses from Kosovo and Albanian regions—produced from cow, sheep, and goat milk—to identify promising lactic acid bacteria (LAB) with potential probiotic properties.
A total of 28 cheese samples were collected and subjected to metagenomic analysis. From this, 14 bacterial species were isolated for further characterization using low-throughput functional assays. These included six Lactobacillus spp. (*L. brevis, L. curvatus, L. kefiri, L. paracasei, L. paraplantarum, L. plantarum*), four Enterococcus spp. (*E. durans, E. faecium, E. faecalis, E. italicus*), two Lactococcus spp. (*L. garvieae, L. lactis*), as well as *Carnobacterium maltoaromaticum*, *Leuconostoc mesenteroides*, and *Streptococcus salivarius ssp. thermophilus*. The results showed that these strains have interesting probiotic potential, with highest acidification value was recorded as 4.5 after 24 hours. Furthermore, 84 percent of the isolates showed proteolytic activity, while 78% showed positive lipolytic activity and the final biomass (measured in OD600) of the isolates ranged from 0.28 to 0.94, showing variable potential and growth. The few strains tested for their antifungal effect against *Aspergillus niger* exhibited no antifungal effect against this fungus. These findings underscore the microbial richness of traditional cheeses in the Albanian and Kosovan lands, and highlight their potential as sources of novel LAB for use in both probiotic development and artisanal cheese improvement.

Keywords: bacteria, lactic acid bacteria, cheese, milk, probiotics, metagenomic analysis

Registration number: P095

Prevalence of Antibiotic Resistant *Eschericha coli* Strains Isolated from Food and Environmental Samples

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Abstract: Antibiotics have been widely utilized in animal husbandry practices to promote growth and treat infectious diseases. However, their extensive use can result in serious consequences including disruptions to the gut microbiota of treated animals and the proliferation of resistant bacteria. Additionally, antibiotics and their metabolites may be disseminated into the environment through animal manure, contributing to the emergence of antibiotic resistance genes in bacterial populations. This study aimed to assess the prevalence of colistin-resistant *Escherichia coli* in chicken meat, chicken manure, and surface samples (i.e., poultry drinkers). Samples were collected over a one-month period. Colistin-resistant bacteria were isolated using a growth medium supplemented with colistin sulfate. A total of 81 samples were analyzed, of which 73 were positive for the presence of colistin-resistant strains (coliforms and *Pseudomonas* spp.). Based on their morphological characteristics, 31 *Escherichia coli* isolates were selected for confirmation of the mcr-1 gene using qPCR technique. Subsequently, antimicrobial susceptibility of the selected bacteria was determined by the Kirby-Bauer disk diffusion method with the following antibiotics: colistin, imipenem, ertapenem, meropenem, ceftazidime, cefotaxime, cefepime, and ciprofloxacin. The minimal inhibitory concentration (MIC) for colistin was evaluated using the ETEST and broth microdilution methods.

Keywords: colistin, antibiotic resistance, *Escherichia coli*, *Enterobacteriaceae*

Registration number: P097

Virulence and Antimicrobial Resistance Traits of *Escherichia coli* Retrieved from Fermented Dairy Foods in Egypt: A Public Health Hazard

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Abstract: During Ramadan in Egypt, fermented dairy foods like Yoghurt and *Laban Rayeb* are essential for *Sehoor* due to their nutritional benefits. They aid digestion, provide lasting energy, and help maintain hydration during fasting. Paired with traditional foods, they sustain well-being throughout the holy month. The high demand for fermented dairy products increases production to meet consumer needs. However, this may compromise safety standards, leading to contaminated products. Poor handling and quality control can introduce pathogenic bacteria with antimicrobial resistance (AMR) and virulence traits, posing a significant threat to global public health. Data on the prevalence of AMR and virulent *Escherichia coli* (*E. coli*) in fermented dairy products during the holy Ramadan in the most popular supermarkets in the highly populated districts of the Dakahlia governorate, Egypt, remain limited. This study aimed to identify and characterize the incidence of AMR and virulence genes in *E. coli* isolates using the multiplex PCR (M-PCR) analysis assay. A total of 34 (22.6%) *E. coli* isolates, representing twelve distinct serotypes, were recovered from 150 randomly collected fermented milk samples, including Laban Rayeb (n = 75) and Yoghurt (n = 75), obtained from various districts of Dakahliya governorate, Egypt. The most prevalent serotypes were O153:H2 (n = 7), O125:H21 (n = 5), O119:H6 (n = 5), O111:H2 (n = 4), O127:H6 (n = 4), O26:H11 (n = 4), and O103:H2 (n = 3). The virulence genes *stx1* and *stx2* were detected in 76.47% of isolates, while *eaeA* and *hylA* were found exclusively in O26:H11, O119:H6, and O55:H7. The *kan*, *dfrA*, BlaOXA-1, TetA(A), and *vanA* AMR genes were positive in 70.59%, 67.65%, 61.76%, 100%, and 47.06%, respectively, in different *E. coli* serotypes. The AMR and virulence patterns detected in isolated *E. coli* serotypes highlight the inadequate food safety measures and the potential risk of food poisoning for consumers in the surveyed areas. This underscores the urgent need for stricter food control measures. Authorities must enforce proper hygiene standards to ensure the safety of fermented dairy products.

