Foods
7th Edition
2026

Conference

The 7th International Electronic Conference on Foods

28–30 October 2026, online



Program and Abstract Book

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The 7th International Electronic Conference on Foods

28–30 October 2026 | Online

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Table of Contents

Welcome from the Chairs 1
Keynote Speaker 3
Invited Speakers 4
Industrial Speaker 5
Program at a Glance 6
Foods 2026 Program 7
Foods 2026 Poster List 16
Session A. AI, Technology & Engineering in Food 34
Session B. Nutritional & Functional Foods 59
Session C. Food Physicochemistry & Analysis 172
Session D. Food Microbiology & Biotechnologies 231
Session E. Sustainable Food System & Food Security 277
Session F. Sensory & Consumer Research 325
Session G. Food Safety, Toxicology & Quality 344
Session H. Food Packaging & Storage Technology 409

Welcome from the Chairs

Dear Colleagues,

I am honored to welcome you to the **7th International Electronic Conference on Foods—Future Foods Powered by Smart, Healthy & Emerging Technologies** (Foods 2026), hosted by the MDPI Journal *Foods* (ISSN 2304-8158, Impact Factor 6.0). This three-day virtual event, running from **28–30 October 2026**, will bring together global experts to explore innovative directions for future foods.

Food stands at a crossroads: smart foods meets traditional foods, and emerging technologies converge with established techniques, driving forward the exploration of food nutrition and safety. Against this backdrop, the Foods 2026 conference aims to bring together cutting-edge perspectives, focusing on how emerging technologies can deliver nutrition, health, and scientific advances, while exploring viable pathways for "future food." We sincerely invite experts and scholars to join us and share your insights and latest research at this event.

Foods 2026 will feature a wide range of sessions covering critical topics in food science, including, but not limited to, the following:

A. AI, Technology & Engineering in Food;
B. Nutritional & Functional Foods;
C. Food Physicochemistry & Analysis;
D. Food Microbiology & Biotechnologies;
E. Sustainable Food System & Food Security;
F. Sensory & Consumer Research;
G. Food Safety, Toxicology & Quality;
H. Food Packaging & Storage Technology.

We warmly invite your participation and look forward to working with you to shape a healthier, more substantial, and sustainable future for Foods.

Sincerely,
Prof. Dr. Arun K. Bhunia
Molecular Food Microbiology Laboratory, Department of Food Science, Purdue University, USA
Conference Chair of the 7th International Online Conference on Foods



Prof. Dr. Arun K. Bhunia
Molecular Food Microbiology Laboratory, Department of Food Science, Purdue University, USA



Foods (ISSN 2304-8158) is an international, peer-reviewed scientific open access journal that provides an advanced forum for studies related to all aspects of food research, with major emphasis on the "science of food". Our goal is to strive for the publication of exceptionally high-quality articles with rigor and depth. We will publish comprehensive reviews, research articles, and short communications on novel findings. We encourage scientists, researchers, and other food professionals to publish their experimental and theoretical results. There is no restriction on the maximum length of the papers, but the full experimental details must be provided so that results can be reproduced. There are, in addition, unique features of this journal:

- Inquiry on manuscripts regarding research proposals and research ideas is welcomed;
- Electronic files or software regarding the full details of the calculation and experimental procedure, if unable to be published in a normal way, can be deposited as supplementary material;
- We also accept manuscripts communicating to a broader audience regarding research projects financed with public funds

Impact Factor: 6.0 (2025); 5-Year Impact Factor: 6.5 (2025)

Keynote Speaker



Dr. Antonio J. Signes-Pastor

Department of Public Health, Universidad Miguel Hernández, Spain

Dr. Antonio J. Signes Pastor is a Permanent Professor at Miguel Hernández University of Elche (UMH) who stands out for his solid, multidisciplinary academic career and extensive international experience in research and teaching. In 2021, he rejoined the Spanish university system through a competitive research excellence program after conducting research for several years at Dartmouth College in the USA and Queen's University Belfast in the UK.



Dr. Efstathios Stathis Giaouris

Laboratory of Food Microbiology and Hygiene (LFMH), Department of Food Science and Nutrition (DFSN), School of the Environment, University of the Aegean, Lemnos, Greece

Dr. Giaouris is Professor of Food Microbiology at the Department of Food Science and Nutrition, University of the Aegean, Greece. He holds a Ph.D. from the Agricultural University of Athens, with part of his doctoral research conducted at INRA-AgroParisTech in France, under a highly competitive European Union Marie Curie fellowship. He leads the Laboratory of Food Microbiology and Hygiene and has participated in numerous national and international research projects related to food microbiology, hygiene, and safety.



Prof. Dr. Theodoros Varzakas

Department of Food Science and Technology, University of Peloponnese, Antikalamos, Greece

Theodoros Varzakas serves as Full Professor at the Department of Food Science and Technology, University of the Peloponnese, Greece since 2019 specializing in issues of food technology, food processing/engineering, food quality and safety. Section Editor in Chief Journal Foods in Food Security and Sustainability (2020-). Ex Editor in Chief Current Research in Nutrition and Food Science (2015-2019). Series Editor for contemporary Food Engineering, CRC.



Asst. Prof. Konstantinos Papadimitriou

Laboratory of Food Quality Control and Hygiene, Department of Food Science and Human Nutrition, Agricultural University of Athens, Athens, Greece

Konstantinos Papadimitriou is an Assistant Professor of Food Quality Control at the Laboratory of Food Quality Control and Hygiene of the Department of Food Science and Human Nutrition of the Agricultural University of Athens. His research interests include the microbiology of dairy products, the physiology, genetics, and genomics of lactic acid bacteria, the metagenomics of food ecosystems, single-cell microbiology, plasmid biology, and applied bioinformatics. His published work includes more than 90 articles in scientific journals (h = 28, Scopus), more than 100 abstracts at scientific conferences, and 10 book chapters.

Invited Speakers



Dr. Kumud Kant Awasthi

K R Mangalam University, India



Dr. Miguel Ângelo Cerqueira

International Iberian Nanotechnology Laboratory, Braga, Portugal



Prof. Dr. Lorenzo Nissen

Microbiology of Human Nutrition, Department for the Promotion of Human Science and Quality of Life - San Raffaele University of Rome, Italy



Prof. Dr. Martin Caraher

Emeritus Professor of Food and Health Policy, Centre for Food Policy, City St. George's, University of London, London, UK



Assoc. Prof. Jiage Ma

Key Laboratory of Dairy Science, Ministry of Education, College of Food Science, Northeast Agricultural University, Harbin, China



Asst. Prof. Nikolaos Andritsos

Department of Food Science and Technology, School of Agricultural Sciences, University of Patras, Agrinio, Greece

Industrial Speaker



Dr. Maruxa Quiroga Garcia

TASTELAB, Rúa Vázquez Seijas, 2, entreplanta 5, Lugo, Spain

Dr. Maruxa Quiroga is an Agricultural Engineer with a PhD and a scientific background in sensory analysis, food innovation, and industrial processes. Her expertise focuses on the measurement and interpretation of sensory perception, consumer preferences, and product characteristics, particularly through the application of sensory evaluation methodologies in food research. She lectures in Master's programs at the University of Santiago de Compostela (USC), connecting scientific principles of sensory analysis with their practical applications in consumer research and the food industry.

Program at a Glance

28 October—Wednesday Morning (Parallel Sessions)		29 October—Thursday Morning (Parallel Sessions)		30 October—Friday Morning (Parallel Sessions)	
09:00-11:20 (CET)	09:00-11:15 (CET)	09:00-10:55 (CET)	09:00-11:55 (CET)	09:00-11:25 (CET)	09:00-12:05 (CET)
Chair Welcome Speech **Session B.** Nutritional & Functional Foods *[All Day]* **Flash Poster (Session B)**	**Chair Welcome Speech** **Session A.** AI, Technology & Engineering in Food **Flash Poster (Session A)**	**Session F.** Sensory & Consumer Research **Flash Poster (Session F)**	**Session H.** Food Packaging & Storage Technology **Flash Poster (Session H)**	**Session G.** Food Safety, Toxicology & Quality *[All Day]* **Flash Poster (Session G)**	**Session D.** Food Microbiology & Biotechnologies **Flash Poster (Session D)**
Break					
28 October - Wednesday Afternoon		29 October - Thursday Afternoon (Parallel Sessions)		30 October - Friday Afternoon	
14:00-16:30 (CET)		14:00-17:25 (CET)	14:00-16:15 (CET)	14:00-17:05 (CET)	
Session B. Nutritional & Functional Foods *[All Day]* **Flash Poster (Session B)**		**Session E.** Sustainable Food System & Food Security **Flash Poster (Session E)**	**Session C.** Food Physicochemistry & Analysis **Flash Poster (Session C)**	**Session G.** Food Safety, Toxicology & Quality *[All Day]* **Flash Poster (Session G)** **Chair Closing Speech**	

Foods 2026 Program

28 October 2026 (Wednesday)

Session B. Nutritional & Functional Foods (Parallel Session) [Part 1]

Time: 09:00 (CET, Basel) | 04:00 (EDT, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
09:00–09:10	**Prof. Dr. Arun K. Bhunia** Conference Chair	*Welcome from the Conference Chair*
09:10–09:15	**Prof. Dr. Juana Fernández-López** Session Chair of Session B	*Opening Speech from the Session Chair*
09:15–09:35	**Prof. Dr. Lorenzo Nissen** Invited Speaker	Defining Reproducible Parameters for in Vitro Colon NAMs to study the Gut Microbiota/Food/Host Triad: Results from the WG1 of INFOGUT
09:35–09:50	**Maria Manuela Lageiro** Oral Speaker	Fruit Peel Wastes as Potential Sources of Functional Ingredients with Antioxidant and Antimicrobial Activities
09:50–10:05	**Stefanos Michailidis** Oral Speaker	In Vitro Biochemical Investigation of the Antioxidant, Anti-Inflammatory and Antithrombotic Bioactivities of Wine Extracts from Pangeo Mountain-Originated Organic Grapes with Health-Promoting Properties
10:05–10:20	**Amparo Gamero** Oral Speaker	Impact of Fruit and Vegetable Enrichment on Functional Profile and Sensory Acceptance of Yogurts
10:20–10:35	**Teleky Bernadette-Emoke** Oral Speaker	Engineering Biopolymer Hydrogels for 3D/4D Food Printing in Personalized Nutrition for Elderly Dysphagia Management
10:35–10:50	**Reshma Suresh** Oral Speaker	Prebiotic Potential of Dragon fruit (*Hylocereus costaricensis*) Peel and Pulp on *Lactobacillus acidophilus*
10:50–11:20	**Flash Poster Presentations**	**Judith Rodríguez-Párraga** Reformulation of 'Longaniza de Pascua' with Locusta migratoria Powder: Nutritional and Technological Evaluation **Elisa Mariana García** Bioactive Phenolic Extracts from Native Argentine Chaco Plants: Characterization and Potential Food Applications **Cristina Popovici** Antioxidant-Rich Functional Mini-Baguette: The Role of Rose Petal Fortification and Sourdough Fermentation **Maricar Dela Rosa Albao** Development of Plant-Based Beverage Made of Cassava (*Manihot esculenta*) and Sweet Potato (*Ipomoea batatas*) Using Response Surface Methodology **Esther Trigueros** Pectooligosaccharides (POS) and Polyphenol-Rich Extracts from Agri-Food By-Products: Valorization of Cocoa (*Theobroma cacao*) Pod Husk (CPH) through Microwave-Assisted Extraction (MAE) **Laura Candela Salvador** Coffee Silverskin Extract as a Functional Ingredient for the Development of Caffeinated Gummies
		BREAK

Session A. AI, Technology & Engineering in Food (Parallel Session)

Time: 09:00 (CET, Basel) | 04:00 (EDT, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
09:00–09:10	**Prof. Dr. Arun K. Bhunia** Conference Chair	*Welcome from the Conference Chair*
09:10–09:15	**Prof. Dr. Nazimah Hamid** Session Chair of Session A	*Opening Speech from the Session Chair*

09:15–09:30	**Souhaila Hadday** Oral Speaker	From Field Management to Quality Fingerprint: Season-Robust FTIR–Machine Learning Prediction of Bioactive Compounds in Moroccan Olive Oil
09:30–09:45	**Stacie Tan** Oral Speaker	Comparing Artificial Intelligence (AI) Generated Sensory Responses with Human Descriptive Analysis Using Chocolate Brownies
09:45–10:00	**Onaolapo Adeola Olatunji** Oral Speaker	Influence of Pretreatment and Agro-Ecological Origin on the Solar Drying Kinetics and Moisture Diffusivity of *Vernonia amygdalina* Vegetable
10:00–10:15	**Agustín Sanguinetti** Oral Speaker	CNN-Based Binary Pollen Classification for Monofloral Honey Authentication with Conventional Light Microscopy
10:15–10:30	**Alejandro Saavedra** Oral Speaker	Application of Hyperspectral Imaging and Machine Learning for the Discrimination of Chickpea Varieties
10:30–10:45	**Jiaye Cai** Oral Speaker	Computer Simulation of Ohmic Heating of a Heterogeneous Model Food with an Irregular Geometry
10:45–11:00	**Carlos Roberto Camarillo-Rojas** Oral Speaker	Development of a Powder Formulation from Avocado (*Persea americana*)
11:00–11:15	**Flash Poster Presentations**	**Florencia Onaga Medina** Powdered Ingredients from Olive Pomace: Impact of Drying Temperature and Defatting on Bioactive Potential **Piotr Lukasiak** **Multicriteria Quality Indices as a Tool for Estimating Consumer Desirability of Gluten-Free Bread Enriched with Chestnut Flour** **Chihiro Sugihara** **Microwave Re-Heating of Packaged Rice: Computer Simulation of the Starch Re-Gelatinization and Evaluation of Quality Retention**
		BREAK

Session B. Nutritional & Functional Foods [Part 2]

Time: 14:00 (CET, Basel) | 09:00 (EDT, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:05	**Dr. Manuel Viuda-Martos** Session Chair of Session B	*Opening Speech from the Session Chair*
14:05–14:20	**Yongting Luo** Oral Speaker	Tremella fuciformis Polysaccharides Protect Against Doxorubicin-Induced Cardiotoxicity via Antioxidant and Gut Microbiota
14:20–14:35	**Rosa Zapata** Oral Speaker	Enriching Croissants with Orange Peel By-Product Powder: Impact on FTIR Fingerprint and Bioactive Quality
14:35–14:50	**Lucia Francesca Vuono** Oral Speaker	Unlocking the Potential of Spent Coffee Grounds: From Agro-Industrial Waste to Functional Bioactive Ingredients
14:50–15:05	**Ana Gonçalves** Oral Speaker	Thermal Water-Assisted Production of Shell-Enriched Flour from Non-Marketable Portuguese Chestnuts
15:05–15:20	**Balaji Jeyakumar** Oral Speaker	Supercritical CO_2 Extraction of the Oat Lipids for Functional Food Ingredients
15:20–15:35	**Alexis Ayala-Niño** Oral Speaker	Ethanolic and Methanolic Extraction of Phenolic Compounds and Their Antioxidant Capacity by DPPH and FRAP from Cahuiche Fruit (Vaccinium leucanthum)
15:35–15:50	**Helmut Bethancourt-Dalmasí** Oral Speaker	Nutritional Characterization and Bioactive Potential of Dehydrated Duckweed (*Lemna minor*) for Food and Feed Applications
15:50–16:05	**Shahd Ali** Oral Speaker	Insight into the Chemical and Functional Properties of Artichoke Leaves
16:05–16:30	**Flash Poster Presentations**	**María Ruiz-Rico** Exploring the Effect of Cricket (Acheta domesticus)-Enriched Pasta on Gut Microbiota After *In Vitro* Colonic Fermentation **Agata Wojciechowicz** Development of High-Fiber Functional Pasta Enriched with Oat β-Glucan, Apple Pomace, Inulin and Psyllium Husk: Technological and Sensory Evaluation

	Fatbardha Terstena Valorization of Pumpkin Flesh and Peel Flours as Sustainable Ingredients for Semolina Pasta: Effects on Color and Cooking Quality
	Mark Anthony Casas Lat Harnessing Philippine Seaweeds for Nutrient-Dense Snack Development
	Vandana K V Development of Microencapsulated Probiotic Formulation Using Spray Drying
END OF DAY 1	

29 October 2026 (Thursday)

Session F. Sensory & Consumer Research (Parallel Session)

Time: 09:00 (CET, Basel) | 04:00 (EDT, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
09:00–09:05	**Prof. Dr. José Ángel Pérez-Álvarez** Session Chair of Session F	*Opening Speech from the Session Chair*
09:05–09:25	**Dr. Maruxa Quiroga Garcia** Industrial Speaker	When Science Listens to the Senses: Sensory Science for Innovation
09:25–09:40	**Airisse Rae Prieto Basinang** Oral Speaker	Mapping Alternative Food Product Perceptions: The Interplay of PROP Taster Status and Food Neophobia
09:40–09:55	**Angelica Nicole Castulo** Oral Speaker	Consumer Acceptance of Upcycled Foods: Attitudes, Neophobia, and Nutrition Involvement of Filipino Consumers
09:55–10:10	**Francesco Maiuolo** Oral Speaker	Visual Hierarchy, Attention and Choice: An Eye-Tracking Study of PGI Extra Virgin Olive Oil Packaging
10:10–10:25	**Sofia Vargha** Oral Speaker	AI-Assisted Food Design: Co-Creation with Young Consumers
10:25–10:40	**Lucía Nieto** Oral Speaker	Milk Minimizes Sensory Penalties in Coffee Pulp Infusions More Effectively Than Rice and Soy Beverages
10:40–10:55	**Flash Poster Presentations**	**Eleni Sakadani** Consumer Acceptance and Sensory Evaluation of a Hybrid Yogurt with Milk and Fava Bean Protein **Alice Vilela** Reframing Non-Alcoholic Wine Studies: Sensory Characteristics and Bioactive Changes Induced by De-Alcoholization **Laura Cismaru** Environmental Concern Challenges the Health Halo: Rethinking the Communication Strategy for Organic Foods in Emerging European Markets
	BREAK	

Session H. Food Packaging & Storage Technology (Parallel Session)

Time: 09:00 (CET, Basel) | 04:00 (EDT, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
09:00–09:05	**Dr. Vitor D. Alves** Session Chair of Session H	*Opening Speech from the Session Chair*
09:05–09:25	**Dr. Miguel Cerqueira** Invited Speaker	Smart Packaging Strategies to Ensure Food Quality and Safety
09:25–09:40	**Katja Wack** Oral Speaker	Risk-Based Assessment of PFAS in Food Contact Packaging Using Packaging Component and Supplier Risk Indicators
09:40–09:55	**Beatrice Sordini** Oral Speaker	Sustainable Packaging for Extra Virgin Olive Oil: A Comparative Shelf-Life Study
09:55–10:10	**Filipa Soares** Oral Speaker	Front-of-Package Nutrition Labelling for Child-Targeted Foods: A Systematic Review of Caregiver-Mediated Decision Outcomes and Evidence Certainty
10:10–10:25	**Hayriye Unal** Oral Speaker	Development of Natural-Source Antimicrobial Systems for Extending the Shelf Life of Table Olives during Packaging
10:25–10:40	**Kosuke Nakamura** Oral Speaker	Food-Processing Metabolomics Reveals Nutrient-Derived Adduct Formed by Ethylene Oxide Fumigation
10:40–10:55	**Hanieh Noeparast** Oral Speaker	Effects of Storage Temperature and Packaging Type on the Postharvest Quality of Finger Lime (*Citrus australasica*)
10:55–11:10	**Inês Mansinhos** Oral Speaker	Valorization of Mediterranean Aromatic Plants for the Production of Functional Films for Food Applications
11:10–11:25	**Luana de S. C. Carnaval** Oral Speaker	From Citrus Processing Residues to Functional Edible Coatings: Waste-Derived Pickering Systems for Sustainable Food Packaging and Fresh-Cut Fruit Preservation