Keywords: *E. coli*, fermented dairy food, virulence genes, AMR genes, public health hazard

Registration number: P099

The Consequences of Coliform Contamination in Cheeses

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Abstract: Coliforms are a group of Gram-negative, lactose-fermenting bacteria. Currently, 19 genera are recognised as coliforms, including *Enterobacter, Klebsiella, Citrobacter* and *Escherichia* within the *Enterobacteriaceae* family, and *Aeromonas* within the *Aeromonadaceae* family. As coliforms may not always originate from faecal sources, the concept of faecal coliforms, which are capable of fermenting lactose at 45 °C, was introduced to more accurately indicate faecal contamination. *E. coli* is commonly used as the primary indicator organism. It provides indirect evidence of the presence of potential pathogens and food safety risks. However, recent studies indicate that only a fraction of coliforms are faecal in origin, with the majority being environmental contaminants.
In cheese, the sources of coliforms vary by product type: they are common in raw milk cheeses, but in pasteurised products, their presence usually indicates contamination after pasteurisation, during processing, ageing, or through ingredients added. The growth, survival, and fate of coliforms in the final product are influenced by cheese manufacturing parameters, including pH, starter cultures, salting, moisture, ageing conditions, and water activity. Early coliform growth can lead to gas defects and affect the formation of organic acids and flavour compounds. Some coliform strains exhibit strong proteolytic activity, which can negatively impact the quality of dairy products. Early coliform growth during cheese production can also reduce the formation of desirable compounds such as diacetyl and lactic acid.
During our research, we determined the presence of coliform bacteria in 44 different types of cheese. The isolated bacteria were identified using 16S rDNA sequencing. The results show that *Escherichia coli* was the most prevalent bacterium, being detected in 19 of the cheese samples tested. Coliforms were present in 24 out of 44 samples. All samples of raw sheep's cheese, raw cow's milk cheese, telemea-type cheese and whey cheese tested positive for coliforms. The coliforms identified were: *Escherichia coli, E. fergusonii, Klebsiella oxytoca, K. michiganensis, K. grimontii, K. pneumoniae, Citrobacter freundii, C. braakii, C. pasteurii, Enterobacter sichuanensis, E. mori, E. kobei, E. hormaechei.*

Keywords: coliform, raw milk cheese, safety

Registration number: P100

Mechanisms of Induced Resistance to Green Mold in Citrus Fruit by *Pichia galeiformis* and its Secreted Protein PgSCP

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Abstract: Green mold disease caused by *Penicillium digitatum* poses a significant threat to citrus industries worldwide, while the prolonged use of chemical fungicides accelerates pathogen resistance and poses health risks. Biocontrol yeasts, which can induce fruit resistance as a key mechanism, are promising alternatives to chemical pesticides. This study investigates the biocontrol yeast *Pichia galeiformis* isolated from citrus orchards, systematically evaluating its efficacy against postharvest green mold in citrus fruits and unraveling its underlying mechanism. First, our research demonstrated that *P. galeiformis* suppresses green mold by inducing host resistance. Subsequently, a small cysteine-rich protein PgSCP, secreted by *P. galeiformis*, was identified and validated to directly enhance fruit disease resistance. Further analyses revealed that PgSCP specifically interacts with the citrus transcription factor CsFAR1. CsFAR1 positively regulates resistance to green mold by activating the expression of defense-related genes, including *DHAPS-1*, *GSH1*, *ACO1*, *INVA*, *PAL6*, *OMT*, *CYP73A16*, *CCOAOMT1*, *CYP73A4*, *PER16* and *COMT1*, thereby strengthening fruit resistance. Our findings indicate that PgSCP triggers disease resistance in citrus fruits by activating the CsFAR1 signaling pathway. This study first systematically characterized the secretome of *P. galeiformis* and elucidated the molecular mechanism underlying the role of secreted proteins in resistance induction, providing a theoretical basis for developing eco-friendly biocontrol strategies and advancing sustainable disease management in citrus crops.

Keywords: citrus fruit, green mold, *Pichia galeiformis*, secreted protein, inducement mechanism

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Registration number: P101

Antibiotic Resistance in *Aeromonas hydrophila* and Other *Aeromonas* spp. from Natural Waters

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Abstract: *Aeromonas hydrophila* is widely distributed in freshwater environments and has recently been recognized as an emerging pathogen associated with increasing numbers of human infections, including gastrointestinal diseases and opportunistic extraintestinal conditions. The spread of antibiotic resistance within this genus poses a significant public health concern, as isolates are frequently found to be multidrug-resistant.
The aim of our study was to investigate samples from natural waters, focusing on the isolation of *A. hydrophila* and the determination of its antimicrobial susceptibility profile. Bacterial isolates obtained by culture methods were identified using MALDI-TOF MS. Antimicrobial resistance was assessed by the Kirby–Bauer disk diffusion method with several antibiotics relevant to human medicine.
A number of bacterial species were identified in the course of water testing, including *Aeromonas hydrophila*, *A. veronii*, *A. eucrenophila*, *Enterobacter ludwigii*, *Acinetobacter lactucae*, *Stenotrophomonas maltophilia*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. However, it was observed that only *Aeromonas* formed characteristic colonies on the ADA-V selective agar plates utilised for the analysis of water samples. Preliminary results indicated that the isolates exhibited reduced susceptibility to beta-lactam antibiotics, while in some cases resistance to fluoroquinolone was also observed.
Our findings highlight that natural waters may serve as reservoirs of clinically relevant, resistant *Aeromonas* strains. This underlines the potential entry of such bacteria into the food chain, thereby posing an indirect food safety risk. These results emphasize the need for regular monitoring from both public health and food safety perspectives.

Keywords: natural water, *Aeromonas* spp., *A. hydrophila*, antibiotic resistance, food safety risk

Acknowledgements: The research was supported by József Farkas Doctoral Program in Food Science, Doctoral School of Agricultural and Food Sciences, Hungarian University of Agriculture and Life Sciences.

Registration number: P102

Development of a Generalized, ComBase-Compatible Database for Linking Probabilistic and Kinetic Data

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Abstract: Predictive microbiology has been traditionally studying bacterial growth, survival and death in laboratory- or food-environments. While kinetic models, with focus on growth/death rates remain common, assessing the probability of bacterial growth is critical, especially for pathogens, as even low contamination levels can cause severe foodborne illnesses. To address this, we propose combining deterministic and stochastic approaches to improve the efficiency of microbial risk assessments.
As a first step, we have developed a database ontology that accommodates both kinetic and probabilistic (including binary, i.e. growth/no-growth) data, that is also compatible with the well-known ComBase database (www.combase.cc). The main difference from the ontology of ComBase appears in the definition of the response variable. In kinetic modelling, the basic elementary information is the log(cell-concentration), from which growth or survival / inactivation rates are derived. In contrast, the basic element in the probabilistic approach is the growth / no growth binary data, which can be used to estimate probabilities of growth. To accommodate both perspectives, our ontology extends the relevant fields of ComBase to accept not only common numerical values but also intervals, and symbols to denote G / *NG* (growth / no-growth) responses. In both deterministic and stochastic cases, the response may vary over time, allowing for dynamic modelling.
By linking binary and kinetic data, this resource will enhance the efficacy of predictive modelling especially under extreme conditions and strengthen research in microbial food safety.