11:25–11:55	**Flash Poster Presentations**	**Nitish Kumar Singh** Shaping the Future of Food Packaging: Behavioral Insights into Plastic Packaging Decisions in the UK Fast-Moving Consumer Goods (FMCG) Sector **Raquel Lucas-Gonzalez** Effect of Biodegradable PLA–Chitosan–Pomace Extract Films as Slice Separators on the Quality and Shelf Life of Gouda Cheese **Natalia Hejda** Sodium Pyrithione-Modified PCL/PLA Blends as Active Antimicrobial Biodegradable Packaging Materials **Danai Ioanna Koukoumaki** Waste to packaging: Novel Edible Films from Whey-Derived Microbial Protein incorporated with cellulose **Paulina Aguirre-Lara** Effect of *Schinus molle* Leaf Extract Incorporated into Starch-Based Active Coating on the Preservation of Fresh Tomatoes **Joanna Bryś** Stabilizer-Dependent Physical Stability of Vitamin-Fortified Coconut Milk Alternatives
	BREAK	

Session E. Sustainable Food System & Food Security (Parallel Session)

Time: 14:00 (CET, Basel) | 09:00 (EDT, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:05	**Prof. Dr. Theodoros Varzakas** Session Chair of Session E	*Opening Speech from the Session Chair*
14:05–14:35	**Prof. Dr. Theodoros Varzakas** Keynote Speaker	The Effect of One Health in Agri-Food Systems: From Animal and Plants to Food Safety, Healthy Soils, Biodiversity and Antimicrobial Resistance
14:35–14:55	**Prof. Dr. Martin Caraher** Invited Speaker	Food Financialization - A Growing Trend: Food Sovereignty or Dominion?
14:55–15:15	**Dr. Kumud Kant Awasthi** Invited Speaker	Nanotechnology-Based Seed Priming for Sustainable Food Security in Rice and Wheat
15:15–15:30	**Ioana Mihaela Balan** Oral Speaker	From Food Ethics to Food Citizenship – Reframing Food Security for Sustainable Food Systems in Central and Eastern Europe
15:30–15:45	**Eva Martínez Ibáñez** Oral Speaker	From Ocean to Data: Digital Traceability for Sustainable Seafood Value Chains
15:45–16:00	**Alik Pelman** Oral Speaker	Future Food as an Optimization Problem: Balancing Nutrition, Sustainability, Justice, and Agency
16:00–16:15	**Pedrão Reghiany Mayka** Oral Speaker	Natural Alternatives to Synthetic Additives in Meat Products: A Five-Year Review of Antioxidants, Antimicrobials, and Yeast-Derived Biomolecules
16:15–16:30	**Seham Al Raish** Oral Speaker	Consumer Values, Safety Perceptions, and Sustainable Vegetable Purchasing Behavior: A Cross-Sectional Study
16:30–16:45	**Gracia Chiguila Rodriguez** Oral Speaker	Physicochemical, Nutritional, and Sensory Characteristics of Soy- and Lentil-Based Patties Analogous to Meat
16:45–17:00	**Beauty Japhet** Oral Speaker	Life Cycle Sustainability Assessment of Gluten-Free Food Systems: Evidence Gaps & Integration of Nutritional Functional Units
17:00–17:25	**Flash Poster Presentations**	**Victoria Chimere Eche** Brewery Waste to Functional Food: Alkaline and Ultrasonic Recovery of Brewer's Spent Grain Protein and Its Application in Croissant Fortification **Mariana Robalo Santos** Recovery of Residual Oil from Canola Meal by Ultrasound-Assisted Extraction, Using a Green Solvent: Influence of Process Variables

		Víctor Manuel Pérez Puyana Agro-Waste as a Feedstock for Flour and Bioplastic Production: A Circular Economy Approach **Fernando Daniel Urbieta-Villalobos** Proteomic Reprogramming During Amaranth Seed Germination Reveals a Domestication Signature Associated with Stress Versus Growth Strategies **Joaquin Ruiz Pagano** From Bovine Bone Waste to Value-Added Resources: Opportunities for Circular Bioeconomy in the Meat Industry

Session C. Food Physicochemistry & Analysis (Parallel Session)

Time: 14:00 (CET, Basel) | 09:00 (EDT, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:05	**Prof. Dr. Joana S. Amaral** **Prof. Dr. Susana Casal** Session Chairs of Session C	*Opening Speech from the Session Chairs*
14:05–14:20	**Edgar Alejandro Esquivel-Fajardo** Oral Speaker	High-Temperature Ohmic Heating as a Strategy to Improve Resistant Starch Type 5 Formation in Corn Starches with Different Amylose Contents
14:20–14:35	**Reichell P. Cruz Cabrera** Oral Speaker	Fish Oil Microencapsulation on Volatile Compound Profiles and Physicochemical Properties of Dark Chocolate
14:35–14:50	**Elsa M. Gonçalves** Oral Speaker	Influence of Processing Operations on the Functional and Rheological Properties of Legume Flours
14:50–15:05	**Mattia Spano** Oral Speaker	What's Beyond Macro- and Micro-Nutrients? NMR Metabolite Profiling of Edible Insects for a Larger View of Their Features
15:05–15:20	**Magdalena Cywińska-Antonik** Oral Speaker	Glucose Reduction in NFC Apple Juice by Immobilized Glucose Oxidase/Catalase: Quality and Safety Assessment
15:20–15:35	**Chenglin Zhu** Oral Speaker	Effects of High Hydrostatic Pressure Treatment on the Flavor Quality of Kiwi Wine Based on Machine Learning and Flavoromics
15:35–15:50	**Ana Beatriz Magalhães Novais** Oral Speaker	Food Processing as a Strategy for Low-FODMAP Functional Ingredient Development: A Systematic Literature Review of Mediterranean Plant Foods
15:50–16:15	**Flash Poster Presentations**	**Iwona Szymańska** Comparative Effects of Pea, Soy, and Wheat Protein Preparations on the Properties of Structured Emulsions **Andrei-Cristian Stănicel** Ftir Insights into Wheat Flour Gluten: Linking Secondary Structure of Gliadins and Glutenins with Baking-Related Functionality **Jasenka Gajdoš Kljusurić** Sustainable Processing of Citrus By-Products: Influence of Drying on Bioactive Compound Recovery **Branislava Teofilović** Chemometric Mapping of Phenolic Diversity in Lamiaceae Extracts Highlights Solvent-Dependent Patterns **Anna Łyczak** Influence of Replacing Raw Cocoa with Cocoa Shell Husk on Chemical Composition, Physicochemical Properties, and Sensory Attributes of Apple-Cocoa Fruit Leathers
		END OF DAY 2

30 October 2026 (Friday)

Session G. Food Safety, Toxicology & Quality (Parallel Session) [Part 1]

Time: 09:00 (CET, Basel) | 04:00 (EDT, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
09:00–09:05	**Prof. Dr. Esther Sendra** Session Chair of Session G	*Opening Speech from the Session Chair*
09:05–09:25	**Dr Jiage Ma** Invited Speaker	Insights into Synergistic Bio-preservation with Nisin and Botanical Agents: Mode of Action, Biofilm Control, and Implications for Food Systems
09:25–09:40	**Michelle Evaristo** Oral Speaker	Thermal Resistance of Selected Heat-Resistant Spore-Forming Bacteria in Philippine Shelf-Stable Foods at Different Syrup Concentrations
09:40–09:55	**Monika Borkowska** Oral Speaker	qPCR-HRM Authentication of Single-Component Dominant Functional Foods
09:55–10:10	**Gorka Santamarina-García** Oral Speaker	Monitoring Antibiotic Residues in Extensively Managed Raw Sheep Milk for Enhanced Food Quality and Safety
10:10–10:25	**Manos Vlasiou** Oral Speaker	Transporter-Mediated Modulation of Veterinary Drug Residues in Milk: A One Health Computational Toxicology Framework
10:25–10:40	**Slaveya Petrova** Oral Speaker	Accumulation of Microplastics in Tomato (Solanum lycopersicum L.)
10:40–10:55	**Giovanni D'Ambrosio** Oral Speaker	Redefining *Salmonella* spp. Challenge Testing in Ready-to-Eat (RTE) Products: Current Gaps and Harmonisation Proposal
10:55–11:10	**Alejandra María Albert Bermejo** Oral Speaker	Impact of Subsurface Localized Irrigation on Physicochemical Quality and Postharvest Stability of Table Grapes
11:10–11:25	**Flash Poster Presentations**	**Khadidja Reguieg** Formulation and Quality Optimization of a Goat Whey-Milk Kefir Enriched with Powdered Milk **Erwin Limbo Descallar** Quality and Microbiological Stability of Pasteurized Coconut Skim Milk During Refrigerated Storage **Shakirah Omotoke Azeez** Genotoxicity and Cytotoxicity Screening of Ethanol and Water Extracts of *Lonicera caerulea* Leaf
	BREAK	

Session D. Food Microbiology & Biotechnologies (Parallel Session)

Time: 09:00 (CET, Basel) | 04:00 (EDT, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
09:00–09:05	**Dr. Efstathios Giaouris** **Dr. Konstantinos Papadimitriou** Session Chairs of Session D	*Opening Speech from the Session Chairs*
09:05–09:30	**Dr. Efstathios Giaouris** Keynote Speaker	Beyond Killing Microbes: Harnessing Food-Grade Lactic Acid Bacteria for Sustainable Biofilm Control in the Food Industry
09:30–10:00	**Dr. Konstantinos Papadimitriou** Keynote Speaker	From Food Microbial Communities to Systems Microbiomes: A Multiomics Perspective
10:00–10:20	**Asst. Prof. Nikolaos Andritsos** Invited Speaker	Serotype Distribution and Antimicrobial Resistance of Listeria monocytogenes in the Feed–Animal–Food Continuum Within the One Health Concept
10:20–10:35	**Aqib Javaid** Oral Speaker	Interplay of Vertical Inheritance and Horizontal Gene Transfer Shapes Biogenic Amine Biosynthesis in Lactic Acid Bacteria: Implications for Food Safety
10:35–10:50	**Dingkang Wang** Oral Speaker	Multi-Omics Profiling of Palmitoleic Acid-Associated Changes in *Zygosaccharomyces rouxii*
10:50–11:05	**Chiara Nadai** Oral Speaker	Tracking One Year of Homemade Kombucha Backslopping: Microbial Succession, Chemical Transformations, and Bioactivity in Green and Black Tea Fermentations

11:05–11:20	**Karabo Mabetoa** Oral Speaker	Probiotic-Derived Extracellular Vesicles: Emerging Natural Inhibitors of Foodborne Pathogens and Biofilms
11:20–11:35	**Emanuela Lavanga** Oral Speaker	Glutamate and pH Affect GABA Production and Acid Stress Tolerance in Levilactobacillus brevis LB12
11:35–12:05	**Flash Poster Presentations**	**Maria João Nunes** Impact of Nitrite Reduction in Cooked Turkey Ham: Preliminary Studies on Safety Issues **Norton Komora** Traditional Fermented Foods from Southern Brazil as a Source of Bacteriocinogenic Lactic Acid Bacteria against *Listeria monocytogenes* **Emilia Janiszewska-Turak** The Effect of Mono - and Co-Culture Fermentation on the Physicochemical Properties of Beetroot Juice **Suzette Juarez-Contreras** Adaptive Responses of *Listeria monocytogenes* during Long-Term Frozen Storage of Cheese: Survival and Biofilm Recovery **Abirami Karthikeyan** Natural Bioactives Against Staphylococcus aureus: Disrupting Biofilm Formation and Virulence to Combat Food Contamination **Oulayya Essalhi** Screening Safe and Functional Lactic Acid Bacteria from Argan Press Cake for Food Biopreservation Applications
	BREAK	

Session G. Food Safety, Toxicology & Quality (Parallel Session) [Part 2]

Time: 14:00 (CET, Basel) | 09:00 (EDT, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:05	**Prof. Dr. Esther Sendra** Session Chair of Session G	*Opening Speech from the Session Chair*
14:05–14:35	**Dr. Antonio J. Signes-Pastor** Keynote Speaker	Arsenic in the Food Chain: Speciation Analysis, Dietary Exposure, and Health Implications under a One Health Framework
14:35–14:50	**Marcos Rodríguez Estrada** Oral Speaker	Mineral Profiles Across the Iberian Rice Chain: From Soil to Grain
14:50–15:05	**Tiziana Sgamma** Oral Speaker	Supporting Allergen Risk Management in Spice Supply Chains: Detection of Peanut Contamination in Garlic and Garlic-Derived Products Using Molecular and Protein-Based Approaches
15:05–15:20	**João G. Costa** Oral Speaker	Food–Drug Interactions: Knowledge, Training, and Counselling Practices Among Portuguese Community Pharmacists - A Preliminary Cross-Sectional Study
15:20–15:35	**Mostafa Altit** Oral Speaker	Safety-by-Design of Functional Camel Milk Kefir Using Predictive Microbiology and Machine Learning for Salmonella Control
15:35–15:50	**Ánder Solana-Guilabert** Oral Speaker	Preharvest Sorbitol–Calcium Treatment Reduces Chilling Injury and Postharvest Losses in Pomegranate cv. 'Mollar de Elche' Stored at 2 °C and 7 °C
15:50–16:05	**Sarah Oluwatoyin Olusola** Oral Speaker	Assessment of *Petiveria alliacea* L. Extract on the Shelf Life and Residue Analysis of *Solanum lycopersicum* L. Fruits
16:05–16:20	**Ewen Cameron David Todd** Oral Speaker	The One Health Gap in the Arab World: Diagnosing Governance Deficits through Brucellosis and Hepatitis A
16:20–16:55	**Flash Poster Presentations**	**Ezra Gabrielle J. Cacayan** Postharvest Quality Changes and Thermal Injury Development in Hot Water-Treated Philippine Carabao Mangoes (*Mangifera indica L.*) During Ripening **Alberto Guirao** Preharvest Treatments with Sorbitol and Salicylic Acid to Preserve Quality and Reduce Chilling Injury in 'Sanguinelli' Blood Oranges During Cold Storage **Gustavo Fix** Development of a Simultaneous Voltammetric Method for

		Amaranth and Tartrazine Employing a Glassy Carbon Electrode Modified with Graphene/Carboxymethyl-Botryosphaeran **Ilaria Petrignani** Discrimination of Species in Raw Milk by Raman Spectroscopy and Principal Component Analysis **Yashika Jagadish** Evaluation of the Protective Potential of Chitosan-TPP Encapsulated *Tamarindus indica* Fruit Pulp Extract against Tartrazine-Induced Haematological and Biochemical Alterations in Female Wistar Albino Rats **Caroline Simão** Digital Image Processing Coupled with Machine Learning for the Classification of Commercial Fruit Vinegars **Mariem Ayed** Shelf-Life Dynamics of Plain and Lemon-Flavored Goat's Milk Kefir
16:55–17:05	**Prof. Dr. Arun K. Bhunia** Conference Chair	*Closing from the Conference Chair*
END OF FOODS 2026		

Foods 2026 Poster List

Submission ID	Author Name	Title
A. AI, Technology & Engineering in Food		
Sciforum-197904	Analia Cecilia Colletti	A digital twin approach for enzymatic browning and shelf-life prediction in postharvest bananas using deep learning
Sciforum-197872	Luciana Girard	Technological pretreatments applied to traditional canary seed (Phalaris canariensis L.) for the production of flour suitable for human consumption
Sciforum-195857	Gonzalo Astray	Application of hyperspectral imaging and machine learning for the discrimination of chickpea varieties
Sciforum-198519	Laura García-Curiel	Integrating computer vision descriptors with instrumental measurements to characterize color and texture evolution in whey-aguamiel cheese during refrigerated storage
Sciforum-197103	Darianna Ur-Mora	Design and evaluation of a coaxial extrusion system for alginate-based 3d food printing
Sciforum-197599	Chihiro Sugihara	Microwave re-heating of packaged rice: Computer simulation of the starch re-gelatinization and evaluation of quality retention
Sciforum-198518	Murlykina Natalia	Study of the Functional and Technological Properties of Gluten-Free Raw Materials for New Chocolate Muffins
Sciforum-198649	Lorena Sofia Pepa	Phenylalanine-Based Supramolecular Gels for Structuring Apple Juice Matrices
Sciforum-196305	Efstathios Panagou	Rapid and non-invasive monitoring of natural black olive fermentation through UV-Vis spectroscopy coupled with PCA-ANN modelling
Sciforum-197898	Diego Gutiérrez	Effect of different preservation treatments on membrane lipid modification and its association with enzymatic browning in fresh-cut eggplants
Sciforum-202977	Julio Federico Benites	INFLUENCE OF LEMON AND OREGANO ESSENTIAL OILS, ASSOCIATED WITH MODIFIED ATMOSPHERE PACKAGING, ON THE PRESERVATION OF FRESH CUT ANCO SQUASH (CUCURBITA MOSCHATA).
Sciforum-197649	Emerson Maximo Asto-Rodriguez	Classical, Deep, and Quantum Machine Learning for Automated Ulluco Quality Classification
Sciforum-197840	Jesús Guadalupe Pérez-Flores	Computational Characterization of a Promising Region in Fresh Pasta Using Mixture Design and Constrained Simulation

Submission ID	Author Name	Title
B. Nutritional & Functional Foods		
Sciforum-198198	Thivya Nallathamby	Development and Evaluation of a Low Glycemic Index Nutrient Bar made with Finger Millet (Eleusine coracana), Kodo Millet (Paspalum scrobiculatum) and Kithul Palm (Caryota urens) Jaggery as a Natural Sweetener
Sciforum-196179	Tiago Azevedo	Preserved hepatic, renal, and intestinal antioxidant enzyme activity in mice supplemented with an olive pomace extract
Sciforum-198333	Rui Dias-Costa	Valorisation of oyster mushroom stems in meat formulations: Effects on physicochemical, technological and sensory properties
Sciforum-198271	Agnieszka Ciurzyńska	SUGAR-FREE CAFFEINE GUMMIES ENRICHED WITH COLLAGEN AND PECTIN
Sciforum-206445	Pei Zhang	Cross-Continental Comparison of Chinese and European Producing Zones: Environmental Gradients of Nutritional Components in Naked Oats (Avena sativa L.)
Sciforum-197540	Shewangzaw Addisu Mekuria	Worker Bee Larvae as a Novel Edible Insect - Advancing EU Novel Food Authorization
Sciforum-200664	Agata Wojciechowicz	Effect of Milk Thistle (Silybum marianum L.) Addition on the Quality and Nutritional Value of Rye Bread
Sciforum-196747	Nisa Buset-Ríos	Short-term effects of Opuntia dillenii fruit-derived products consumption on plasma antioxidant capacity in healthy adults: A pilot study
Sciforum-202799	Pablo Daniel Ribotta	From the Andean Grain to the Functional Ingredient: Thermomechanical Extrusion of Amaranth for High-Value Food Applications
Sciforum-195713	Roberta Pino	Upcycling Grape Pomace into Functional Bread: A Sustainable Valorization Strategy
Sciforum-195734	Karen Florencia Irigoytia	Millet-, soybean-, and rice bran-based gluten-free breads formulated with Type I sourdough: effect on quality and in vitro glycaemic index
Sciforum-190578	Achilleas Atzemopoulos	Comparative network pharmacology analysis of marker bioactive compounds from Greek monofloral honeys reveals potential anticancer-related mechanisms
Sciforum-197208	Maria Eugenia Sabatino	Contribution of bioactive compounds from walnut and almond by-products to the modulation of oxidative stress and cell survival in Caco-2 cells.
Sciforum-198637	Silvana Cecilia Ruiz	Optimization of the sous-vide cooking process in pumpkin and carrot puree using response surface methodology
Sciforum-192267	Naresh Kumar Mehta	Development of Nutrient-Enriched Fish Pizza Incorporated with Pangasianodon hypophthalmus Surimi Powder and Its Quality Assessment
Sciforum-195741	Karen Florencia Irigoytia	Effect of the incorporation of Neltuma affinis pod and soybean extruded-expeller meal flours on the technological properties of gluten-free fresh pasta
Sciforum-196112	Luis Alberto Condezo Hoyos	Multiphenolic inulin obtained by grafting with phenolic compound from Sambucus peruviana using a novel and hybrid dual intermediate frequency ultrasound procedure