Keywords: predictive modelling; ComBase; growth/no-growth boundary

Registration number: P103

Where Tech Meets Taste: Application of Immersive Technologies in Sensory Science

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Abstract: Consumer sensory science is experiencing significant growth, with the global sensory testing market projected to reach USD 47.5 billion by 2033, underscoring increasing demands for realistic and context-rich sensory evaluation methods. Traditional laboratory sensory evaluations typically lack ecological validity, restricting their predictive capabilities for consumer behavior in actual market scenarios. This study addressed these limitations by integrating Virtual Reality (VR), Augmented Virtuality (AV), and Eye Tracking (ET) technologies into consumer sensory evaluations.

Five structured experiments involving over 100 participants were conducted:

1. **Experiment 1:** Evaluated the acceptability of a Virtual Sensory Laboratory. Results indicated high participant comfort and acceptance (VRSQ mean score: 4.5/5), minimal simulator sickness symptoms (SSQ score <15), and 92% successful aroma identification accuracy.
2. **Experiment 2:** Compared traditional sensory booth evaluations with VR sensory testing of lemonade samples. VR methods significantly improved emotional engagement (PANAS positive affect increased by 20%, $p<0.05$) and provided comparable sensory attribute discrimination to traditional methods ($r=0.89$).
3. **Experiment 3:** Assessed sensory evaluation methods (Just-About-Right, Check-All-That-Apply) across three virtual environments (sensory booth, food court, park). Multivariate analyses revealed significant contextual effects on consumer sensory perception (MANOVA: Wilks' $\lambda=0.78$, $p<0.01$).
4. **Experiment 4:** Explored consumer visual attention on sustainable labeling, comparing traditional ET and VR-integrated ET (VRET). VRET showed significantly higher visual engagement (mean fixation duration: +28%, $p<0.01$), indicating increased consumer attentiveness within immersive environments.
5. **Experiment 5:** Investigated AV for color masking in food evaluation, demonstrating AV significantly altered consumer expectation and sensory perceptions compared to unmasked conditions (Preference shift: 35%, $p<0.01$).

Collectively, these immersive methods enhanced ecological validity, improved participant engagement, and strengthened the predictive accuracy of consumer responses compared to traditional sensory evaluation. These findings clearly illustrate the methodological advantages of adopting VR, AV, and ET technologies within consumer sensory science.

Keywords: reality-virtuality continuum, consumer sensory science, immersive environments, digital sensory science

Registration number: P104

Model Development Based on Near Infrared Spectroscopy and Chemometrics for the Detection and Quantification of Adulteration in High Value Grape Seed Extracts

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Abstract: Grape seed extract (GSE) is a valued dietary supplement in the global market for its high content of polyphenolic compounds, associated with benefits such as cardiovascular protection and the prevention of neurodegenerative diseases. However, the high price and demand of these products have led to adulteration practices with extracts of similar chemical composition, such as pine bark extract (PBE), peanut skin extract (PSE) and green tea extract (GTE). These adulterations, difficult to detect with conventional analytical methods, affect the quality, efficacy, and safety of supplements, raising concerns among both the industry and consumers. To combat this, present study aims to explore the applicability of near-infrared spectroscopy (NIRS), using desktop and handheld instruments, for the rapid, accurate, and non-destructive quantification of various adulterants in GSE mixtures. Samples with different levels (0.5 - 13 w/w%) of PBE, PSE and GTE were prepared, then scanned with a NIRS XDS benchtop, and a NIR-S-G1 handheld device in diffuse reflectance mode. Leave-three consecutives out cross-validated and test-set validated chemometric models based on partial least squares and support vector regression were developed to predict the concentration of each component. Among relevant chemical parameters, peanut allergens were quantified using a sandwich enzyme immunoassay method and correlated with NIRS spectra. The results show that the combination of NIRS and chemometrics allows for the identification and quantification of adulterants with high accuracy ($R^2p \geq 0.92$; RMSEP $\leq 0.9\%$), even with handheld devices, facilitating its implementation in situ quality control. Overall, this study demonstrates the utility and potential of NIR spectroscopy as a practical tool in the authentication and safety of GSE-based products.

Keywords: grape seed extract, near-infrared spectroscopy, adulteration

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Registration number: P105

Recognizing Hungarian Lavender Honey in LAB Growth and Taste Profile of Set-Type Yogurt

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Abstract: Hungarian lavender honey from Pannonhalma was latest characterized in scientific paper by Gyergyák et al (2016) for total phenolic content (46.785±3.2 mg/kg), total flavonoid content (5.425±0.9 mg/kg), proline content (189.535±1.1 mg/kg), antioxidant activity (46.64±1.1 %RSA), FRAP (183.602±11.5 µM/kg), antioxidant content (12.802±0.0 mg AA/100g). It is also scientifically proved that lavender honey has also antibacterial effect with 25% minimum inhibitory concentration (MIC) against *Escherichia coli* (ATCC 8739), *Escherichia coli, Proteus mirabilis, Staphylococcus aureus* (ATCC 25923), *Enterococcus faecalis* (ATCC 29212) in Vojvodina, Serbia (Sakač et al. 2022). Although there is an increasing consumer demand on honey flavoured yogurt, there is a lack of knowledge related to the effect of lavender honey on thermophilic lactic acid bacteria (shortly: LAB) used for yogurt production.
Our aim was to investigate the effect of Hungarian lavender honey (Pannonhalma Archabbey) on the microbial growth of *Lactobacillus bulgaricus, Streptoccus thermophillus* and *Bifidobacterium* spp., which are frequently used starter cultures for yogurt production. Moreover, the recognition of lavender honey in small and taste was also tested with the further prospective of determination the tolerable level. Therefore set-type yogurts were made with 6% Holland Jersey UHT milk (Holland Jersey B.V., Nijkerk, Netherland) and 1-4 w/w % lavender honey (shortly: honey level) and analysed after 2-week storage period.
Results of microbiological analysis revealed that the applied lactic acid bacteria are reacting differently to the increasing concentration of lavender honey. Already at 2% honey level *Lactobacillus bulgaricus* and *Bifidobacterium* spp. count decreased by 6% compared to control, whereas *Streptococcus thermophilus* count was increased by 3%. Higher honey levels made this difference in microbial growth tendency of the studied LAB even more remarkable.
Results of sensory analysis showed that 55% of panellists could recognise honey smell already at 4% honey level, but none of them could identify lavender in the smell. Whereas the taste of honey was already recognisable at 3% honey level for 66% of panellists and at 4% honey level, 55% of panellists identified lavender also in the taste.

Keywords: lavender honey, lactic acid bacteria, taste, set-type yogurt

Acknowledgements: We are grateful for BiRia Ltd, who provided the yogurt culture used in this study.

Registration number: P106

From Pigmented Rice to Functional Rice Noodles: Nutritional Benefits and Quality Improvements via Potato Starch

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Abstract: The aim of this study is to investigate the potential of pigmented rice for rice noodle production and the role of potato starch (PS) supplementation in enhancing product quality. Comparative analyses of five pigmented rice varieties and two white rice controls revealed that pigmented rice exhibited substantially enhanced nutritional values compared with white rice, including 1.2–1.4-fold higher protein, 2–3-fold higher lipid, 6–10-fold higher fiber, and approximately sevenfold more ash. In addition, total phenolic content (5.25-15.30 mg/100g), anthocyanin content (3.36–9.86 mg/100 g) and antioxidant capacity (146–1137 µmol TE/g) were dozens to hundreds of times greater. Starch granules of both pigmented and white rice exhibited similar morphology and A-type crystallinity. High-amylose pigmented rice demonstrated pasting and gel stability suitable for noodle production, similar to white rice, whereas low-amylose pigmented rice formed weaker gels. Application trials with Luc Do (LD) colored rice showed that noodles had significantly greater nutritional and bioactive values than white rice noodles, including 13–17-fold higher fiber and up to 330 mg/100 g anthocyanins, but required starch modification to improve texture and cooking quality. Incorporating 10% PS with LD rice flour and modified cassava starch optimized amylose content and starch granule swelling power, reduced cooking loss, improved hardness and chewiness, and yielded noodles most comparable to white rice in texture and sensory acceptance. Overall, high-amylose pigmented rice, combined with appropriate starch supplementation, offers a promising strategy for developing nutritious, antioxidant-rich rice noodles with desirable technological and sensory attributes.