Sciforum-197707	Rosana Aparecida Manolio Soares-Freitas	Identification of Circulating Peptides In Vivo Following Amaranth Protein Isolate Ingestion
Sciforum-197697	Leonardo Musto	Plant sterol supplementation does not inhibit intestinal cholesterol absorption in subjects with obesity
Sciforum-202278	Lucía Elisabet Brelis	Effect of Convective Drying on the Bioactive Compounds and Antioxidant Activity of Honey Powder Compared with Conventional Drying Methods
Sciforum-203320	Julio Federico Benites	Chia Sprouts (Salvia hispanica L.): Potential as a Source of Bioactive Compounds
Sciforum-203241	Esther Trigueros	Pectooligosaccharides (POS) and Polyphenol-Rich Extracts from Agri-Food By-Products: Valorization of Cocoa (Theobroma cacao) Pod Husk (CPH) through Microwave-Assisted Extraction (MAE)
Sciforum-197747	Leonardo Musto	Exploring the effect of cricket (Acheta domesticus)-enriched pasta on gut microbiota after in vitro colonic fermentation
Sciforum-198405	Alexis Pereira	Comparative phenolic composition of Swiss chard and spinach microgreens
Sciforum-203002	Sundhar B	Development of Microencapsulated Probiotic Formulation using Spray Drying
Sciforum-198545	Mª Elvira López-Oliva	Grape Antioxidant Dietary Fibre Enhances Nrf2-Linked Redox Protection in Rat Colonic Mucosa
Sciforum-198621	Marisa Nicolai	Fatty Acid Composition and Nutritional Quality of Marine Fish Species from the West African Coast
Sciforum-197744	Leonardo Musto	The role of plant sterols in modulating the gut microbiota: implications for health and disease
Sciforum-202171	Ewa Pejcz	Impact of Bean-Flour Sourdough on Technological Quality, Colour and Antioxidant Properties of Wheat-Based Bread
Sciforum-196554	Manuel Viuda-Martos	Partial Substitution of pork Fat by a Gelled Emulsion Formulated with Pomegranate Peel Flour and Quinoa Oil: Impact on Chemical Composition, Physicochemical Attributes, and Sensory Quality of Beef Burgers
Sciforum-198382	Erwin Limbo Descallar	Vitamin Composition of Fresh Young Banaba (Lagerstroemia speciosa) and Malunggay (Moringa oleifera) Leaves: A Comparative Evaluation
Sciforum-197541	Elena Preite	Exploring Poncirus trifoliata Fruits as a Source of Natural Antioxidants: Influence of Ripening Stage
Sciforum-197718	Leonardo Musto	Effect of plant sterol supplementation on oxidative stress markers in adults with obesity
Sciforum-203121	Mussa Makran	Autochthonous lactic acid bacteria from Gran Canaria (Canary Islands) enhance the functional properties of goat cheese via modulation of bioactive fatty acids and antioxidant capacity
Sciforum-197536	Shewangzaw Addisu Mekuria	Worker Bee Larvae Powder in 3D-Printed Bioinks

Sciforum-198618	Paula Sette	Valorization of Grape Pomace for the extraction of phenolic compounds using Natural Deep Eutectic Solvents (NaDES)
Sciforum-183455	Chantelle Human	Stability and protein-phenolic interactions of ready-to-use protein-packed functional honeybush tea powder formulations.
Sciforum-197838	Anna Florowska	The effect of fenugreek seeds addition on selected quality characteristics of hamburgers
Sciforum-198548	Fathima Sapra	Quantification of Anthocyanins in Red Cabbage (Brassica oleracea var. capitata f. rubra) Leaf Powder and Their Potential Implications for Neuroprotection
Sciforum-202307	Mohamad Norisham Mohamad Rosdi	Antioxidant Capacity, Metabolite Profiles and In Silico Analysis of Purple Passion Fruit Peel Tea under Different Drying and Brewing Conditions
Sciforum-198413	Dimitra Alimpoumpa	Enhancing storage and thermal stability of lactic acid bacteria through electrospinning/electrospraying encapsulation
Sciforum-188404	Tiago Azevedo	Impact of Inonotus hispidus supplementation on morphometric and physiological parameters in HPV16-transgenic mice
Sciforum-194680	Maria Manuela Guerra	Healthy Indulgence: New Formulation and Validation of a Dessert for Dietary Restrictions
Sciforum-180286	Christiane Queiroz	Post-Fermentation Incorporation of Grape Pomace into Yogurt: Effects on Bioactive Compound Content and Antioxidant Activity
Sciforum-196227	Tarik Sebbah	Smart, Ready-to-Use Nutritive Formulations of Portulaca oleracea L.-Loaded Food-Grade NADESs for Functional Food Development
Sciforum-198062	Laura Candela Salvador	Coffee Silverskin Extract as a Functional Ingredient for the Development of Caffeinated Gummies
Sciforum-196176	Jin Mark De Guia Pagulayan	Physico-chemical properties of a novel plant based milk alternative using coconut protein concentrate (CoPROTINA) and coconut dietary fiber (CoFBR): screening of formulation parameters
Sciforum-198539	Marianela Alejandra Federik	Effect of Yacon Flour and Allulose on the Browning Index and Antioxidant Capacity of Cookies
Sciforum-198628	Silvana Cecilia Ruiz	Advances in the design and optimization of a functional purée for sous vide processing
Sciforum-197715	Leonardo Musto	Management of chronic low-grade inflammation through plant sterol supplementation: A randomized trial in subjects with obesity
Sciforum-203162	NEHA ELANDASSERY SASHA	Multi-Enzyme Inhibition and Anti-Inflammatory Effects of Dammar Bee Honey: An In Vitro Study
Sciforum-198171	Joana T. Martins	Natural Solid Lipid Nanoparticles as an Emerging Platform for Vitamin E Delivery in Functional Foods
Sciforum-179600	Cecile Leah T. Bayaga	Effect of plant sterols and dietary fiber among Filipino adults with moderately raised serum cholesterol levels
Sciforum-202789	Lucía Alvarez-Antuña	Brown onion peel as a functional ingredient: antioxidant and anti-inflammatory potential after in vitro digestion

Sciforum-197597	Irene Dini	Probiotics and Fermentation-Derived Metabolites: Advances in Functional Food Science
Sciforum-198346	Neuvis Alejandro Pino	Oleogel-Based W/O Emulgels as Fat Replacers in Dough Systems: Rheological and Structural Characterization
Sciforum-203139	GIULIANA SILVINA SELING	Antiglycation Activity of Plant Extracts Evaluated through the Kinetics of Advanced Glycation End Product (AGE) Formation in Model Systems and Apple Juice
Sciforum-198714	Sandra Lamas	Influence of Olive Tree Age and Interannual Variability on Nutritional and Health-Related Compounds in Verdeal Transmontana Olive Oils
Sciforum-195990	Lucia Francesca Vuono	Unlocking the Potential of Spent Coffee Grounds: From Agro-Industrial Waste to Functional Bioactive Ingredients
Sciforum-198400	Pablo Daniel Ribotta	Effect of Thermomechanical Extrusion on the Antioxidant Activity of Peanut Skin: An Exploratory Study
Sciforum-197903	Ana Paulina Barba de la Rosa	Characterization of bioactive peptides released during the fermentation of amaranth seeds with their endophytic bacteria
Sciforum-202224	Lorenza Marinaccio	Ursolic And Oleanolic Acid-Rich Extract From Rosmarinus Officinalis L.: in vitro and in vivo biological potential
Sciforum-199986	Frankzua Munive	Effects of Different Drying Methods on Bioactive Compounds and Antioxidant Capacity of Cushuro (Nostoc sphaericum)
Sciforum-197549	Judith Rodríguez-Párraga	“Reformulation of ‘Longaniza de Pascua’ with Locusta migratoria Powder: Nutritional and Technological Evaluation”
Sciforum-197738	Elisa Mariana García	Bioactive Phenolic Extracts from Native Argentine Chaco Plants: Characterization and Potential Food Applications
Sciforum-202961	Kushlani Nalinka Deshapriya	Comparative Evaluation of the Cytotoxic Effects of Selected New Improved and Traditional Red and White Sri Lankan Rice (Oryza sativa L.) Varieties on Human Colorectal Cancer (Caco-2) Cells
Sciforum-196806	Emmanuel Pérez-Escalante	Optimization of rye protein hydrolysis with Flavourzyme for the obtention of hydrolysates with radical scavenging properties
Sciforum-197965	Gabriela Alcalá-Gómez	Amino acid and fatty acid composition of two sweet tomatillo species (Physalis gracilis and Physalis grisea)
Sciforum-202772	Susana Diez	Development of gluten-free premixes with an improved nutritional profile: effect of Jerusalem artichoke powder on the technological quality of millet-legume blends
Sciforum-197791	Ana Divito	Food microstructure as a modulator of the bioaccessibility and anti-inflammatory activity of bioactive compounds in pumpkin snacks enriched with thyme essential oil
Sciforum-200157	Agata Wojciechowicz	Development of High-Fiber Functional Pasta Enriched with Oat β-Glucan, Apple Pomace, Inulin and Psyllium Husk: Technological and Sensory Evaluation
Sciforum-203238	Mark Anthony Casas Lat	Harnessing Philippine Seaweeds for Nutrient-Dense Snack Development
Sciforum-203239	Paula Sette	Optimization of pectin recovery from Williams pear processing by-products through pre- and post-extraction washing treatments

Sciforum-195843	Filomena Nazzaro	Blackcurrant and Tomato Seed Oils: Distinct Fatty Acid Profiles with Shared Functional Potential
Sciforum-198589	Paloma Franco	Influence of sprouting conditions on compositional changes and techno-functional properties of adzuki bean (Vigna angularis) flours
Sciforum-202198	Durim Alija	Valorization of Pumpkin Flesh and Peel Flours as Sustainable Ingredients for Semolina Pasta: Effects on Color and Cooking Quality
Sciforum-197222	Mariana Soledad Lingua	Multifunctional cream cheese enriched with co-encapsulated polyphenols from sweet potato waste and probiotics
Sciforum-209576	Emília F. Vieira	Phytochemical and Bioactive Properties of Ochna afzelii and Steganotaenia araliacea from Northern Angola
Sciforum-209579	Luísa Dovala	Bridging the Gap Between Traditional Knowledge and Scientific Evidence for Three Underutilised Fruits of Cabinda
Sciforum-209581	Amândio D. Zimba	Nutritional and Functional Characterisation of Edible Leaves and Flowers from Selected Traditional Plants in Mozambique

Submission ID	Author Name	Title
C. Food Physicochemistry & Analysis		
Sciforum-198622	Milica Vidić	Application of lactic acid-based natural deep eutectic solvents for the extraction of phenolic compounds from winter savory
Sciforum-198166	Izabela Sadowska-Bartosz	Effect of Metal Ion Complexation on the Stability and Antioxidant Properties of Anthocyanins
Sciforum-187338	Tarik Sebbah	Tailoring of Hydrophobic NADESs Acidity and Viscosity on the Stabilization and HPLC Analysis of Portulaca oleracea L. Leaves Labile Bioactives
Sciforum-193543	Virginia Judit Larrosa	PECAN NUT FLOUR AS AN INGREDIENT IN NOODLES: IMPACT OF DRYING TEMPERATURE ON STRUCTURE AND QUALITY ATTRIBUTE
Sciforum-197880	Jasenka Gajdoš Kljusurić	Sustainable Processing of Citrus By-Products: Influence of Drying on Bioactive Compound Recovery
Sciforum-198356	Vanessa Grifoll Garcia	Upcycling Agaricus bisporus Stems: Ultrasound-Assisted and NADES for Protein Extraction
Sciforum-198520	Guilherme Cerejo	Development and Characterization of an innovative Artisanal Cider Production Using alternative ingredients
Sciforum-201560	Antonio Jose Pérez-López	Effect of Hyperbaric Micro-Oxygenation on the Chromatic Evolution of Tempranillo Red Wine
Sciforum-198255	Izabela Sadowska-Bartosz	Anthocyanin fluorescence for monitoring oxidation of the chokeberry fruit during drying and storage of fruit lyophilizates
Sciforum-185711	Sándor Beszédes	Non-Destructive and Reagent-free Monitoring of Vegetable Oil Oxidation Using Dielectric Measurement
Sciforum-202167	Ewa Pejcz	Bean Pre-treatment Shapes the Techno-functional and Rheological-Pasting Behaviour of Wheat-Bean Flour Systems
Sciforum-198056	Elsa M. Gonçalves	Impact of Mild Oven Drying on Colour Preservation and Phenolic Extractability of Mentha spicata L. from the Saloia Region
Sciforum-202258	Sintija Vetra	Characteristics of Latvian Red Wines Produced from Local Grape Varieties
Sciforum-198638	Johnny Fernando Granja Travez	Metabolic Changes during Coffee Cherry Ripening and Their Implications for Coffee Processing
Sciforum-197801	Mariana Soledad Lingua	Red Grape Pomace Flour: Exploring its Physicochemical composition, Antioxidant Characteristics and Technological Performance in Breadmaking
Sciforum-198258	Liz Carolina Ríos	Improvement of Paraguayan cane fermentation through nitrogen supplementation: effects on ethanol yield and aromatic profile.
Sciforum-201872	Guilherme Amaro Cerejo	Comparative evaluation of quality characteristics and mineral profile of three avocado (Persea americana L.) culivars commercialized in Portugal: Fuerte, Hass and Ryan

Sciforum-198679	Sina Makouie	Characterizing and Optimizing Milk Thistle Pomace Oil and Bioactives Extracted by Ultrasound-Assisted Extraction
Sciforum-203295	Joanna Bryś	Stabilizer-dependent physical stability of vitamin-fortified coconut milk alternatives
Sciforum-195020	Casiana Blanca Villarino	Effects of formulation on the physicochemical properties and acceptability of a strawberry-flavored upcycled coconut skim milk (uCSM)
Sciforum-176628	Nicoleta-Aurelia Chira	FTIR INSIGHTS INTO WHEAT FLOUR GLUTEN: LINKING SECONDARY STRUCTURE OF GLIADINS AND GLUTENINS WITH BAKING-RELATED FUNCTIONALITY
Sciforum-197713	Maria Paz Corradi	Effect of thermal pretreatment on the antioxidant capacity of Cymbopogon flexuosus essential oil when added to sunflower oil
Sciforum-197609	Iwona Szymańska	Comparative Effects of Pea, Soy, and Wheat Protein Preparations on the Properties of Structured Emulsions
Sciforum-198392	Mariana Robalo Santos	Oxidative Changes in Canola Oil during Storage as Affected by Hydrothermal-Microwave Pretreatment
Sciforum-198570	Valmary Michelle Van Breda	Cryogenic Pre-treatment of Grape must before winemaking: Effect on must and wine physico-chemical and sensory profiles
Sciforum-198362	Nicoleta-Aurelia Chira	Oil yield, fatty acid profile, and nutraceutical potential of Nigella damascena seeds under varying pedoclimatic conditions
Sciforum-197866	Patricia Andrea Della Rocca	Dielectric characterization of foods in solid and semi-solid state
Sciforum-203310	Enoch Thaddaeus Quayson	Physicochemical properties of stored Ga and Fante Kenkey Aflata-mix from maize-sweet potato composite dough
Sciforum-180070	Alin Barna	A RAPID AND NON-DESTRUCTIVE COSY NMR APPROACH FOR DISTINGUISHING BUTYRIC AND n-3 FATTY ACID MOIETIES IN DAIRY FAT MATRICES
Sciforum-197882	Mariana Robalo Santos	Effect of hydrothermal-microwave pretreatment on tocopherol retention and acidity evolution in canola oil during storage
Sciforum-198453	Matilde Maia	Exploring the Antioxidant Capacity of Lupin Flour as a Sustainable Functional Ingredient
Sciforum-197810	Ornela Bárbara L. Becker	Comparison of the Chemical Composition of Different Gluten-Free Brewer's Spent Grain Batches for Potential Applications in the Food Industry and Biorefineries
Sciforum-202212	Durim Alija	Thermomechanical Properties of Durum Wheat Semolina Blends Enriched with Pumpkin Flesh and Peel Flour Evaluated by Mixolab
Sciforum-203230	Mark Anthony Casas Lat	Development and Nutritional Characterization of Multispecies Seaweed Chips from Philippine Seaweeds
Sciforum-197922	Paulo Henrique Fonseca	Response Surface Optimization of Digital Image Colorimetry for Total Acidity Determination in Alcohol Vinegar

Sciforum-195659	Anna Łyczak	Influence of Replacing Raw Cocoa with Cocoa Shell Husk on Chemical Composition, Physicochemical Properties, and Sensory Attributes of Apple-Cocoa Fruit Leathers
Sciforum-196460	Izalin Zahari	Effect of Extrusion Conditions and Retort Processing on the Physicochemical Properties of High-Moisture Meat Analog from Sorghum and Pea Protein Isolate
Sciforum-195580	Carlos A. Ligarda-Samanez	Physicochemical, Bioactive, and Agroclimatic Differentiation of High-Andean Specialty Coffees Oriented toward Traceability and Territorial Valorization
Sciforum-209580	Menalda V. André	Effect of Wet Ageing on the Proximal Composition and Mineral Profile of Meat from Adult Serpentina Goats

Submission ID	Author Name	Title
D. Food Microbiology & Biotechnologies		
Sciforum-203132	Mussa Makran	Development of lactic acid bacteria starters for cheesemaking isolated from different dairy matrices in Gran Canaria (Canary Islands)
Sciforum-194322	Sergio Martínez-Terol	Bioprocessing of Olive Mill Wastewater Sludge-Derived Subcritical Water Extracts (SWE) by Lactic Acid Bacteria
Sciforum-202737	Ingryd Carolly de Oliveira Medeiros	Evaluation of the microbiological quality of mayonnaise using an accelerated shelf-life test
Sciforum-197655	Mario Terlizzi	A First Approach to combine AI and Predictive Microbiology
Sciforum-198715	Suzette Juarez-Contreras	“Adaptive Responses of Listeria monocytogenes during Long-Term Frozen Storage of Cheese: Survival and Biofilm Recovery”.
Sciforum-196087	Tarik Sebbah	Identification by MALDI-TOF MS and probiotic characterization of Enterococcus faecium strains isolated from equine milk
Sciforum-192101	Carolina Iraporda	Development of type II sourdoughs using Lactiplantibacillus plantarum CIDCA 8327 in gluten-free matrices
Sciforum-197902	Vânia Rodrigues	Development and Validation of a TaqMan Real-Time PCR Assay for Species-Level Authentication of Locusta migratoria in Commercial Food and Feed Matrices
Sciforum-202012	Clara Santa Rosa Fioriti	DEVELOPMENT OF A NON-DAIRY MEDIUM FOR THE CULTIVATION OF Lacticaseibacillus paracasei.
Sciforum-198590	Rita Vedor	From Fruit Waste to Functional Ingredients: Probiotic Growth Promoting and Bioactive Potential of Rejected Plum and Orange Pulp
Sciforum-203126	Sónia Eduarda Ferrás Soares	Towards Future Honey Microbiome Studies: Optimization of Molecular Approaches for Bacterial DNA Detection in Portuguese Honey
Sciforum-198586	Maria João Nunes	Impact of nitrite reduction in cooked turkey ham: preliminary studies on safety issues
Sciforum-198708	Diogo Lucas Pinheiro	Exploring the use of Aspergillus oryzae for the development of innovative fish-based sausages
Sciforum-197073	Yousra Meriem Berrached	MODELLING THE COMBINED EFFECTS OF pH AND TEMPERATURE ON BIOFILM FORMATION DYNAMICS OF A MULTIDRUG RESISTANCE STRAIN OF STAPHYLOCOCCUS AUREUS
Sciforum-198538	Angela Guerrieri	Shelf life extension of Ready-to-Eat glasswort through natural antimicrobials and Modified Atmosphere Packaging
Sciforum-201151	Grace Naa Ayorkor Charway	Antibacterial and Antibiofilm Activity of Lactic Acid Bacteria Against Major Foodborne Pathogens: Potential for Natural Biocontrol
Sciforum-197679	Virginia Melany Lara	Disruption of Candida tropicalis biofilms on stainless steel by essential oil emulsions

Sciforum-203269	Zofia Owczarzak	Cronobacter turicensis within the Cronobacter genus (Enterobacteriaceae): genomic architecture and evolutionary stability
Sciforum-198311	Lakshith P C	Bio-Prospecting and Probiotic Characterization of Lactic Acid Bacteria Isolated from Milk and Dahi of Indigenous Badri and Malnad Gidda Cattle of India
Sciforum-195896	Filomena Nazzaro	Sustainable Valorization of Berry Seed By-Products: Effects of Blackcurrant and Raspberry Seed Oils on Sessile-Cell Metabolism in Bacterial Biofilms of Food and Public Health Relevance
Sciforum-200499	Abirami Karthikeyan	Natural Bioactives Against Staphylococcus aureus: Disrupting Biofilm Formation and Virulence to Combat Food Contamination
Sciforum-197832	Emilia Janiszewska-Turak	The Effect of Mono- and Co-Culture Fermentation on the Physicochemical Properties of Beetroot Juice
Sciforum-197532	Anagha Murali	Production and Evaluation of a Novel GABA-Producing Plant Yogurt and its Functional Benefits
Sciforum-197102	David Penco-Parra	Impact of Lachancea thermotolerans inoculation on microbial diversity during Spanish-style green table olive fermentations
Sciforum-196641	Oulayya Essalhi	Screening Safe and Functional Lactic Acid Bacteria from Argan Press Cake for Food Biopreservation Applications.
Sciforum-181916	Efstathios Giaouris	A Comparative Analysis of Turbidity and Impedance Measurements for Rapid Quantification of Bacillus cereus in Milk Across Diverse Temperatures and Salt Concentrations
Sciforum-196627	Mohamed AMELLAL	Response Surface Optimization of Goat Milk Kefir Fermentation for Improved Physicochemical and Microbiological Quality
Sciforum-198699	Mariam NADIR	Exploring Plant Matrices as Sources of Bioprotective Lactic Acid Bacteria for Food Applications
Sciforum-197256	Elena Lekakou	Heat-stable antifungal activity of a wild Bacillus sp. against food-spoilage moulds: a promising approach for clean-label food preservation
Sciforum-195986	Aleksandra Piotrowicz	A Proof-of-Concept ImageJ/Fiji Workflow for Single-Cell Analysis of Lipid Accumulation in Oleaginous Yeasts
Sciforum-203045	María Virginia Ozcariz Fermoselle	Biotechnological development of active polymeric biostructures containing nanoencapsulated essential oils for antifungal protection of horticultural produce

Submission ID	Author Name	Title
E. Sustainable Food System & Food Security		
Sciforum-189646	Matheus Koengkan	Asymmetric Adjustment and Structural Change in the China-Brazil Soybean-Emissions Nexus
Sciforum-180289	Víctor Manuel Pérez Puyana	Agro-Waste as a Feedstock for Flour and Bioplastic Production: A Circular Economy Approach
Sciforum-196624	Victoria Chimere Eche	Brewery Waste to Functional Food: Alkaline and Ultrasonic Recovery of Brewer's Spent Grain Protein and Its Application in Croissant Fortification
Sciforum-198584	GIULIANA SILVINA SELING	Climate-resilient native resources for sustainable bioeconomies: extraction and stabilization of bioactive compounds from Schinus molle, Neltuma ruscifolia and propolis
Sciforum-198234	Antoni Capellà	A mathematical simulator to evaluate the crop production in agrivoltaic systems
Sciforum-197230	María del Mar Contreras	Phenolic compounds, xylose, and glucose production from vine shoots through sequential microwave-assisted processing
Sciforum-201845	Kamila Soares	Assessment of Household Food Waste and Consumer Behaviours in Portugal Using Smart Scale Technology
Sciforum-196855	Siniša Srečec	Chemical characterization of condensate as a by-product in chamomile drying process
Sciforum-197881	Mariana Robalo Santos	Recovery of residual oil from canola meal by ultrasound-assisted extraction, using a green solvent: influence of process variables
Sciforum-180290	Víctor Manuel Pérez Puyana	Development of Soy Protein-Based Bioplastics as Controlled-Release Systems for Iron Biofortification in Crops
Sciforum-203187	Rosaria Cozzolino	Valorizing Red Grape Pomace through the Development of Biscuits with Potential Health-Promoting Properties
Sciforum-197830	Marcleilton R. S. Santos	Nutritional composition and antioxidant potential of Talinum paniculatum (Jacq.) Gaertn. seeds
Sciforum-203234	Carla Bonifacino	VALORIZATION OF INDUSTRIAL ORANGE RESIDUES: EFFECT OF ESSENTIAL OIL EXTRACTION ON BIOACTIVE COMPOUNDS AND TOCOPHEROL PROFILE
Sciforum-186157	Titilope Modupe Fasuan	Solar Radiation-Induced Senescence in Tropical Fruits: Mechanisms, Consequences, and Mitigation Strategies
Sciforum-189595	Ming-Chen Chiang	Negotiating Sustainability at the Family Table: Sustainable Food Purchasing in All-Age Households
Sciforum-197610	Cecilia Abirached	Valorization of Tannat grape seed residues after ultrasound assisted extraction of antioxidant compounds
Sciforum-198128	Mikhail Grachev	STORAGE STABILITY OF HORSERADISH PEROXIDASE IMMOBILIZED IN ALGINATE BEADS REINFORCED WITH ALMOND SHELL-DERIVED NANOCELLULOSE

Sciforum-195243	Erwin Limbo Descallar	Comparative Evaluation of Lakatan and Saba Banana Peel Coffee Powders as Caffeine-Free Beverage Alternatives
Sciforum-198212	Lucía López Blanco	Subcritical water extraction of tiger nut by-products: Assessment of nutritional value and safety
Sciforum-195327	Casiana Blanca J Villarino	Ready-to-drink upcycled coconut skim milk-pineapple blend: influence of formulation on physico-chemical properties and consumer acceptability
Sciforum-202513	Claudia Montserrat Gómez-Leguizamón	Early phytotoxicity response of L. sativa L. to calcined bovine bone powder aqueous extracts through a germination bioassay
Sciforum-200334	Oscar Nuñez	Sustainable Recovery of Astaxanthin from Crustacean By-Products Using Green Extraction Technologies
Sciforum-198087	Konrad Szczepański	Comparison of the effect of ultrasound and antioxidants application on the stability of fruit seeds oil.
Sciforum-202041	Pedrão Reghiany Mayka	Reformulation of "Toscana" Sausage: Reduction of Sodium and Curing Salts Using Potassium Chloride and Spray-Dried Rosemary Extract
Sciforum-198225	Nicolás Alexander Montero Muñoz	EFFECT OF ACID HYDROLYSIS CONDITIONS ON THE PHYSICOCHEMICAL PROPERTIES OF NANOCELLULOSE FROM ALMOND-SHELL-DERIVED CELLULOSE
Sciforum-198552	Aikaterini Natsia	Hempseed oil bodies: physicochemical characterization and emerging applications in food products
Sciforum-198670	Laura Regina Leòn Ovelar	From Bovine Bone Waste to Value-Added Resources: Opportunities for Circular Bioeconomy in the Meat Industry
Sciforum-190832	Mauro Lombardo	Gender- and Age-Related Differences in Sustainable Dietary Transitions during a Mediterranean Diet Intervention
Sciforum-198247	Efstathios Giaouris	Investigating Biofilm Formation by Endophytic Bacteria from Plant Roots under Thermal and Nutritional Stress: Implications for Sustainable Crop Resilience and Food Safety
Sciforum-192801	Aneta Cegiełka	The use of freeze-dried black chokeberry pomace as a by-product in pork burgers
Sciforum-198517	Georgios K. Vasios	A bibliometric analysis of microgreens research (2003-2025): Global agricultural and nutritional trends
Sciforum-197602	Adrian Paul Hinalao Basilio	KNOWLEDGE, ATTITUDES, AND PRACTICES OF FOOD INDUSTRY PROFESSIONALS TOWARD RABBIT MEAT IN FILIPINO CUISINE
Sciforum-198213	ADRIANA SKENDI	Thermal Stabilization and Kinetic Modeling of an Enriched Hydrophilic Extract from Grape Pomace Using Alginate-Carboxymethyl Cellulose Blended Hydrogels
Sciforum-202757	Edward Peter De Guzman	Upcycling Virgin Coconut Oil Byproducts into Hybrid Textured Vegetable Protein for Plant-Based Sausages
Sciforum-198653	María Eugenia Golzi	Technological properties and optimization of lentil aquafaba for the development of vegan meringues

Submission ID	Author Name	Title
F. Sensory & Consumer Research		
Sciforum-189006	Matheus Koengkan	Certification Engagement and Consumer Trust in Organic Food Markets: Evidence from Portugal
Sciforum-195252	Erwin Limbo Descallar	Characterization of Banana Blossom (Musa acuminata Colla) and Taro (Colocasia esculenta) Flours and Their Application in Soft Cookies
Sciforum-198734	Nicolle Stefani Juncos	Sensory impact of three essential oils from the genus Cymbopogon as natural flavorings for fermented yogurt
Sciforum-196795	Damir D. Torrico	Sensory Characterization of Dairy and Plant-Based Yogurts Using Napping® and Multiple Factor Analysis
Sciforum-197768	Nazarena Cela	Exploring consumers’ perception of craft beer from social agriculture tracked with blockchain technology
Sciforum-197585	Raquel P. F. Guiné	Visualization of television cooking shows and culinary programs: Insights from a sample of Portuguese citizens
Sciforum-200155	Marco Fazio	Visual hierarchy, attention and choice: an eye-tracking study of PGI extra virgin olive oil packaging
Sciforum-198738	Nicolle Stefani Juncos	Sensory effects of using the Cymbopogon genus as a flavoring agent in cream cheese: focus group and descriptive analysis

Submission ID	Author Name	Title
G. Food Safety, Toxicology & Quality		
Sciforum-197244	Giovanna Gabrielle Fatima de Souza	Development and validation of voltammetric method of synthetic dye amaranth in foods employing a boron doped diamond electrode
Sciforum-198131	Ljilja Torovic	What’s in Your Coffee? Ten Years of RASFF Safety Notifications
Sciforum-197500	Tiziana Sgamma	Supporting Allergen Risk Management in Spice Supply Chains: Detection of Peanut Contamination in Garlic and Garlic-Derived Products Using Molecular and Protein-Based Approaches
Sciforum-198662	José Pinela	Tropane Alkaloid Determination in Datura stramonium L. and Toxicological Assessment using Galleria mellonella Larvae
Sciforum-197129	Ana Guerrero Barrado	Suitability of Gluten-Free Offerings in Spanish Food Service Establishments: An Exploratory Study of Safety and Allergen Management Practices
Sciforum-197125	Arita Sabriu Haxhijaha	Assessment of protein oxidation in beef treated with pomegranate (Punica granatum L.) peel extract
Sciforum-197729	Ljilja Torovic	Beyond the bar: Uncovering hazards in chocolate
Sciforum-196001	Mariem Ayed	Shelf-life dynamics of plain and lemon-flavored goat’s milk kefir
Sciforum-206874	Roberto Sturniolo	Contamination and Nutritional Quality in Date-Derived Natural Sweeteners from Algeria and Tunisia
Sciforum-196576	Erwin Limbo Descallar	Quality and Microbiological Stability of Pasteurized Coconut Skim Milk During Refrigerated Storage
Sciforum-201903	Giulio Perricone	Shelf-life evaluation of pasteurised Nocellara del Belice table olives produced by the Castelvetrano method
Sciforum-192709	Gerieka R. Anapi	Postharvest Quality Changes and Thermal Injury Development in Hot Water-Treated Philippine Carabao Mangoes (Mangifera indica L.) During Ripening
Sciforum-198222	Mina Janković	Beyond the Gluten-Free Trend: Attitudes and Knowledge Among the General Population
Sciforum-203264	Yashika Jagadish	Evaluation of the Protective Potential of Chitosan-TPP Encapsulated Tamarindus indica Fruit Pulp Extract against Tartrazine-Induced Haematological and Biochemical Alterations in Female Wistar Albino Rats
Sciforum-201230	Gustavo Fix	Development of a simultaneous voltammetric method for amaranth and tartrazine employing a glassy carbon electrode modified with graphene/carboxymethyl-botryosphaeran
Sciforum-186485	Nika Lovrincevic Pavlovic	Cumulative Risk Characterization of Bisphenol Residues in Food Contact Materials During the EU Regulatory Transition
Sciforum-197836	Alberto Guirao	Pre-harvest treatments with sorbitol and salicylic acid to preserve quality and reduce chilling injury in 'Sanguinelli' blood oranges during cold storage

Sciforum-197423	Carla Ferraris	Buckwheat as an emerging allergen: a pilot study for its detection in food products by real-time PCR
Sciforum-197195	Khadidja Reguieg	Formulation and Quality Optimization of a Goat Whey-Milk Kefir Enriched with Powdered Milk
Sciforum-198689	Diogo Lucas Pinheiro	Optimizing fermentation time to improve the safety and quality of a Portuguese-style fish sausage
Sciforum-197896	Milica Vidić	Hoodia gordonii as an unauthorised novel food in food products: A RASFF-based analysis
Sciforum-193508	Melissa Alves Rodrigues	Highlighting the Underestimated Role of Fungi in Food Safety and Occupational Health: Preliminary Screening of Potential Mycotoxigenic Fungi Isolated from Slaughterhouses and Cutting Rooms in Northern Portugal
Sciforum-197321	Gerieka R. Anapi	Evaluation of Sulfite-Free Anti-Browning Pretreatments on Moisture Content of Osmotically-Dehydrated Philippine Carabao Mango (Mangifera indica L.) Slices During Cabinet Drying
Sciforum-197232	Carlos Itiro Bettette	Simultaneous voltammetric method for quality control of brilliant blue FCF and tartrazine in beverages
Sciforum-198569	Adeola Oluwakemi Aasa	In vitro and in situ antifungal activity of potential probiotic lactic acid bacteria from maize: evaluation of enzyme production and mycotoxin degradation.
Sciforum-198243	Mina Janković	How Well Do You Know the Gluten-Free Products?
Sciforum-198572	Odete Linda Armando Zefanias	Effectiveness of Sanitizers Applied During Poultry Chilling for Reducing Campylobacter Contamination on Chicken Meat: A Meta-Analysis
Sciforum-198486	Shakirah Omotoke Azeez	Genotoxicity and cytotoxicity screening of ethanol and water extracts of Lonicera caerulea leaf
Sciforum-197808	Ágata García-Nácher	Current Status of Texture-Modified Transitional Foods for Infants: A Scoping Review and Spanish Market Analysis
Sciforum-193417	Danica Mostoles	LC-HRMS fingerprinting for Ecologic and Conventional Honey Discrimination
Sciforum-197766	Ljilja Torovic	What’s Brewing in Tea? A Decade of Food Safety Alerts in the EU RASFF Database
Sciforum-197877	Isabel Casanova Martínez	Essential Fatty Acids and Human Health Indexes in Gilthead sea bream (Sparus aurata): Evaluating Sustainable Feed Alternatives and growing stage
Sciforum-198532	Mina Janković	Beyond Gluten Removal: Nutritional Perceptions and Deficiency Awareness in Gluten-Free Diet Followers
Sciforum-197601	Martina Ivešić	Microplastic Contamination of Honey: A Systematic Review of Occurrence, Sources, and Bee Health Effects
Sciforum-197751	Margarida Almeida	Effect of thyme essential oil against pathogenic microorganisms inoculated on chicken breast

Sciforum-197805	Marta Rodríguez-Soriano	Food Safety in Rice-Based Beverages: Labeling Screening and LAB-Driven Metal(loid) Detoxification Review
Sciforum-193223	Oscar Nuñez	High-Throughput and Green Screening Methods for the Botanical Classification of Spanish Honeys Using UV-Vis and FIA-UV-Vis Spectral Fingerprints
Sciforum-195936	Nina Kudumija	The impact of seasonal weather on mycotoxin content in barley, triticale and oat during a two-year cropping period (2024–2025)
Sciforum-203300	Ljilja Torovic	Processing Contaminants in Foods: A Quarter of a Century of RASFF Notifications Reveal Persistent Food Safety Challenges
Sciforum-198365	Josep Pages-Rebull	Classification and Authentication of Flour by HPLC-UV and Chemometrics
Sciforum-203246	Mojca Jevšnik Podlesnik	Food Safety Education in Slovenian Primary Schools: Evaluation of an Innovative Learning Approach
Sciforum-196245	Philip Junior Yeboah	Fermentation-Driven Inactivation of Salmonella Enteritidis: Linking Microbiome Succession and Physicochemical Dynamics
Sciforum-197892	Milica Vidić	Eurycoma longifolia (Tongkat Ali) as an unauthorised novel food in food products: An overview of RASFF notifications
Sciforum-198254	Jelena Kaurinović	Occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in Small Pelagic Fish from the Adriatic Sea: Evidence of PFOS Dominance
Sciforum-198316	Caroline Simão	Digital Image Processing Coupled with Machine Learning for the Classification of Commercial Fruit Vinegars

Submission ID	Author Name	Title
H. Food Packaging & Storage Technology		
Sciforum-198195	Irene Gouvinhas	Impact of Bioactive Absorbent Membranes on Spoilage Indicators and Shelf-Life of Refrigerated Meat
Sciforum-202808	Ana Cristina Ferrão	Store to preserve: The impact of different packaging methods on the quality of hazelnuts
Sciforum-177629	Natalia Hejda	Sodium Pyrithione–Modified PCL/PLA Blends as Active Antimicrobial Biodegradable Packaging Materials
Sciforum-198134	Maria Apostolia Pissia	Evaluating the storage stability of snail meat powders from Cornu aspersum
Sciforum-203195	Maria Magdalena Costanzo	Packaging evaluation for storage of biscuits with high Jerusalem artichoke content
Sciforum-195498	Paulina Aguirre-Lara	Effect of Schinus molle leaf extract incorporated into starch-based active coating on the preservation of fresh tomatoes
Sciforum-197637	Danai Ioanna Koukoumaki	Waste to packaging: Novel Edible Films from Whey-Derived Microbial Protein incorporated with cellulose
Sciforum-200907	Nitish Kumar Singh	Shaping the Future of Food Packaging: Behavioral Insights into Plastic Packaging Decisions in the UK Fast-Moving Consumer Goods (FMCG) Sector
Sciforum-197857	Kimberly Berrazueta-Jaramillo	Translational Application of Chia (Salvia hispanica) and Nopal (Opuntia ficus-indica) Mucilage-Based Edible Coatings for the Postharvest Preservation of Cherry Tomato and Carrot
Sciforum-197894	Manuel Alejandro Fiallos Cárdenas	From Laboratory Films to Food-Contact Packaging: A PRISMA 2020 Systematic Review and Translational Maturity Assessment of Bacterial Cellulose/Nanocellulose
Sciforum-198312	Jenifer Amanda Puente Moreno	Effect of chitosan coatings with putrescine on the postharvest quality of oranges during storage at chilling temperatures
Sciforum-196563	Manuel Viuda-Martos	Effect of Biodegradable PLA-Chitosan-Pomace Extract Films as Slice Separators on the Quality and Shelf Life of Gouda Cheese
Sciforum-203284	Taha Mehany	Smart Spectroscopic and Multivariate Data Analysis Tools for Real-Time Monitoring of Extra Virgin Olive Oil Quality during Storage
Sciforum-197259	Alcina MMB Morais	Edible Coatings Enriched with Extracts from Fucus spiralis and Limnospira sp. for Sustainable Postharvest Preservation of Strawberries
Sciforum-201559	Pedro Melgarejo Martinez	Effect of Packaging Material on the Color Stability of Refrigerated Mandarin Juice During Storage
Sciforum-197202	Paulina Brzęcka	Active packaging as a growing trend in food industry: antimicrobial compounds in biodegradable films.
Sciforum-198180	Irene Gouvinhas	Performance of Novel Bio-based Absorbent Pads for Meat Packaging Applications

Session A. AI, Technology & Engineering in Food

Sciforum-192234: Designing Novel Sweetener Candidates Targeting the Human Sweet Taste Receptor via a Target-Aware Chemical Language Model

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Excessive intake of dietary sugar is a leading, modifiable risk factor for non-communicable diseases. This drives a critical need for safe sugar alternatives. Widespread artificial sweeteners pose health risks and limitations. This study aimed to computationally design novel small-molecule sweetener candidates targeting the human Venus flytrap domain (VFTD) of the sweet taste receptor (TAS1R2-TAS1R3) and evaluate their binding affinity, ADMET properties, sweetness intensity, and thermal stability. An AI-driven pipeline with a target-aware chemical language model (TamGen) generated two molecular libraries. The binding affinity of each generated compound to the VFTD of the TAS1R2 subunit was evaluated using molecular docking simulations with AutoDock Vina. Sucralose was used as a benchmark cutoff, and compounds with higher binding affinity than sucralose ($<$ -5.5 kcal/mol) were selected. The selected compounds were subjected to *in silico* ADMET profiling using ADMETlab 3.0 to assess toxicity, pharmacokinetics, and synthetic accessibility scores. Finally, sweetness intensity (logSw) and thermal stability were predicted using Chemsweet software. TamGen framework generated 19,658 unique molecules. Initial docking-based screening selected 18,454 compounds having higher binding affinity than sucralose. Subsequent ADMET profiling further reduced this library to 17 compounds. These compounds showed a very favorable safety profile, including low toxicity and poor intestinal absorption. In addition, these selected compounds show logSw values between 4.08 and 5.63, indicating higher sweetness intensity than sucrose. Thermal stability analysis has confirmed that these compounds are highly stable and suitable for food processing applications. The integration of generative AI models and rigorous computational evaluation provides an efficient way to discover next-generation sweeteners. The identified candidates have a high sweetness potential, excellent thermal stability, and favorable safety profiles. To validate these computational results, future research needs to integrate *in vitro* receptor-binding assays and sensory evaluations, alongside *in vivo* toxicological studies, to confirm overall physiological safety and metabolic effects.