Keywords: anthocyanin, antioxidant capacity, pigmented rice, proximate composition, physicochemical properties, rice noodle, sensory acceptance

Registration number: P107

Effect of Microwave-Drying on Bioactive Compounds and Functional Properties of Mulberry Leaves

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Abstract: This study investigated the effect of microwave-drying on the bioactive compound content and functional properties of fresh and semi-dried mulberry leaves. The application of microwave treatment significantly enhanced the extraction of total phenolic compounds (TPC), 1-deoxynojirimycin (DNJ), antioxidant activity (DPPH and FRAP), and α-glucosidase inhibitory capacity. The optimal condition was observed in semi-dried leaves treated at 500 W for 4 minutes, yielding 6.58 ± 0.01 mg GAE/g dry mass (TPC), 23.28 ± 0.03 mg DNJ/g dry mass, 190.62 ± 3.93 µmol TE/g dry mass (DPPH), and 131.09 ± 0.17 µmol TE/g dry mass (FRAP). Additionally, the α-glucosidase inhibitory activity reached an IC_{50} of 0.98 ± 0.01 mg/mL. These results highlight microwave-drying as a promising method to enhance the functional quality of dry mulberry leaves for potential applications in food and nutraceutical industries.

Keywords: mulberry leaves, microwave-drying, phenolic compounds, 1-deoxynojirimycin (DNJ), antioxidant activity, α-glucosidase inhibition

Registration number: P108

Obtaining Protein Concentrate from Gutweed (Enteromorpha sp.) for Use in the Food Industry

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Abstract: Gutweed (*Enteromorpha* sp.), a species of green brackish algae, distributes with a high biomass in extensive shrimp ponds in Mekong Delta and has a high protein content (13-22% w/w db). The aim of this study was to extract protein from this gutweed species for use in the food industry. The results showed that, using 0.1N alkaline solution only extracted less than 50% of the protein of the dried raw gutweed. When this algae was treated with ultrasound before extraction, the extraction efficiency increased to 63.32%. When treating the algae with Celluclast 1.5L enzyme, the extraction efficiency reached 68.82%. The combination of enzymatic hydrolysis and ultrasound is called ultrasound-assisted enzymatic hydrolysis (UAEH). This method improved the extraction efficiency to 86.15%. Three phase partitioning (TPP) can be considered as a simple, effective, economical, and green bioprocessing method for the purification of biological macromolecules, especially proteins, compared to conventional techniques. With the extract adjusted to pH 3, $(NH_4)_2SO_4$ concentration of 30% (w/v), extract and n-butanol ratio of 1:1 and mixing duration of 20 minutes, recovery efficiency reached 76.23% and the purity of the obtained protein was 71.02%.

Keywords: green brackish algae, extraction, UAEH, three phase partitioning

Registration number: P109

Comparative Properties of Biodegradable Films from Whole and Broken Rice Flours

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Abstract: This study aimed to investigate the film-forming ability and compare the characteristics of biodegradable films produced from two rice varieties Tài Nguyên Chợ Đào (CD) and IR504 (IR) from whole and broken rice via the casting method. All films obtained were transparent, easy to handle, and mechanically stable. Tensile strain ranged from 4.17% to 12.90%, while tensile stress at break was between 8.62 MPa and 12.56 MPa. IR-based films exhibited mechanical strength approximately 1.5 times higher than those from CD. Notably, films made from broken CD rice demonstrated higher mechanical strength than those from whole grains, whereas the difference was insignificant in the case of IR. Regarding other properties: moisture content, water solubility, water vapor permeability, and UV-blocking ability, films derived from CD higher than those from IR. These findings confirm the technical feasibility of using broken rice flour for biofilm production and highlight its potential application in food preservation, especially for mitigating oxidative processes.

Keywords: biodegradable packaging, thermoplastic flour, mechanical properties, molecular profile.

Registration number: P110

Ethanol Injection-Based Nanoliposomal Co-Delivery of Adenosine, Cordycepin, and Curcumin: Formulation and Application in a Nutritional Beverage