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Sciforum-192938: Dynamic redistribution and phase transition of solid particles in emulsion droplets

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The dynamics of solid particles in emulsions play a fundamental role in designing delivery systems yet the mechanisms governing their confinement and redistribution remain unclear. Microfluidic droplet generation was used to load solid particles into oil droplets and to investigate how particles behave in a biphasic system. Chlorophyllin was used as a model and we found that droplet microfluidics enabled particle incorporation and reduced leaching when compared to using high-shear homogenizer to incorporate solid particles into a biphasic system. The distribution of particles within droplets whether at interface or in the core is governed by particle hydrophobicity. At the droplet surface, gum arabic stitches a barrier, capturing the particles from escaping, while polysorbate surfactant led to rapid dissolution. The polymer network anchored to the droplet surface remained intact during dilution or storage preventing release. A spontaneous transition from particle-loaded emulsion to double emulsion occurs during storage, where water diffuses from outside into the oil. The structure of particle-loaded emulsions protected chlorophyllin from degradation caused by light and heat. These polymer-coated emulsions retained particles in oral and gastric digestion, with a responsive release observed in the intestine, where bile salts perforate the interface and provide paths for pigment diffusion. This study highlights the potential of microfluidic techniques as a platform for trapping solid particles into emulsions and provides a fundamental understanding on the fate of particles in the system. The platform can potentially be adapted to deliver versatile bioactive compounds across different fields.



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Sciforum-195857: Application of hyperspectral imaging and machine learning for the discrimination of chickpea varieties

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This research aimed to evaluate the capacity of hyperspectral fingerprints, coupled with machine learning models, to ensure the authenticity of chickpeas from different varieties and origins (Castellano, Pedrosillano, Pedrosillo, Blanco lechoso and Fuentesaúco)

The hyperspectral images obtained were captured using two cameras that cover an approximate range of 400–1000 nm (Vis-NIR) and 900–1700 nm (NIR), which allowed the capture of the characteristic spectral signatures of each sample (which depend on different factors such as their composition, moisture content, and structural characteristics, among others). The data was flat-fielded using the references and the algorithms facilitated by the manufacturer. Then, the spectrum for each chickpea is obtained by averaging the spectra of all its individual pixels. Both Vis-NIR and NIR databases include spectra of around 5000 individual measurements, were divided into three sets: training (for developing the models), validation (for comparting and selecting the optimal hyperparameter combinations/models), and testing (for determining the selected model's performance with out-of-bag examples), encompassing 50%, 30% and, 20% of each dataset respectively. To determine the variety of each chickpea sample, artificial neural networks were used.

Different ANN models were developed using a range of hyperparameter combinations. The selected ANN presents, for the training, accuracy values slightly around 90% while, for the testing phase, they remain close to this value. The results demonstrated the potential of hyperspectral images as a non-destructive method to ensure the authenticity of chickpeas and improve the detection of possible fraud in the food chain.

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Sciforum-196305: Rapid and non-invasive monitoring of natural black olive fermentation through UV–Vis spectroscopy coupled with PCA-ANN modelling

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Table olives are among the most widely consumed fermented foods and constitute an essential part of the Mediterranean diet. Nevertheless, their production is still based on empirical and craft-based processing practices. As a result, significant challenges must be faced regarding product safety and quality, since the final products often exhibit variability and instability. The aim of this study was to evaluate the efficacy of UV–Vis spectroscopy as a rapid, real-time, and non-invasive tool for monitoring biochemical changes in brine during the fermentation of cv. Kalamata natural black table olives. For this purpose, olives were processed according to industrial practice in 7% (w/v) NaCl brine for 145 days. Brine samples were routinely collected and UV–Vis spectra were collected in the range 330-800 nm. The acquired spectral data were initially subjected to principal components analysis for dimensionality reduction. The scores of the first four principal components explaining 99% of the variability of the original dataset were further used as input variables for an artificial neural network (ANN) model to correlate spectral information with fermentation time. The predictive performance of the ANN was further compared with a Partial Least Squares Regression (PLS-R) model developed on the same dataset, composed of training and validation subsets. Results demonstrated that the ANN model achieved high predictive accuracy reflected by relatively high values of R^2 (0.94) and low values of RMSE (9.0 days) computed for validation subset. These values were more satisfactory than those obtained by the PLS-R model that was used as reference approach (R^2 = 0.88 and RMSE = 12.5 days) for the validation subset. Overall, the findings of the study provided promising perspectives for the use of UV–Vis spectroscopy combined with chemometric modeling, as a rapid and non-invasive analytical approach to monitor the fermentation of table olives.



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Sciforum-197103: Design and evaluation of a coaxial extrusion system for alginate-based 3d food printing

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Introduction: Coaxial extrusion 3D printing offers a novel technique over conventional single-nozzle printing by utilizing a dual-channel nozzle to simultaneously deposit two materials concentrically. This approach unlocks new possibilities for food texture and nutritional value, providing structural stability and a specific sensory experience. This system enables the encapsulation of sensitive ingredients within a protective external matrix. The present work focuses on the design, formulation, and evaluation of a food ink for coaxial 3D printing, utilizing an ionic encapsulation system composed of a sodium alginate external matrix and a zinc-fortified whipped cheese internal core. Whipped cheese proteins (such as casein) facilitate the absorption of this mineral in the body, as the amino acids present in the dairy product act as natural ligands that improve zinc bioavailability.

Methods: Printing conditions were studied, and alginate solutions (2.0%, 2.5%, and 3.0% w/w) were evaluated to determine the optimal concentration for printability by analyzing their viscoelastic behavior and textural properties. The printability index (Pr) and syneresis behavior were assessed over time. Finally, ICP-OES was used to precisely quantify the presence and retention of calcium and zinc within the optimized matrix.

Results: The high content of calcium cations in the cheese enabled ionic gelation upon contact with the alginate, enhancing the structure without altering rheological properties. Experimental results identified the 2.5% (w/w) alginate formulation as the most suitable concentration, providing the best functional balance, greater dimensional stability, and maximum viscoelastic recovery. Finally, ICP-OES spectrometry precisely quantified the presence and retention of calcium and zinc within this matrix, validating its potential as a functional food.

Conclusions: Coaxial extrusion 3D printing successfully yielded a core-shell structure with the geometric fidelity required to efficiently retain micronutrients, maintaining the morphological integrity of the sample against syneresis phenomena.



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Sciforum-197157: CNN-based binary pollen classification for monofloral honey authentication with conventional light microscopy

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Monofloral honeys have distinct organoleptic and physicochemical characteristics depending on the predominant plant species from which their nectar is collected. These honeys command higher market prices than unlabeled blends, as informed consumers show a greater willingness to pay. The standard procedure for authenticity testing is the quantitative analysis of their pollen grains in suspension where minimum percentage thresholds vary according to the plant species involved and applicable jurisdictional legislation. Here, we assessed the capacity of the convolutional neural network (CNN) DenseNet-121 to use binary classification to discriminate and quantify 5 pollen types (*Echium plantagineum*, *Helianthus annuus*, *Lotus* sp., *Scutia buxifolia* and *Trifolium* spp. [*T. repens* + *T. pratense*]) associated with monofloral honeys in Argentina. Datasets were built with individual pollen grain images extracted from low-magnification bright-field microscopy images from 30 apicultural species, each with at least 3 independent samples. One of the samples was used for testing while the rest were used for training. For each species, the binary classifier was trained with 5 different seeds with specified hyperparameters following a balanced one-vs-rest scheme: each positive taxon against an aggregated class built as an equal mixture of all 29 other classes. Metrics (accuracy, F1, precision, recall, ROC-AUC and PR-AUC) were computed for each classifier. For *Lotus*, all metrics were above 99% with a near-perfect discrimination. *Echium* and *Scutia* were also very well classified with metrics above 95%. *Helianthus* was detectable with high confidence when the model predicted positive (precision ~99%), but let a significant fraction of positive grains escape (recall 72.4 ± 4.7%). *Trifolium* showed the worst metrics, in some cases barely above chance for positive detection. Our results show that this classifier is highly pollen-type dependent and it has potential to be integrated into a user-friendly software interface for routine validation of certain monofloral honeys with conventional laboratory equipment.



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Sciforum-197266: Comparing Artificial Intelligence (AI) generated sensory responses with human descriptive analysis using chocolate brownies

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Artificial Intelligence (AI) has been increasingly discussed as a potential mechanism to support traditional sensory evaluation, which is limited by high cost, time, and human bias. This study evaluated non-traditional flavor ingredients in chocolate brownies as a food model system to assess the alignment of AI-generated responses to human sensory descriptive analysis and physicochemical properties. Ten chocolate brownie formulations were developed using conventional and non-traditional ingredients (stevia, gochujang, barbecue, miso, chicken stock, fish sauce, garlic, liquid smoke, Splenda, and control/classic), designed with modified attributes in taste, aroma, and chemical sensations. Brownies were prepared and analyzed for color, moisture content, and texture (texture profile analysis). Human sensory data were collected from a trained panel group (n=20) using a hybrid of Spectrum and Quantitative Descriptive Analysis (QDA) approach with a 15-point intensity scale for sensory attributes. Each formulation was evaluated in duplicates. AI sensory responses were generated using ChatGPT 5.4 mini, in which 20 virtual panelists were prompted and acted as a trained internal panel to evaluate the ten formulations. Human sensory data, AI-generated data, and instrumental data were analyzed using mixed-model ANOVA, radar plot, and principal component analysis (PCA). Results showed significant differences in color (crumb redness and crumb yellowness), hardness, and moisture content across formulations. Regarding sensory outputs, ChatGPT generally overestimated responses to basic tastes and aromas. However, ChatGPT was closely aligned with human responses in terms of texture descriptors. In savory formulations (miso and fish oil), ChatGPT had a positive bias towards “bitterness” and “umami”. On the other hand, marginal differences were found for “density” and “chewiness”. This study shows that AI tools such as ChatGPT can be potentially used to screen different formulations. Further studies across a wide range of food categories are suggested to integrate stronger AI into sensory evaluation and support sensory-driven product development.



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Sciforum-197599: Microwave re-heating of packaged rice: Computer simulation of the starch re-gelatinization and evaluation of quality retention

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[Introduction] Pre-cooked packaged rice is widely consumed in Japan and in Asian countries as ready-to-eat food after reheating, usually using a microwave (MW) oven. Then, starch is gelatinized during processing, it partially got retrograded during distribution and storage. Although MW reheating promotes starch re-gelatinization, restoring its desirable texture and eating quality, MW heating often produces non-uniform temperature distributions, leading to uneven quality within the product. This study aims to predict starch re-gelatinization progression during MW reheating and to understand the changes in physical properties and analyze their relationship using computer simulation.

[Methods] In this study, MW reheating of packaged rice (2450 MHz, 600 W, 180 s) was simulated using COMSOL Multiphysics 6.4 coupled with a starch re-gelatinization kinetic model. A conformal mesh was employed at the interface between the rotating and stationary domains of the MW oven model to ensure electromagnetic field continuity. The starch re-gelatinization process was modeled as a first-order reaction, and the kinetic parameters were determined from constant-rate heating experiments and differential scanning calorimetry (DSC) measurements of endothermic enthalpy associated with re-gelatinization. Textural properties were evaluated using a two-bite compression test with a texture analyzer. To assess water mobility, cooked rice was sampled from three locations within the container, and two-dimensional T_2 weighted images of the sample cross-sections were acquired using a high-field MRI system (9.4 T).

[Results & discussions] Simulated temperature distributions and re-gelatinization profiles showed good agreement with experimental results. Texture and water-status analyses revealed that quality-related structural changes, including increased stickiness, persisted beyond the completion of starch re-gelatinization. These findings provide new insights into the mechanisms of quality development during MW reheating and may contribute to the optimization of the reheating processes and container designs for improved quality uniformity in packaged rice products.



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Sciforum-197649: Classical, Deep, and Quantum Machine Learning for Automated Ulluco Quality Classification

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Introduction

Ullucus tuberosus (ulluco) is an Andean tuber currently graded by subjective visual inspection, with no international quality standard. This study addresses two objectives: preventing defective tubers from contaminating healthy batches, and proposing a five-category grading framework to support standardization. We benchmarked classical machine learning, deep convolutional neural networks (CNNs), and quantum models for automated visual classification.

Methods

A dataset of 2,390 images was captured inside a lightbox using two cameras to capture different lighting conditions. Samples were manually labeled into five categories (Extra, Category I, Category II, Bad 1, Bad 2) using Label Studio. A background-removed version was generated via image segmentation. We extracted 40 features covering color, texture, shape, frequency, and wavelet domains. Three CNNs (Custom, MobileNetV3-Large, ResNet-50) and nine classical classifiers were trained, alongside quantum models: angle-encoding QNNs (pure 12-qubit and hybrid with a pre-network) and QSVMs with PCA to 8 qubits, all evaluated with 5-fold cross-validation.

Results and Discussion

MobileNetV3-Large achieved the best performance: 79.4% multiclass and 92.6% binary accuracy (good vs. bad), with fast inference (3.9 ms/img, 12.4 MB). The hybrid QNN reached 72.9% multiclass and 92.1% binary accuracy, outperforming all classical baselines, with 19 KB and 1.1 ms per inference. ResNet-50 scored 76.2% but was slower and larger. Logistic Regression, the best among the nine classical classifiers tested, attained 67.0%. The pure QNN performed near random (34.8%), highlighting the importance of the pre-network in hybrid designs.

Conclusions

Deep CNNs remain the top choice for ulluco grading, but hybrid quantum-classical models offer competitive accuracy with an extremely small footprint, suitable for edge deployment. Both objectives were met: reliable good/bad separation (92.6%) and five-category grading (79.4%). This work provides the first quantum ML benchmark for Andean crops and a reproducible basis for formal ulluco quality standards, paving the way for automated quality control in Andean agriculture.



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Sciforum-197682: Influence of Pretreatment and Agro-ecological Origin on the Solar Drying Kinetics and Moisture Diffusivity of *Vernonia amygdalina* Vegetable.

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Vernonia amygdalina (bitter leaf), is an indigenous African leafy vegetable that is rich in bioactive compounds. The high moisture content (> 80% wet basis) of the leaves however limits its shelf life. While drying is essential in preserving the quality of the vegetable to a nutritionally safe level, the combined influence of pretreatment type and agro-ecological origin on the drying kinetics and mass transfer behaviour of *V. amygdalina* remains insufficiently characterised.

Fresh Vernonia leaves harvested from urban (Bodija, UB) and rural (Ekere, RR) sites in Ibadan, Nigeria were subjected to squeeze washing (SQW), blanching (BLC), and water steeping (SPP) before drying. The experiment was carried out in a fabricated hybrid solar dryer (1.22 x 0.91 x 1.52 m, fitted with a 1500 w electric heater, a 30 w, 12 V, 7 Amp solar panel powering three 12V axial fans). Experimental inlet temperature was 32 – 48 ^{O}C with outlet temperature of 31.9 – 42.3 ^{O}C and a relative humidity of 21 – 61 %.

The moisture ratio data were fitted to five thin-layer mathematical models (Newton, Page, Henderson-Pabis, Wang-Singh, and Lewis) evaluated by R^2 and residual sum of squares (RSS). The effective moisture diffusivity (D_{eff}) was computed from the best-fit model parameters using a measured leaf half-thickness of 0.13 mm.

The Initial moisture content ranged from 83.70 ± 0.17 – 86.23 ± 0.12 % (wet basis), with rural samples recording higher values. The Page model provided the best fit across all treatment combinations (R^2 = 0.9806 – 0.9897; RSS = 0.018 – 0.034). Effective moisture diffusivity ranged from 3.76 × 10^{-12} to 5.53 × 10^{-12} m^2/s with UBSQW recording the highest (5.53 × 10^{-12} m^2/s) and RRSPP the lowest (3.76 × 10^{-12} m^2/s). Blanched samples: RRBLC and UBBLC achieved a respective final moisture contents of 8.00 ± 0.00 % and 10.67 ± 1.15 % falling within the recommended safe storage range (8.00 – 10.00 %), The steeped samples on the other hand showed the slowest moisture loss.

The study shows that pretreatment and agro-ecological origin significantly ($p \leq 0.05$) influence the solar drying behaviour and moisture diffusivity of *V. amygdalina.* Future work focusing on drying optimisation and bioactive compound retention profiling across pretreatment regimes is recommended.



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Sciforum-197701: Development of a powder formulation from avocado (*Persea americana*)

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Avocado (*Persea americana*) is a fruit of high global value due to its rich nutritional profile, which includes monounsaturated fatty acids. However, the industrial use of its pulp is limited because of rapid enzymatic browning and its short shelf life at room temperature. In Mexico, there is a traditional product made from avocado puree, chili peppers, and cilantro, called "guacamole." This study explores spray drying as an alternative method for producing guacamole powder, evaluating the concentration of solids in the feed. A standardized guacamole mix was prepared (58.2% avocado pulp, 2.5% chili pepper, 1.4% cilantro, and 0.7% onion). Maltodextrin:SiO_2 (99:1) was used as a carrier material at two different proportions (15 and 20%), and the mixture was processed using a pilot-scale spray dryer at inlet and outlet temperatures of 160 °C and 80 °C, respectively. The physicochemical properties (moisture content, water activity, flowability, and color) were evaluated, along with a sensory evaluation using a hedonic scale (9 points) of the reconstituted product. A stable green powder with less than 3% moisture and low flowability was obtained. No significant difference was observed in the parameters evaluated at the different proportions of carrier material. The reconstituted product maintained acceptable organoleptic properties (7.33 overall acceptance score). Spray drying of guacamole is an alternative for agro-industrial processing transforming avocados into a value-added product. This development aligns with Sustainable Development Goals (SDGs) 9 (Industry, Innovation and Infrastructure) and 12 (Responsible Consumption and Production) by reducing post-harvest losses and offering a more stable commercial alternative.



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Sciforum-197872: Technological pretreatments applied to traditional canary seed (*Phalaris canariensis* L.) for the production of flour suitable for human consumption

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Traditional canary seed (*Phalaris canariensis* L.) has a high nutritional value and protein content, standing out for its tryptophan, cysteine, and phenylalanine content and for being gluten-free. These characteristics position it as a raw material with potential for the development of foods intended for human consumption. However, the varieties cultivated in Argentina have amorphous silica spicules in their hulls, which are potentially carcinogenic, limiting their use in food and requiring technological treatments to reduce or eliminate them. In this context, the objective of the present work was to evaluate the application of hydrothermal and microwave pretreatments to traditional canary seed grains to minimize spicules in the resulting flour. The studies were conducted by combining hydrothermal pretreatment (110°C, 1 atm, 15 min) followed by microwave exposure at three times (30 s, 60 s, and 120 s). The pretreated samples were then subjected to an abrasive treatment (1h, 175 rpm) in a specially designed equipment and a subsequent dehulling stage (pilot impact dehuller: 2960 rpm, 40 s). Finally, the samples were ground in a blade mill to obtain the flours. Spicules quantification was carried out using a microscope (Ernsleitz Wetzlar, Germany, 200X magnification) in previously calcined samples (550°C, 4 h) to avoid interference. The results obtained showed significant differences (Tukey, $p < 0.05$) at 120 s of microwave exposure compared to shorter times. Under these conditions, a reduction in spicules from 843.4 ± 66.7 spicules/g of flour (dry basis, d.b.) to 27.6 ± 13.6 spicules/g of flour (d.b.) was achieved. These results show that the combined application of hydrothermal and microwave pretreatments could reduce the presence of spicules in traditional canary seed flours, expanding their use in foods intended for human consumption.



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Sciforum-197898: Effect of different preservation treatments on membrane lipid modification and its association with enzymatic browning in fresh-cut eggplants

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Fresh-cut eggplant quality is significantly affected by browning and lipid membrane modification may be associated with this change. In this work, browning of fresh-cut eggplants under different preservation treatments followed by changes in color and PPO enzymatic activity were related with membrane lipid modifications by FTIR spectroscopy. Eggplants Black nite variety (Santiago del Estero- Argentina), were washed, disinfected with chlorinated water (150ppm – 3min) and cut into 1-cm-thick slices and subjected to different treatments: a- UV-C (1 kJ/m^2); b- immersion in 1% w/v ascorbic acid (AA) for 3 min + UV-C (AA + UV-C); c- UV-C + active modified atmosphere packaging with 3% O2 and 15% CO2 (UV-C + AMA); d- Immersion in distilled water at 50 °C – 1 min + UV-C (TT + UV-C); e-Untreated samples (control). 3 slices (180 g) per treatment were placed in plastic trays and covered with 35 µm thick bioriented polypropylene films (5.000 cm3 O2/m-2 24h-1 atm and 18.000 cm3 CO2/m-2 24h-1 atm-1 at 25 °C) in treatments a, b, d and e. Treatment c was packed in 80 µm thick high-density polyethylene bags (1.930 cm3 O2/m-2 24h-1atm-1 and 9.400 cm3 CO2/m-2 24h-1 atm-1 at 25 °C). Samples from each treatment were evaluated in triplicate during stored at 4 °C on days 0, 4, 8 and 12. Samples treated with UV-C + AMA delayed color development and reduced PPO activity during 8 days of storage. This is consistent with the infrared absorption spectra, which showed that this treatment induced less modification of the polyunsaturated fatty acids in membrane lipids, thereby maintaining freshness for a longer period. Therefore, these results suggest that the combination of UV-C and AMA plays an important role in maintaining low levels of browning and less membrane modification in fresh-cut eggplants during 12 days of storage at 4 °C.



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Sciforum-197904: A digital twin approach for enzymatic browning and shelf-life prediction in postharvest bananas using deep learning

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Banana (*Musa spp.*) is a climacteric fruit with high postharvest perishability driven by enzymatic browning catalyzed by polyphenol oxidase (PPO). This study aimed to develop a digital twin system integrating a convolutional neural network (CNN) for image-based quality classification with a kinetic model of enzymatic browning for shelf-life prediction under retail storage conditions. A dataset of 1203 banana images (1024 x 1024 px) at consumption maturity (Class A: “uniform color, appearance and firmness”; Class B: "yellow color with small imperfections, light brown spots and slightly less firmness compared to class A”; Defect: “significant discoloration with multiple large brown spots and unacceptable firmness for consumption”) was used to train an EfficientNet-B3 with transfer learning, featuring a dual output: quality classification and continuous browning score (B-score “0: without browning” – “1: maximum browning”). This score initialized a Michaelis–Menten kinetic model coupled with an Arrhenius equation (K_m: 3.0 mM; E_a: 95.3 kJ/mol) simulating PPO-mediated browning dynamics over time, assuming free contact between the enzyme and the substrate. Retail conditions of 15, 20, and 30 °C at 67% RH were assessed. The CNN achieved 95.0% accuracy (MAE: 0.063). The digital twin showed that Class A bananas maintained acceptable browning (B-score: 0.5) for 7.0, 4.7, and 1.7 days at 15, 20, and 30 °C, respectively. Class B showed critically reduced shelf-life (B-score: 0.5) of 2.0, 1.2, and 0.4 days at 15, 20, and 30 °C, respectively, with commercial acceptability lost (B-score $>$ 0.8) in under 1 day at 30 °C. Defect class bananas exceeded a B-score of 0.5 from day zero at all temperatures, confirming they must be redirected to industrial processing before reaching retail display. This CNN–digital twin framework is a novel food 4.0 tool for individualized real time shelf-life prediction at the point of sale, supporting inventory rotation, waste reduction, and quality management in the fruit supply chain.



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Sciforum-197957: Computer simulation of ohmic heating of a heterogeneous model food with an irregular geometry

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Introduction:

Ohmic heating (OH) of heterogeneous foods is challenging as geometric and electrical variations cause a non-uniform temperature distribution. Additionally, biological variability makes it difficult to isolate these factors using real foods. Thus, developing model foods and mathematical simulations is essential to optimize the OH process. This study developed a non-homogeneous konjac glucomannan (KGM) model food mimicking a salmon fillet's irregular geometry and varying electrical properties, while a 3D OH simulation model was constructed and validated.

Methods:

KGM gels were prepared and molded into salmon fillet shapes. To simulate spatial variations in muscle properties, the model food incorporated multiple sections with varying NaCl concentrations (e.g., 0, 0.2, 0.35, 0.5 wt%). Samples were placed in a polyethylene mold with 0.35 wt% NaCl solution and heated from 10°C to 90°C (20 kHz, 30 V) using a Joule heating machine (FJB-5.5, Japan). Temperatures were monitored at three locations using fiber-optic sensors. A 3D model coupling electric current and heat transfer was constructed in COMSOL Multiphysics 6.4 using the finite element method.

Results and Discussion:

Simulated temperature distributions agreed well with experimental measurements, confirming model validity. Heating was relatively uniform overall; however, the central monitoring location exhibited slightly lower temperatures than the lateral positions, attributed to sample thickness variation. Current density analysis revealed an approximately twofold difference between peripheral and central regions, caused by the fillet-shaped geometry and preferential current pathways through the surrounding salt solution along both sides of the sample.

Conclusions:

The KGM-based model food system enabled flexible property modification and accurate replication of complex, non-uniform food geometries. The 3D finite element simulation successfully predicted both temperature and current density distributions during the OH process, providing a validated framework to guide future optimization of OH processing for heterogeneous foods with irregular geometries and electrical properties to improve heating uniformity.



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Sciforum-198270: From Field Management to Quality Fingerprint: Season-Robust FTIR–Machine Learning Prediction of Bioactive Compounds in Moroccan Olive Oil

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Introduction: Olive oil's biochemical quality, particularly its content of phenolics, flavonoids, antioxidants, and carotenoids, depends on a complex interplay between irrigation, nitrogen fertilization, and growing season, making reliable prediction from agronomic data alone unreliable. Fourier-transform infrared spectroscopy (ATR-FTIR), paired with machine learning, offers a faster alternative to wet-chemistry analysis, yet no calibration model has so far been validated across multiple seasons and agronomic treatments for Moroccan olive cultivars.

Methods: A 3 × 3 factorial trial was conducted on 'Moroccan Picholine' (*Olea europaea* L.) trees, combining three irrigation levels with three NPK fertilization rates over two growing seasons (2022/2023 and 2023/2024), yielding 324 cold-pressed oil samples. Total phenolic content, total flavonoid content, DPPH radical scavenging activity, and carotenoid content were measured by wet-chemistry assays and served as reference values. ATR-FTIR spectra were preprocessed using four strategies and modeled with Random Forest and XGBoost regression, validated through 5-fold cross-validation and an independent 20% blind test set.

Results: Principal component analysis separated samples mainly by irrigation level and growing season, with specific infrared regions associated with C–O stretching vibrations contributing strongly to this variance. First-derivative spectra gave the most accurate predictions overall, with test-set R^2 values ranging from 0.925 to 0.943 and RPD values between 3.66 and 4.20 across the four parameters. Feature-importance analysis pointed to a small set of spectral regions, alongside growing season, as the main drivers behind these predictions, lending biochemical interpretability to the models.

Conclusions: Combining mid-infrared spectroscopy with ensemble machine learning enables accurate, simultaneous prediction of four key quality parameters in olive oil across different seasons and agronomic conditions. This approach provides a practical, reagent-free tool for monitoring olive oil quality at scale, with direct relevance to precision agriculture in Moroccan olive production systems.



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Sciforum-198518: Study of the Functional and Technological Properties of Gluten-Free Raw Materials for New Chocolate Muffins

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The largest segment of the gluten-free products market is represented by flour confectionery products. Among them, muffins occupy a special place due to their versatility, compact format, rapid preparation, and high sensory appeal. Chocolate muffins are particularly popular among consumers; however, their adaptation to gluten-free technology remains challenging.

The study aimed to investigate the functional and technological properties of gluten-free raw materials for the development of new chocolate muffins. To evaluate the hydration ability of gluten-free ingredients during dough mixing, the water-holding capacity (WHC) of different raw materials and mixtures was determined. The WHC values of rice and corn flour mixtures ranged from 162 to 165%, approaching the value of rice flour (167%). The addition of corn and potato starches reduced the WHC to 155%, which was close to the value of corn flour (156%).

The water absorption capacity (WAC) of dough samples prepared with yogurt exceeded the corresponding values obtained with water. Corn and rice flours demonstrated higher WAC values (236% and 222%, respectively) than starches (164–180%) due to their higher protein and dietary fiber contents. The gluten-free mixture containing corn and rice flours together with corn and potato starches showed a WAC of 312%, which was slightly lower than that of corn flour dough (326%) but sufficient to ensure desirable functional-technological and structural-mechanical properties of muffins.

Based on the obtained WHC and WAC values and the chemical composition of the raw materials, a gluten-free formulation for chocolate muffins was developed using corn and rice flours (2:1) and corn and potato starches (2.13:1.00). The developed product may expand the range of gluten-free confectionery products intended for consumers with celiac disease and gluten intolerance.



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Sciforum-198519: Integrating computer vision descriptors with instrumental measurements to characterize color and texture evolution in whey–aguamiel cheese during refrigerated storage

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INTRODUCTION: Monitoring the evolution of quality in dairy products often relies on instrumental measurements, whereas image-derived information is often analyzed separately, despite its potential to capture complementary visual changes. This study evaluated whether computer vision descriptors can be integrated with conventional instrumental measurements to characterize formulation-dependent evolution in a whey–aguamiel cheese system during refrigerated storage.

METHODS: Four cheese formulations differing in medium fermentation and *Lacticaseibacillus casei* supplementation were stored at 4 °C and evaluated over 28 days. Instrumental color (CIE L*a*b*) and texture profile analysis (TPA) parameters were measured, while top-view images were processed to extract HSV color metrics and texture descriptors derived from gray-level co-occurrence matrices (GLCM) and local binary patterns (LBP). Instrumental and image-derived datasets were integrated using treatment × time as the analytical unit. Correlation analysis and principal component analysis (PCA) were applied to identify cross-modal relationships and to describe product evolution within a reduced multivariate space.

RESULTS: Instrumental data showed formulation-dependent changes in lightness and hardness, with non-fermented treatments presenting higher hardness values. Image-derived features varied across treatments and storage time: Hue reflected chromatic shifts, whereas GLCM contrast and LBP entropy captured surface heterogeneity at different texture scales. Correlation analysis revealed structured links between visual descriptors and instrumental attributes. PCA summarized 49.5% of the total variability in the first two components, separating samples by formulation and time. Non-fermented treatments occupied more dispersed regions in the PCA, while fermented treatments showed more constrained trajectories.

CONCLUSIONS: Image-derived color and texture descriptors were coherently integrated with instrumental measurements in a shared multivariate space. This integration showed that the evolution of whey–aguamiel cheese during refrigerated storage could be interpreted as formulation-dependent visual–structural trajectories. The results support computer vision as a complementary, non-destructive source of information for multivariate characterization of dairy product evolution.



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Sciforum-198597: AI-Based Non-Destructive Online Quality Detection of Potatoes Using Cross-Modal Imaging and Spectroscopy

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At present, india is one of the leading countries in the world in terms of potato cultivation area and overall potato production. Rapid and non-destructive evaluation of potato quality before processing is very important for improving post-harvest management, supporting rural development, and increasing farmers' income. However, most existing potato quality sorting techniques are mainly limited to laboratory-based or theoretical studies, while the market still lacks a fully integrated intelligent detection system suitable for real production conditions. Therefore, there is a strong need to develop an online potato quality detection method that can work effectively under actual post-harvest processing environments. This study developed a potato quality sorting approach based on cross-modal technology. For external quality assessment, an industrial camera was used to capture potato images, and the YOLOv5s algorithm was applied to detect surface defects such as green skin, sprouting, rotting, and mechanical damage. For internal quality evaluation, visible/near-infrared spectroscopy was used to collect spectral data, and a convolutional neural network model was employed to identify internal blackheart disease. The external defect detection model achieved a mean average precision of 0.892 at an IoU threshold of 0.5, while the internal defect detection model obtained an accuracy of 98.2%. The complete online detection system achieved a real-time dynamic defect detection rate of 91.3%, with an average detection time of 350 ms per potato Compared with studies conducted under ideal laboratory conditions, the results of this research are more practical because the system was tested in a real-time online production environment. This work provides a useful reference for developing intelligent online quality inspection systems for potatoes and other similar agricultural products.



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Sciforum-198604: Deep Learning-Based Tomato Quality Grading and Instance Segmentation Model for Complex Field Conditions

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Tomato grading and harvesting robots often face several difficulties while working under complex field conditions, such as dense fruit growth, partial occlusion, changing viewing angles, low segmentation accuracy, high fruit-missing rates, and poor boundary detection. To overcome these challenges, there is a need for a fast, accurate, and reliable visual instance segmentation model that can support automatic tomato quality evaluation and robotic harvesting.

This study proposed TQVGModel, also known as the Tomato Quality Visual Grading Model, which is a Mask R-CNN-based deep learning network designed for tomato quality grading and instance segmentation. The model uses a multi-branch IncepConvV2 backbone developed with ConvNeXt architecture and large-kernel convolution decomposition. This helps improve segmentation accuracy while maintaining efficient real-time performance. To reduce the chances of missing difficult or less-represented tomato classes, the model applies Class Balanced Focal Loss in the classification branch. In addition, an Enhanced Sobel operator is integrated with boundary prediction and an edge loss function to improve the accuracy of tomato edge localization, which is important for reliable quality assessment. The study also developed a tomato quality grading subsystem to automate fruit evaluation and support further applications such as robotic harvesting and crop growth monitoring. A high-quality tomato instance segmentation dataset named Tomato-Seg was also prepared for testing the model in complex field scenarios. Experimental results showed that the TQVGModel-Tiny version achieved 80.05% mean average precision, which was 7.04% higher than the original Mask R-CNN model. It also required fewer parameters and provided faster inference speed, with 33.98 million parameters and 53.38 ms processing time per image. Overall, the results indicate that TQVGModel provides better accuracy, faster detection, lower miss rate, and improved edge localization. Therefore, this model can be useful for intelligent tomato quality grading, robotic harvesting, and smart monitoring systems under complex agricultural environments.



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Sciforum-198649: Phenylalanine-Based Supramolecular Gels for Structuring Apple Juice Matrices

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The development of low-molecular-weight supramolecular hydrogels based on amino acids emerges as a promising approach for food matrix structuring and functional food design. Particularly noteworthy is the ability of L-phenylalanine (PHE) to form gels in the presence of propylene glycol. Building upon previous findings where a binary water/propylene glycol system (50:50 v/v) containing 1.0% w/v PHE achieved gelation either through mechanical agitation or cold storage, this study investigates the gelation behavior and process parameters of PHE self-assembly in complex commercial or natural apple juice matrices. The incorporation of juice altered gelation kinetics, requiring adjustments in PHE concentration (1.0%–1.4% w/v), mechanical energy input (1000–2000 rpm agitation), or storage conditions. Both sucrose or sweetener-added commercial juice (1.0% or 1.2% w/v PHE) maintained a viscosity value of 72 mPa.s during 30 min of agitation at 1000 rpm, showing no gelation. However, sweetener-added commercial juice at 1.2% PHE formed a self-standing hydrogel after 1 week at 4 °C. At 1.4% w/v PHE, this system exhibited average viscosity peaks by increasing stirring speed; 126.6 mPa.s at 9.25 min (1400 rpm), 120.15 mPa.s at 10 min (1700 rpm), and 110.75 mPa.s at 15.25 min (2000 rpm). Samples containing natural squeezed juice (1.2% or 1.4% w/v PHE) displayed steady viscosities (83.8 mPa.s or 78.9 mPa.s, respectively) under 1400 rpm agitation, showing no viscosity peaks. Nevertheless, the 1.4% PHE matrix successfully formed a structured hydrogel upon cold storage.

To confirm true viscoelastic behavior, ongoing research encompasses thermal gelation kinetics (T_{gel}via temperature sweeps), viscoelastic moduli profiling, and yield stress determination. These findings demonstrate that PHE-based GRAS hydrogels provide a controllable, process-dependent texturizing technology for industrial unit operations, offering promising applications in the continuous processing of plant-based matrices and the scalable formulation of texture-modified foods for dysphagia management.



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Sciforum-198717: Multicriteria Quality Indices as a Tool for Estimating Consumer Desirability of Gluten-Free Bread Enriched with Chestnut Flour

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The aim of this study was to develop multicriteria quality indices for gluten-free bread enriched with chestnut flour and to determine whether an index based only on physicochemical and textural attributes could approximate the consumer desirability ranking of bread formulations. This approach was intended as a practical tool supporting quality assessment, rather than as a replacement for sensory evaluation.

The analysis was conducted using data from formulations containing 0, 5, 10, 15, and 20% chestnut flour. Partial indices were calculated for texture, physicochemical properties, colour, and sensory quality. These were then combined into an integrated quality index and a physicochemical-textural index excluding all sensory variables. The direction of desirability for each attribute was defined according to its technological relevance. Lower hardness, gumminess, chewiness, and specific mass were treated as favourable, whereas higher loaf volume, porosity, springiness, and cohesiveness were considered beneficial. Variables with less straightforward technological interpretation were used cautiously or retained only for supplementary analyses.

The integrated quality index ranked the 5% formulation highest, followed by 10%, 15%, 0%, and 20%, with index values of 0.729, 0.672, 0.527, 0.429, and 0.181, respectively. The physicochemical-textural index produced the same ranking for the three highest-rated formulations, with values of 0.646, 0.584, and 0.482 for the 5%, 10%, and 15% formulations, respectively. Its agreement with consumer desirability was high at the ranking level, with Spearman's rho = 0.90 and Pearson's r = 0.80.