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Abstract: *Cordyceps militaris* is a medicinal fungus rich in bioactive compounds, among which adenosine (ADE) and cordycepin (COR) are widely recognized as markers of quality and therapeutic potential. However, both ADE and COR are prone to oxidative degradation and rapid clearance in the body. Similarly, curcumin, the principal bioactive compound of turmeric, exhibits poor aqueous solubility and low bioavailability. Co-encapsulation of these compounds into a nanoliposomal delivery system provides a promising strategy to enhance their stability and functional efficacy. In this study, nanoliposomes co-loaded with ADE, COR, and curcumin were prepared using the ethanol injection method combined with ultrasonication. The resulting nanoliposomes exhibited an average particle size below 150 nm, a zeta potential in the range of –30 to –60 mV, and encapsulation efficiencies above 80%. They demonstrated good stability for up to 30 days under refrigerated storage and showed significant antioxidant and antibacterial activities. Furthermore, the optimized nanoliposomes were incorporated into a nutritional beverage. The formulation containing 6% nanoliposomes, 7% honey, and 9% CMC displayed desirable physicochemical properties, with a pH of 5.2 and a Brix value of 6.5. The product maintained good structural integrity, met microbiological quality standards, and received favorable sensory evaluation scores. Overall, the development of a functional beverage enriched with nanoliposomes encapsulating ADE, COR, and curcumin represents a novel approach to improving the applicability of liposomal delivery systems in functional foods, while enhancing the bioavailability and health benefits of these bioactive compounds.

Keywords: *Cordyceps militaris*, curcumin, liposome, co-encapsulating, ethanol injection

Registration number: P111

On-Site Screening of Nut Contamination in Fruit Juices and Smoothies Using NIR Spectroscopy

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Abstract: Unintended nut contamination poses a major food safety risk, even in fruit juices and smoothies consumed by individuals with nut allergies. A concern that gains importance as nutritional awareness and the consumption of fortified foods continue to rise. This study explores the feasibility of rapid, non-destructive on-site detection of nut material (walnut, hazelnut, peanut) using near-infrared (NIR) spectroscopy. The central hypothesis is that characteristic absorption bands associated with lipids and proteins can be exploited to differentiate nut-free and nut-contaminated samples at concentrations ≥ 0.5 % (w/w). Both benchtop and handheld systems will be evaluated for sensitivity, robustness, and practical applicability. Model beverages containing defined concentrations of walnut, hazelnut, and peanut material (0.1 – 5% w/w) will be used to establish spectral fingerprints and develop chemometric classification models (PCA, PLS-DA, SVM). To improve signal quality and minimize matrix effects, a simple, low-cost pre-filtration step will be developed and optimized for practical application. The approach focuses on detecting bulk nut material through lipid- and protein-associated absorption bands. The method is intended as a screening tool for on-site quality control, as NIR does not provide the sensitivity required for trace allergen detection in hypersensitive individuals. The study assesses the technical feasibility of combining NIR spectroscopy with optimized sample preparation as a complementary method to laboratory allergen analysis in food production risk management.

Keywords: NIR, IR, spectroscopy, chemometrics, miniaturized device

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Effect of Extruded Brewer's Spent Grain on Sensory Properties of Biscuits

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Abstract: Brewer's spent grain (BSG) is an abundant by-product of the brewing industry, rich in dietary fibre and protein. In this study, BSG was mixed with corn grits at ratios of 15:85, 30:75, and 45:55 and extruded using a laboratory single-screw extruder to improve stability and functionality. After drying and milling, the extruded brewer's spent grain (EBSG) was fractionated into three particle-size ranges (<250 µm, 250–1000 µm, and 1000–2000 µm) and incorporated into biscuits at 5%, 10%, and 15% substitution levels as a partial wheat flour replacement. Sensory evaluation was conducted by a trained panel. The intensity of each attribute was scored on a seven-point scale (1 = lowest intensity; 7 = highest intensity) in accordance with ISO 4121:2002. EBSG provided a darker appearance characteristic of fibre-rich bakery products. The highest colour scores were achieved in samples with low substitution and fine particles (panellist score of 6.23 for 5% EBSG <250 µm), while the darkest biscuits with coarser particles and higher substitution had lower scores (4.55). Particle size strongly influenced texture and mouthfeel. Finer particles resulted in firmer texture and lower graininess (score 6.51), whereas biscuits formulated with coarse particles showed reduced firmness and more pronounced graininess, with lower scores (2.20). Surface uniformity also decreased with coarser EBSG, where visible cracking was observed (scores ranging from 6.21 to 2.05). Flavour acceptability remained high at moderate inclusion levels, with the best sensory profile recorded at 5–10% substitution (scores up to 6.51), while excessive addition (15% coarse EBSG) slightly reduced acceptability (5.23). Overall, EBSG can be effectively incorporated into tea biscuits, particularly at 5–10% substitution and with particle sizes <250 µm, enabling the development of fibre-enriched products with desirable sensory attributes and improved nutritional value.