Feature reduction analysis showed that four measurements, TPA hardness, volume per 100 g, porosity, and crumb lightness L*, were sufficient to approximate the full quality ranking, with MAE = 0.035, RMSE = 0.046, R^2 = 0.943, and Spearman's rho = 1.00. Further validation is required using independent baking trials, different chestnut flour sources, and varied baking conditions.



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Sciforum-202977: Influence of Lemon and Oregano Essential Oils, Associated with Modified Atmosphere Packaging, on the Preservation of Fresh Cut Anco Squash (*Cucurbita Moschata*)

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The effect of applying lemon essential oil (LEO, *Citrus limon* L.) and oregano essential oil (OEO, *Origanum vulgare* L.), associated with modified atmosphere packaging (MAP), on the preservation of fresh cut grated anco squash (*Cucurbita moschata*) was studied. Anco squash obtained in Santiago del Estero, Argentina, was washed, sanitized, cut, peeled, and grated. Samples were subjected to seven different treatments: untreated control (TC), sodium hypochlorite at 150 ppm (TH), LEO (applied by spraying) 4 and 8 μL/mL (TL4 and TL8), OEO at 4 and 8 μL/mL (TO4 and TO8), and the combination TL4 + TO4. All samples were packaged in polypropylene trays covered with 35 μm polypropylene film to generate a passive modified atmosphere and stored at 5 °C for 5 days. Mesophilic aerobic bacteria, sensory quality (aroma and flavor), total phenolic content, and antioxidant capacity were evaluated throughout storage. Mesophilic counts increased in all treatments; however, samples treated with essential oils, particularly TL8, showed lower microbial growth than TC and TH at day 5. Sensory quality decreased over time, although TL4 and TL4 + TO4 maintained the highest flavor scores and better overall acceptance. Total phenolic content remained stable or increased slightly in essential oil-treated samples, with TO8 and TL4 + TO4 presenting the highest values at the end of storage. Antioxidant capacity was also enhanced by essential oils, and the treatment TL4 + TO4 maintained consistently high values throughout storage (0.29, 0.28, and 0.30 μg GAE/g TF on days 0, 2, and 5, respectively). According to the evaluated parameters, the combined use of lemon and oregano essential oils and MAP represents a promising strategy for preserving the microbiological, sensory, and functional quality of fresh-cut grated anco squash. In particular, the combination TL4 + TO4 showed the most balanced performance, maintaining sensory acceptance while enhancing antioxidant capacity and phenolic content. Further studies should evaluate different lemon–oregano oil ratios and their combination with other preservation technologies.



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Sciforum-203267: Powdered ingredients from olive pomace: Impact of drying temperature and defatting on bioactive potential

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Despite the well-documented generation of solid residue in olive mills, the pomace matrix remains a rich source of entrapped polyphenols. This study aimed to valorize olive pomace (Neuquén, Argentina) by producing functional powders, evaluating the impact of drying and defatting on polyphenol retention and antioxidant capacity.

Pomace was air-dried (10% relative humidity, 1,5 m/s air velocity) at different air temperatures (60, 70, and 80°C). Drying curves were describes using Page, Logarithmic, and Henderson & Pabis semiempirical models. Dried pomaces were ground, sieved (30-mesh), and analyzed for total polyphenol content (TPC, Folin-Ciocalteu) and antioxidant activity (DPPH, ABTS, FRAP). Air-dried samples were then compared with those subjected to freeze-drying, used as a reference process in terms of bioactive preservation. The effect of defatting on phenolic recovery was also evaluated.

The Page model provided the best fit for the drying curves at all temperatures, resulting in an optimal drying time of 180 min and ensuring the stability of the pomace ($aw < 0.3$). Drying at 80°C resulted in significantly higher TPC values (532.46 ± 37.59 mg/100g d.b.) than drying at 60 °C (329.98 ± 43.48 mg/100g d.b.), consistent with the trend observed for antioxidant capacity (i.e, 205 ± 27 mg/100g d.b at 60°C vs 301 ± 50 mg/100g d.b at 80°C by the DPPH method). Based on these results, defatting was evaluated exclusively in samples dried at 80°C, slightly increasing TPC recovery to 584.60 ± 3.31 mg/100g d.b. Freeze-drying enhanced polyphenol retention in both non-defatted powders (785.73 ± 49.77 mg/100g d.b.), and defatted ones (1,058.93 ± 21.74 mg/100g d.b.).

Convective drying at 80°C for 180 min provides an efficient and scalable strategy for manufacturing bioactive olive pomace powders. Sequential defatting optimizes phenolic recovery and antioxidant potential, supporting the sustainable industrial valorization of olive oil by-products as functional food ingredients.



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Session B. Nutritional & Functional Foods

Sciforum-177194: Exploring Determinants of Organic Food Consumption in the UAE: Implications for Sustainable Food Systems

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Introduction

The global demand for organic food has expanded significantly due to increasing consumer awareness of health, environmental sustainability, and food safety concerns. Despite this growth, organic food markets in emerging sectors such as the United Arab Emirates (UAE) remain relatively underdeveloped. Understanding the determinants of organic food consumption is essential for supporting sustainable food systems and informed consumer choices.

Methods

A cross-sectional survey was conducted among 408 adult residents in the UAE to assess knowledge, attitudes, and practices (KAP) related to organic food consumption. The questionnaire evaluated sociodemographic characteristics alongside perceptions of health benefits, environmental impact, certification awareness, and purchasing behavior. Statistical analyses, including chi-square tests, correlation analysis, and regression modeling, were performed to examine associations between variables.

Results and Discussion

Findings indicate that health considerations, food safety concerns, and environmental awareness are key motivators driving organic food purchasing decisions. Younger and more highly educated respondents demonstrated greater awareness and more favorable attitudes toward organic food. However, premium pricing, limited product availability, and uncertainty regarding certification remain significant barriers to consistent consumption. The mean knowledge score (1.18 ± 0.55) reflected moderate awareness levels. A positive association was observed between knowledge, attitudes, and reported purchasing practices, supporting the applicability of the KAP framework in explaining consumer behavior.

Conclusions

The study highlights the importance of educational initiatives, policy support, and improved market accessibility to strengthen organic food adoption in the UAE. Enhancing consumer trust and affordability may contribute to advancing sustainable food consumption patterns and supporting future food system transitions.



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Sciforum-179600: Effect of plant sterols and dietary fiber among Filipino adults with moderately raised serum cholesterol levels

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Filipino dietary patterns are shifting toward a "Westernized" diet—high in saturated fats, sugars, and ultra-processed meats, but low in fruits and vegetables. Driven by rapid urbanization and rising incomes, this transition has fueled an alarming increase in total cholesterol (TC) and LDL-cholesterol (LDL-c) among adults. As cardiovascular disease (CVD) remains the leading cause of death in the Philippines. Dietary interventions using plant sterols and fiber are critical preventive strategies. This study evaluated the effects of plant sterols, dietary fiber, and their combination on the lipid profiles of Filipino adults with moderately raised serum cholesterol. A double-blind, randomized, placebo-controlled trial was conducted with 75 participants divided into four groups: plant sterol (n=18), dietary fiber (n=19), combined sterol and dietary fiber (n=19), and placebo (n=19). For four weeks, groups consumed products containing either 1.2g of plant sterols, 3.5g of dietary fiber, a combination of both, or a placebo. TC and LDL-c were assessed at baseline and endline. After four weeks, the plant sterol group showed significant reductions in TC (7.2%) and LDL-c (12.1%) ($p<0.0001$). The combined group also saw significant TC and LDL-c reductions of 4% and 6.4%, respectively ($p<0.0001$). While dietary fiber was less effective at lowering LDL-c (0.6%), both the fiber and combined groups showed significantly higher HDL-c levels (11%) compared to the placebo ($p<0.05$). Plant sterols are highly effective at reducing TC and LDL-c, while dietary fiber significantly improves HDL-c levels among this group of Filipino adults.



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Sciforum-179696: Tremella fuciformis polysaccharides protect against doxorubicin-induced cardiotoxicity via antioxidant and gut microbiota

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Background: Cardiotoxicity induced by doxorubicin (Dox) is a major limitation of anthracycline chemotherapy, leading to oxidative stress, mitochondrial dysfunction, and heart failure. Natural polysaccharides with antioxidative and cardioprotective properties have attracted attention as potential therapeutic agents. Methods: In this study, we investigated the protective effects of a polysaccharide from Tremella fuciformis polysaccharide (TFP) in a Dox-induced mouse model of cardiomyopathy and explored the underlying mechanisms. Results: TFP was characterized as a heteropolysaccharide primarily composed of glucose, mannose, and galacturonic acid, with a predominant low-molecular-weight fraction (~1.6 kDa). TFP pretreatment significantly improved cardiac function in Dox-treated mice, as indicated by increased ejection fraction and fractional shortening, and attenuated myocardial fibrosis and serum markers of cardiac injury. Histological and ultrastructural analyses showed that TFP preserved myocardial architecture and mitochondrial integrity. Mechanistically, TFP enhanced antioxidant defenses (SOD, GSH-PX), reduced lipid peroxidation (MDA), and restored ATP production, alleviating oxidative stress and mitochondrial dysfunction. Moreover, 16S rRNA gene sequencing revealed that TFP ameliorated Dox-induced gut microbiota dysbiosis by increasing microbial diversity and reshaping the community structure, including reduced abundance of Escherichia-Shigella and restoration of beneficial taxa such as norank_f__Muribaculaceae and Ligilactobacillus. These microbial changes were significantly correlated with cardiac function and oxidative stress indices. Conclusions: Collectively, TFP mitigates Dox-induced cardiac injury by reducing oxidative stress, preserving mitochondrial bioenergetics, and modulating gut microbiota, highlighting its potential as a natural intervention against anthracycline-associated cardiotoxicity.



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Sciforum-180286: Post-Fermentation Incorporation of Grape Pomace into Yogurt: Effects on Bioactive Compound Content and Antioxidant Activity

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Fruit cultivation generates significant agroindustrial waste, requiring sustainable solutions. Grape pomace (GP), is an abundant by-product rich in dietary fiber and phenolic compounds. This study aimed to develop yogurt formulations with GP and evaluate their bioactive compound content and antioxidant activity. Fresh GP (*Vitis labrusca*) was supplied by an agricultural cooperative from Campo do Tenente, Brazil. Yogurts were prepared with whole pasteurized cow's milk, whole powder milk, and starter cultures of *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus*. Fermentation was carried out at 42°C until reaching pH 4.65-4.70. Formulations consisted of a control (0% GP) and post-fermentation GP additions of 2% (2B), 5% (5B), and 7% (7B). Freeze-dried samples were analyzed for total phenolic compounds (TPC, Folin-Ciocalteu assay), total anthocyanins (pH-differential method), total flavonoids, and antioxidant activity (DPPH, FRAP and ABTS assays). GP incorporation promoted a progressive, dose-dependent increase in TPC ($p < 0.01$), reaching the highest value in 7B (2.621 mgGAE/g). Total flavonoid content was significantly higher only in 7B (1.808 mg QE/100 g) than in the control. Anthocyanins were not detected in the control and showed similar levels in 2B and 5B, followed by a marked increase in 7B (3.957 mg cyanidin-3-glucoside/L; $p < 0.05$). Antioxidant activity measured by DPPH was highest in 5B (18.61 μmol TE/g), with a slight, non-significant reduction in 7B. In contrast, ABTS and FRAP values increased progressively with GP concentration, reaching 4.596 and 8.405 μmol TE/g, respectively, in 7B. The incorporation of grape pomace enhanced the functional properties of yogurt by increasing the levels of phenolic compounds, anthocyanins, and antioxidant activity measured by ABTS and FRAP. These findings suggest that grape pomace is a promising, low-cost ingredient for the functional enrichment of fermented dairy products.



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Sciforum-183072: Insight into the Chemical and Functional Properties of Artichoke Leaves

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This study aimed to comprehensively characterize artichoke leaves and evaluate their potential as functional food ingredients through the investigation of their compositional, structural, and techno-functional properties. Different samples were prepared based on the anatomical part of the leaf and the granulometry. Proximate composition was first determined, followed by the characterization of dietary fiber fractions, fiber structural components, mineral composition, and phenolic profile. Proximate analysis revealed higher protein and ash contents in leaf fractions than in woody fractions. Dietary fiber was the most abundant component, with insoluble dietary fiber representing the predominant fraction. Structural characterization revealed relatively uniform pectin levels, whereas hemicellulose, cellulose, lignin, and inulin contents varied markedly among samples, highlighting the heterogeneous nature of artichoke leaf fibers. Techno-functional evaluation revealed marked differences in water-holding, oil-holding, swelling, and cation-exchange capacities among samples, reflecting variations in fiber composition and structure. Correlation analysis demonstrated that the distribution of cellulose, hemicellulose, lignin, and pectin strongly influenced these functional properties, highlighting the relationship between fiber architecture and technological performance. Mineral characterization showed potassium and calcium as the predominant macroelements, whereas iron was the most abundant microelement. Phenolic profiling identified caffeoylquinic acid derivatives as the major compounds, in particular chlorogenic acid and cynarin. In vitro bioaccessibility studies demonstrated that cynarin exhibited greater bioaccessibility than chlorogenic acid during both gastric and intestinal digestion phases.Overall, the distinct compositional and functional characteristics for the different artichoke leaf fractions demonstrate that anatomical part and particle size influence metabolite distribution and technological performance, supporting their targeted valorization as a sustainable source of multifunctional ingredients for food and nutraceutical applications.



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Sciforum-183455: Stability and protein-phenolic interactions of ready-to-use protein-packed functional honeybush tea powder formulations.

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Background

Cyclopia subternata (honeybush) is traditionally consumed as herbal tea. Its bioactive phenolic-rich extracts (CSE) show potential as functional ingredients in ready-to-use (RTU) instant tea powders. The use of protein isolates instead of milk powder can be used to produce a functional high-protein convenience product. However, protein–phenolic interactions may influence physicochemical properties, stability, and bioactivity of phenolic compounds.

Objectives

This study formulated CSE-based RTU powders with whey, pea, and soy protein isolates (1:1 CSE: protein) to evaluate (i) physicochemical characteristics and (ii) phenolic stability (40°C/7% and 75% RH for 9 months).

Results and Discussion

Solid-state characterization (FTIR, DSC, and XRPD) showed amorphous systems and protein conformational changes linked to hydrogen bonding and hydrophobic interactions with phenolics.

Moisture sorption analysis indicated reduced hygroscopicity in soy- and pea-based formulations compared to CSE alone. Water activity values (<0.61) suggested microbiological stability, though moisture contents above monolayer values (calculated using the GAB model) indicated increased molecular mobility and potential physical and chemical degradation.

Second-order reaction rates indicated improved stability of CSE phenolics (quantified with HPLC-DAD) in whey protein formulations compared with CSE alone, while soy protein reduced stability. Of the 10 quantified phenolic compounds, whey protein particularly stabilized (>2.5-fold) hesperidin, scolymoside, mangiferin, and isomangiferin, indicating compound-specific interactions.

Conclusions

Protein–phenolic interactions were confirmed and, together with changes in hygroscopicity, influenced phenolic stability, which could affect bioactivity. Reduced degradation could be explained by steric and chemical shielding. Whey protein isolate demonstrated superior stabilization of CSE phenolics, supporting its use in RTU formulations. Complementary future work should include sensory and visual evaluation and assessment of rehydrated formulations with added food-grade ingredients.



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Sciforum-185055: Development of Pangasius Mince Sausage Incorporated with Chitosan-Konjac Glucomannan Hydrogel

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Introduction: Fish sausages prepared from pangasius mince are gaining popularity due to their nutritional value, palatability, and ease of processing. However, the high fat content of pangasius makes it prone to oxidation and quality deterioration. Improving technological and functional properties remains a key challenge. In this context, incorporation of chitosan-konjac glucomannan hydrogel offers potential benefits by enhancing water retention, texture, and overall product stability, thereby improving the quality of pangasius mince sausages.

Methods: Pangasius mince sausages were prepared with five treatments: control (without hydrogel), T1 (1% hydrogel), T2 (2% hydrogel), T3 (3% hydrogel), and T4 (4% hydrogel). The prepared sausages were analyzed for pH, water holding capacity (WHC), diameter reduction upon cooking, gel strength, texture profile (hardness), instrumental colour (L* value), and sensory attributes using standard procedures.

Results: The incorporation of hydrogel significantly influenced the quality characteristics of the sausages. The pH showed a slight decrease from 7.13 to 7.08 with initial hydrogel addition, followed by a marginal increase at higher concentrations. The WHC increased significantly ($p < 0.05$) from 91.79% to 93.96% with increasing hydrogel levels. A significant reduction in diameter shrinkage was observed, with the lowest value recorded in T4 (6.66%). Gel strength improved notably, with the highest value observed in T3 (355.88 g·cm), followed by T4 (345.61 g·cm). The lightness (L*) value increased from 61.59 to 64.16, indicating improved appearance. The hardness of sausages increased significantly from 7967 g to 8828 g with increasing hydrogel concentration. Sensory evaluation revealed that T3 sausages achieved the highest overall acceptability among all treatments.

Conclusion: Based on the results, incorporation of 3% chitosan-konjac glucomannan hydrogel significantly ($p < 0.05$) improved the technological, textural, and sensory properties of pangasius mince sausages. Therefore, this formulation can be recommended for the development of value-added fish sausages with enhanced quality characteristics.



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Sciforum-185976: Development of Low-Fat Enrobed Fish Cutlets Using Konjac Glucomannan: Effect on Technological and Quality Attributes

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Introduction: Value addition to fish meat-based products involves innovative approaches that improve shelf life, texture, sensory attributes, and overall acceptability. Changing consumer lifestyles and preferences have increased the demand for ready-to-eat deep-fried foods. However, deep frying results in significant oil uptake, which is associated with potential health concerns. In this context, hydrocolloids such as konjac glucomannan (KGM) can be used in batter formulations to reduce oil uptake and improve functional properties. Therefore, the present study was designed to evaluate the effect of konjac glucomannan incorporation on the quality characteristics of enrobed fish cutlets.

Methods: Fish cutlets prepared from Silver Carp (*Hypophthalmichthys molitrix*) were dipped in batter incorporated with different levels of konjac glucomannan (0, 1%, 2%, 3% and 4%). The battered and breaded products were evaluated for coating characteristics such as coating pickup, cooking yield, frying loss, adhesion degree, proximate composition, texture profile analysis, and instrumental colour using standard procedures.

Results: The incorporation of konjac glucomannan significantly influenced the quality attributes of fish cutlets. Coating pickup (16.76-46.41%), cooking yield (10.39-41.21%), and adhesion degree (14.05-29.22%) increased, while frying loss decreased (5.76-1.09%) with increasing levels of konjac glucomannan. Moisture content decreased from 62.65% to 58.06%, whereas lipid content reduced from 13% to 7.14% with increasing incorporation levels. Textural parameters such as hardness (3591.15-6620 g), gumminess (1714-2723), and chewiness (1274.32-1599.12) exhibited an increasing trend. Instrumental colour analysis revealed an increase in lightness (L*) from 36.32 to 52.43, while redness (a*) decreased from 12.62 to 6.99 with increasing KGM concentration.

Conclusion: Based on coating characteristics and overall quality parameters, batter containing 2% konjac glucomannan (T2) was found to be optimal for coated fish cutlets. The incorporation of konjac glucomannan showed a positive effect on technological, textural, and quality attributes and can be recommended for the development of improved low-fat fried fish products.



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Sciforum-185986: Development of Marmalade with an Improved Nutritional Profile Using LMA Pectin and Polydextrose

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Introduction

The development of sweets with improved nutritional profiles, particularly marmalade with reduced sugar content and increased levels of functional ingredients, is highly relevant. Marmalade is a popular product in Eastern Europe. Conventional production uses high-methoxyl (HM) pectin, which forms stable gels only at high sugar concentrations (≥60%) and acidic pH values (2.5–3.5). Reducing sugar content destabilizes the gel structure.

Low-methoxyl pectins (LM and LMA) provide an alternative, as they form gels mainly through ionic interactions between carboxyl groups and calcium ions (the “egg-box” model). LMA pectin can form acid-induced gels due to the presence of amide groups at pH below 3.5. Gel strength depends on pectin concentration, calcium ion content, degree of methoxylation and amidation, and molecular structure.