Keywords: brewer's spent grain, extrusion, biscuits, functional products, sensory evaluation

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Turning Waste Into Worth: Comparative Amino Acid Analysis of Meat-Industry By-products

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Abstract: Food consumption is increasing in parallel with population growth, leading to a corresponding rise in food waste. In this context, by-products of the meat industry—such as skin, tendons, and internal organs—were once considered waste materials. However, recent trends aligned with the principles of the circular economy emphasize the complete utilization of these by-products, aiming to isolate and apply functional compounds in various food matrices to enhance their nutritional value. In this study, the authors evaluated the amino acid composition of animal collagen isolated from the skins of different animal sources—bovine (BC) and porcine (PC). The amino acid content and profile were determined using the HPLC-FD method (Shimadzu HPLC system, Kyoto, Japan). The results indicate the presence of essential amino acids (EAA), which are crucial for the normal functioning of the human body. The EAA content in BC accounted for 12.12% of the total amino acid content (TAA), while in PC it was slightly higher, at 13.29% of TAA. The ratio of essential to non-essential amino acids (NEAA) was similar for both collagen types, 0.14 in BC and 0.15 in PC. Overall, the findings highlight that both bovine and porcine collagen represent valuable sources of amino acids, including essential ones. The comparable EAA/NEAA ratios suggest that both collagen types possess similar nutritional potential. Therefore, collagen derived from animal by-products can be considered a promising ingredient for the development of functional food formulations, contributing to sustainable utilization of meat industry residues within the framework of the circular economy.

Keywords: collagen, meat-industry, protein, amino acid, HPLC

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Registration number: P114

Effects of Different Commercial Pectinase and Yeast Preparations on the Formulation of Methanol and Aromatic Compounds in the Fermentation of Apple-Mash

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Abstract: Generally, because of pectin content, the fruit spirits may contain high amount of methanol that is well-known as toxic compound. In the EU, the methanol content of fruit spirits is limited to be 1000 g/hL a.a with some exceptions: pear spirit 1350 g/1hL a.a, apple and plum spirits 1200 g/hL a.a. Sales in prospective third markets are much more difficult or impossible due to the permitted methanol content limits there to comply with their requirements (USA: 700g/hL, China: 200g/hL a.a, Japan:120g/hL a.a), thus development of economically feasible method for reduction or elimination of methanol, while remaining the characteristics of fruit spirits will take crucial account in industrial spirit making system. The main aim of this study is decrease in activity or inactivating endogenous pectin methylesterases (PME) naturally existed in apple fruit by heat treatment and using different exogenous enzyme preparations to reduce the methanol content of distillates and maintain the quality of spirit. Apple variety FUJI was crashed and decantated, then the pH value was immediately adjusted to pH 3.2 with phosphoric acid. After pasteurization of juice, 4 different commercial enzyme preparations Panzym Smash XXL, Panzym Pro Color (PC), Sihazym Supramash (SUP), and HC, Lallemand) with low PME activity were used with different origins and side activities such as cellulolytic, hemicellulolytic or pure lyase activity. Commercial yeast preparation Uvaferm 228 with the Uvavital manure (Lallemand, France) was use for alcoholic fermentation of apple juice. At the end of fermentation, the batches were distilled using the same distillation equipment, conditions, and settings and separated them into further 3 additional cut fractions for each brew. Three head, hearth and tail fractions of distillates were separated and collected and then analysed by classical and instrumental methods. In all tested treated distillates, the methanol contents the hearth fractions were varied in the range from 18-710 g/hL a.a. The lowest methanol content of distillate made from apple juice was in 18 g/hL a.a. that was made by Panzym Smash XXL enzyme preparation with preheating juice. These values are very promising because they are significantly lower than the EU legal limit even below the USA limit. Some samples meet the Japanese strict regulation. In the distillate from pasteurized and enzyme treated apple juice contained significant high iso-amyl-acetate content compared to distillates made directly from mash. Our results are preliminary, but very promising for development of palinka making method to reduction of methanol content in the fruit spirits.

Keywords: apple juice, methanol, legal limits, food contamination, pectin methylesterase, polygalacturonase, lyase

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