Method

Model gel systems were prepared using different ratios of LMA pectin, sugar, and polydextrose at a constant calcium concentration. The ingredients included amidated pectin, sucrose, polydextrose, citric acid, and calcium lactate. Polydextrose was used as a low-calorie bulking agent and soluble dietary fiber with prebiotic properties and a neutral taste. A control sample was produced using traditional high-methoxyl (HM) pectin technology. Gel strength was measured using a Valenta instrument, and pH was determined using standard laboratory methods.

Results

Preliminary experiments showed that the optimal calcium concentration was approximately 5 mg/g of LMA pectin. In the absence of calcium, gels were unstable, while excessive calcium resulted in overly rigid and grainy textures. Calculations demonstrated that when 50% of sugar was replaced with polydextrose, approximately 1.365 g of LMA pectin (at 5 mg/g Ca^{2+}) was required to achieve gel strength comparable to that of traditional marmalade.

Conclusion

The study demonstrated the feasibility of replacing up to 60% of sugar with polydextrose in marmalade formulations using LMA pectin without compromising gel strength or texture.



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Sciforum-188404: Impact of *Inonotus hispidus* supplementation on morphometric and physiological parameters in HPV16-transgenic mice

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Human papillomavirus (HPV) is the most prevalent oncogenic virus worldwide and is associated with epithelial lesions and several malignancies, representing a major global public health concern. *Inonotus hispidus* is a medicinal mushroom rich in bioactive compounds, including polysaccharides, triterpenoids and phenolic compounds, with reported antioxidant, antitumor and antimicrobial activities. However, its effects in HPV-associated carcinogenesis remain poorly understood. Thus, this study aimed to evaluate the effects of dietary supplementation with a hydroethanolic extract obtained from *I. hispidus* sporocarps on morphometric and physiological parameters in the K14HPV16 transgenic mouse model.

Twenty-nine female FVB/n mice (35-39 weeks old), including wild-type (WT) and transgenic K14HPV16 (HPV) animals, were randomly assigned to six groups (n = 4–5/group). Control groups received the standard diet, whereas supplemented groups received diets containing *I. hispidus* extract at 50, 100, or 150 mg/kg for 28 consecutive days. HPV mice were assigned to HPV-Control, HPV-50, HPV-100, and HPV-150, whereas WT animals were assigned to WT-Control and WT-150. Animal welfare was monitored daily, and body weight, food, and water intake were recorded weekly. Body mass index (BMI) and Lee index were calculated from morphometric measurements. All procedures were conducted in accordance with Directive 2010/63/EU and approved by the relevant national authorities (approval no. 014139).

No mortality or severe clinical signs were observed during the study. *I. hispidus* supplementation did not significantly affect body weight-related parameters. Although BMI and Lee index differed significantly between WT-Control and HPV-150 groups ($p < 0.05$), no consistent treatment-related pattern was detected. Estimated daily food and water intake remained stable throughout the experimental period, with no changes associated with *I. hispidus* supplementation.

In conclusion, *I. hispidus* supplementation showed no adverse effects on morphometric and physiological parameters under the tested conditions, supporting its safety profile and encouraging further studies in HPV-associated disease.



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Sciforum-188691: Nutritional Characterization and Bioactive Potential of Dehydrated Duckweed (*Lemna minor*) for Food and Feed Applications

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Introduction: As the global demand for sustainable and alternative nutrient sources grows, aquatic plants such as duckweed (*Lemna minor*) have emerged as promising candidates for both human nutrition and animal feed. This study aims to characterize the nutritional profile, mineral content, and antioxidant properties of dehydrated *L. minor* to evaluate its potential as a functional ingredient.

Materials and Methods: *L. minor* was grown in outdoor ponds under controlled conditions- After harvesting, it was sun-dried. Dehydrated samples were analyzed to determine their proximate composition (moisture, ash, fat, protein, and fiber) using standardized methods. Its mineral profile was quantified by ICP-MS, and the fatty acid profile by GC. Additionally, polyphenolic compounds were identified using HPLC, and the antioxidant capacity was *measured* through ABTS, DPPH, and FRAP assays.

Results: Proximate analysis revealed a high fiber content of 58.86±3.02 g/100g and a significant protein fraction of 14.11±0.34 g/100g. The mineral profile was notably rich in potassium (4177.45±337.80 mg/100g), calcium (1434.01±73.02 mg/100g), and phosphorus (931.27±59.74 mg/100g). The fatty acid profile was dominated by palmitic acid, with a balanced ratio of linoleic acid (n-6) to α-linoleic acid (n-3). A diverse polyphenolic profile was identified, with Apigenin glycoside-4 (627.11±29.37 µg/100g) and Kaempferol glycoside-6 (523.85±8.05 µg/100g) being the most abundant compounds. Consequently, the samples exhibited robust antioxidant activity, particularly in the FRAP assay (11.84±0.71 mg Trolox equivalent/g).

Conclusions: Dehydrated *Lemna minor* represents a dense source of essential minerals, dietary fiber, and bioactive polyphenols. Its significant protein content and strong antioxidant potential suggest it is a highly viable and sustainable alternative for enriching animal diets or developing functional food products for human consumption.



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Sciforum-190578: Comparative network pharmacology analysis of marker bioactive compounds from Greek monofloral honeys reveals potential anticancer-related mechanisms

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Greek monofloral honeys constitute a rich source of phenolic compounds and bioactive metabolites with documented antioxidant and health-promoting properties. Among them, pine, heather and strawberry tree (Arbutus unedo) honeys are characterized by distinct phytochemical profiles and considerable biological interest. The present study aimed to comparatively investigate the potential anticancer-related activity of three representative marker compounds associated with these honey varieties: taxifolin (pine honey), ellagic acid (heather honey) and arbutin (strawberry tree honey). An integrated in silico framework combining network pharmacology, bioinformatics and pharmacokinetic assessment was employed to identify molecular targets and characterize biologically relevant pathways. Computational target prediction, protein–protein interaction (PPI) network analysis, functional enrichment analysis and ADME profiling were applied to evaluate the biological relevance and pharmacological potential of the selected compounds. Functional enrichment analysis identified significant biological processes associated with the response to organic substances oxidative stress and superoxide metabolism. PPI network analysis identified GNB1 as the principal hub gene, while NQO1, SLC7A11, NOS3, LPAR1 and APOB emerged as key molecular targets involved in redox homeostasis, ferroptosis, GPCR-mediated signaling and cellular metabolism. Taxifolin was predicted to interact with APOB and the ferroptosis regulator SLC7A11, ellagic acid was associated with nucleotide metabolic pathways, whereas arbutin showed high predicted affinity for LPAR1, S1PR2 and TYR, suggesting complementary regulatory mechanisms. Among the investigated compounds, taxifolin and ellagic acid demonstrated the most favorable predicted bioactivity and pharmacokinetic characteristics, whereas arbutin appeared to exert complementary regulatory effects within the interaction network. Overall, these computational findings suggest that bioactive compounds from Greek monofloral honeys may influence multiple cancer-related molecular pathways through a multitarget mechanism. However, these predictions are based exclusively on in silico analyses and should be considered hypothesis-generating until confirmed by appropriate in vitro and in vivo studies.



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Sciforum-192143: Optimization of Enzyme-Assisted Thermoultrasound for Protein Extraction and Hydrolysis of Mexican Caviar (Ahuautle)

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Introduction: Mexican caviar (ahuautle), the eggs of aquatic insects traditionally consumed in central Mexico, represents an underutilized sustainable protein source. Combining enzymatic hydrolysis with thermoultrasound, a green emerging technology, offers a promising strategy to enhance protein extraction efficiency and functionality for functional food applications.

Methods: A Box-Behnken design with two replicates was employed to optimize enzyme-assisted thermoultrasound parameters (pH: 7–9, time: 10–20 min, enzyme concentration/E/S ratio: 1.5–2.5% w/v) for maximizing protein solubility and free amino group release from ahuautle protein concentrate. Response surface methodology (RSM) was applied using Statgraphics software.

Results and Discussion: Response surface analysis revealed that optimal conditions differed between responses. Maximum protein solubility was achieved at alkaline pH (9.0) with 20 min thermoultrasound treatment and enzyme concentration of 2.3% w/v. Maximum free amino group release occurred at pH 8.0, 16 min, and E/S ratio of 2.3% w/v. The model showed adequate fit with R^2 = 87.22%, confirming that the selected variables effectively explain the variability in protein extraction and hydrolysis responses. These divergent optima demonstrate that protein extraction and controlled hydrolysis require distinct processing parameters.

Conclusions: Enzyme-assisted thermoultrasound successfully optimized both protein extraction and hydrolysis of ahuautle, confirming its potential as a sustainable technology for producing functional protein ingredients or bioactive peptide precursors for novel food applications.



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Sciforum-192267: Development of Nutrient-Enriched Fish Pizza Incorporated with *Pangasianodon hypophthalmus* Surimi Powder and Its Quality Assessment

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Introduction: Pizza is a popular fast food preferred among consumers of all age groups worldwide. However, its nutritional value is often limited by high carbohydrate content and low nutritional level. The incorporation of fish-based ingredients offers an effective approach to improve their nutritional quality and overall acceptability. Surimi powder prepared from *Pangasianodon hypophthalmus* possesses high-quality protein, making it a promising ingredient for the development of nutritious fish pizza. Therefore, the present study aimed to develop surimi-enriched fish pizza and evaluate its nutritional, textural, and sensory characteristics.

Methods: Surimi powder prepared from *Pangasianodon hypophthalmus* was incorporated into pizza dough at different levels (5%, 10%, and 15%) by replacing refined wheat flour. The sensory evaluation using a 9-point Hedonic scale identified the optimum formulation. Based on sensory evaluation, the optimized dough formulation was used to prepare fish pizza with conventional toppings and fish paneer. The developed products were analysed for proximate composition, texture profile analysis, and sensory quality using standard analytical procedures.

Results: The incorporation of surimi powder significantly influenced the quality of the developed pizza. Among the treatments, the 5% surimi level exhibited the highest sensory acceptability with desirable texture, flavour, and overall quality. The proximate analysis revealed a substantial increase in crude protein content from 10.85% to 18.46% in the control and fish pizza respectively. The texture profile analysis indicated an increase in hardness and chewiness. However, maintaining good palatability and consumer acceptability with a score of 8.2 on the 9-point Hedonic scale.

Conclusion: The incorporation of 5% surimi powder enhanced the protein content and nutritional value of fish pizza without compromising its textural and sensory acceptability. The developed fish pizza offers a value-added alternative to conventional pizza with promising commercial potential.



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Sciforum-192399: Ethanolic and Methanolic Extraction of Phenolic Compounds and Their Antioxidant Capacity by DPPH and FRAP from Cahuiche Fruit (Vaccinium leucanthum)

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Introduction: Wild fruits represent an important source of bioactive compounds with potential applications in functional foods due to their antioxidant properties. Extraction strategies play a key role in recovering these compounds while preserving their nutritional characteristics. Cahuiche (*Vaccinium leucanthum*) is a wild red fruit native to Mexico that remains poorly characterized scientifically and may represent a valuable source of phenolic compounds and antioxidant molecules. Therefore, this study aimed to evaluate the effect of ethanol–water and methanol–water mixtures on the extraction of phenolic compounds and antioxidant capacity from cahuiche fruit.

Methods: Phenolic compounds were extracted through a maceration process using different ethanol–water and methanol–water concentrations (20, 40, 60, 80, and 100%). Extractions were performed using a sample-to-solvent ratio of 1:25 (w/v). Total phenolic content was quantified using the Folin–Ciocalteu method, and antioxidant capacity was evaluated through DPPH and FRAP assays. The influence of solvent concentration and extraction conditions on bioactive compound recovery was analyzed.

Results: The highest total phenolic content was obtained from the 60% ethanolic extract, reaching 814.22 mg GAE/100 g. Similarly, this extract showed the highest antioxidant capacity, with values of 389.47 µmol TE/100 g for the DPPH assay and 235.10 µmol Fe^{2+}E/100 g for the FRAP assay. These results indicate that intermediate ethanol concentrations favored the extraction of phenolic compounds and antioxidant constituents from cahuiche fruit.

Conclusions: Cahuiche (*Vaccinium leucanthum*) represents a promising source of phenolic compounds and antioxidant compounds. The results demonstrate that ethanol–water extraction, particularly at 60% ethanol concentration, can improve the recovery of bioactive compounds, highlighting the potential of this native fruit as a functional ingredient for food applications.



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Sciforum-194478: Biotransformation of Hemp Seed Cake through Solid-State Fermentation for the Development of Functional Food Ingredients

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The transition toward sustainable food systems requires innovative strategies to valorize agro-industrial by-products into high-value functional ingredients. Hemp seed cake, a protein-rich co-product of oil extraction, remains largely underutilized despite its promising potential for food applications. This study investigated the use of solid-state fermentation (SSF) with *Janthinobacterium lividum* to enhance the nutritional and bioactive properties of hemp seed cake. SSF was conducted under previously optimized conditions (temperature: 25 °C, substrate moisture content: 80%, inoculum volume: 4 mL, and fermentation time: 7 days). Biomass composition was evaluated by determining total protein content (Kjeldahl method), ash content (AOAC method), and total phenolic compounds (Folin–Ciocalteu assay). Violacein production was also monitored as a value-added microbial metabolite. Fermentation induced significant biochemical modifications ($p < 0.05$). Total phenolic content increased markedly from 0.67 to 5.15 g GAE·100 g^{-1} dry matter, indicating a substantial enrichment in bioactive compounds and a potential improvement in antioxidant properties. Total protein content showed a slight but non-significant increase from 35.00 to 36.36% (+1.36%). Ash content decreased significantly from 6.80 to 1.53%, likely reflecting microbial assimilation of inorganic minerals during fermentation. Violacein production reached 0.99 mg·g^{-1} dry matter, demonstrating the capacity of SSF to simultaneously generate a high-value bioactive metabolite alongside an upgraded fermented biomass. These findings demonstrate that SSF is an effective strategy for upgrading hemp seed cake into a phenolic-enriched biomass with potential applications as a functional food ingredient, while simultaneously producing value-added violacein. This approach contributes to agro-industrial by-product valorization and supports the development of sustainable food systems aligned with circular bioeconomy principles.



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Sciforum-194680: Healthy Indulgence: New Formulation and Validation of a Dessert for Dietary Restrictions

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Introduction

The growing demand for healthier baked goods has driven the development of alternatives — refined sugar free, gluten free, and lactose free products. Creating nutritionally balanced, sensorially appealing, and microbiologically safe products is a significant challenge for food innovation when removing or reducing key functional ingredients such as sugar, fat, and gluten containing flours, which play essential roles in structure, texture, stability, and preservation. Objectives This study aimed to develop a dessert product without added refined sugars, gluten, or lactose, and to determine its technological viability, microbiological stability, and consumer acceptance.

Methodology

Six formulations were developed using a common base, incorporating cooked rice, rice flour, and dates, and varying the percentage and type of cocoa, type of coconut milk, and inclusion of cocoa butter powder. The recipe was optimized through iterative prototyping, integrating sensory feedback from the optimization phase. The formulations were subjected to different heat treatments to evaluate their impact on microbiological safety and sensory acceptance. Microbiological analyses included total counts at 30°C, molds and yeasts, Bacillus cereus, Enterobacteriaceae, coagulase positive Staphylococcus, Listeria spp., and Escherichia coli, performed daily from T0 to T4. The final product was evaluated by 50 participants (58% male, 38% female; 78% aged 18–25) using a 9 point hedonic scale and a purchase intention questionnaire preceded by six closed ended questions on dessert consumption habits.

Results

Cocoa butter had the greatest positive impact on texture and sensory appeal. The first formulation showed unsatisfactory counts of Enterobacteriaceae and Bacillus cereus, requiring improved hygiene and adequate heat treatment. Reduced heat treatment led to microbiological instability after 48 hours. The final product qualifies as a “source of fiber” and “contains naturally occurring sugars”. In consumer testing, 66% of tasters “liked” the dessert (mean score = 4), describing it as “pleasant”, “attractive”, and “crunchy”, and most indicated they would purchase it.

Conclusions

The developed formulation proved technologically viable, microbiologically safe, and well accepted. Cocoa and coconut milk variations influenced texture and acceptance. The study highlights the potential of food innovation to use alternative functional ingredients in desserts adapted to dietary restrictions.



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Sciforum-195713: Upcycling Grape Pomace into Functional Bread: A Sustainable Valorization Strategy

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The valorization of agro-industrial by-products has gained increasing attention as a sustainable strategy for developing functional foods with enhanced nutritional value. Among these by-products, grape pomace, the main residue of the wine industry, is rich in bioactive compounds such as polyphenols, flavonoids, anthocyanins, and dietary fiber, making it a promising ingredient for food enrichment. This study investigated the effects of grape pomace flour (GPF) incorporation on the functional, textural, and sensory characteristics of bread. Three formulations were prepared: a control bread without GPF (BC) and two enriched breads containing 2.5% and 5% GPF (BGPF2.5 and BGPF5). The addition of GPF resulted in a significant dose-dependent increase in bioactive compounds. Total phenolic content increased from 35.82 mg gallic acid equivalents (GAE)/100 g dry weight (DW) in the control bread to 58.18 and 72.78 mg GAE/100 g DW in breads containing 2.5% and 5% GPF, corresponding to increases of approximately 62% and 103%. The functional properties of the breads were evaluated through ABTS and DPPH radical scavenging assays. Antioxidant activity was significantly enhanced by GPF incorporation ($p < 0.01$), with the highest values observed in the 5% GPF formulation, reaching 37.56 mM Trolox kg^{-1} DW (ABTS) and 14.37 mM Trolox kg^{-1} DW (DPPH). These findings confirm the contribution of GPF to improving the antioxidant potential of bread. Texture analysis showed that the higher dietary fiber content of GPF increased crumb firmness and improved structural consistency. Sensory quality was assessed using a 9-point hedonic scale, and the enriched breads showed good consumer acceptance. The bread containing 5% GPF obtained the highest scores for appearance and overall acceptability (8/9), outperforming both the control and the 2.5% GPF bread (7/9). Overall, the results demonstrate that GPF is a sustainable ingredient capable of enhancing the nutraceutical value and consumer appeal of bakery products while supporting circular economy strategies through the valorization of winery by-products.



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Sciforum-195734: Millet-, soybean-, and rice bran-based gluten-free breads formulated with Type I sourdough: effect on quality and *in vitro* glycaemic index

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Gluten-free breads (GFBs) are typically formulated with refined flours and starches, and are characterised by the absence of the viscoelastic gluten network, which compromises the structural integrity and promotes rapid staling and starch digestibility. The aim of this study was to evaluate GFB formulated with Type I sourdough (SD) from millet (M), rice bran (RB), or extruded-expelled soybean (SEE), on fermentation parameters, technological properties, and estimated glycaemic index (eGI). GFB were prepared with 30.0 SD-M (GFB-M), 37.5 SD-RB (GFB-RB), or 52.5 SD-SEE (GFB-SEE) g.100g^{-1} (d.b.). The control formulation without sourdough (GFB-O) was prepared with dehydrated baker's yeast and contained 15.0 M, 15.0 RB and 15.0 SEE g.100g^{-1} (d.b.) Total titratable acidity (TTA) was determined by titration with 0.1 M NaOH to pH 8.3. Specific volume (SV, cm^3·g^{-1}) was measured using the rapeseed displacement method (AACC 10-05.01) and eGI was determined using an *in vitro* methodology. GFB-O showed the highest pH and lowest TTA (6.32 ± 0.09; 0.25 ± 0.07 mL NaOH), while GFB-M, GFB-RB and GFB-SEE presented significantly lower pH and higher TTA than GFB-O ($p \leq 0.05$). SV ranged from 2.2 to 4.3 cm^3/g, with GFB-SEE and GFB-RB showing the lowest values and GFB-O the highest ($p \leq 0.05$). GFBs with SD addition had a significantly reduced eGI, with a maximum reduction of 12.3% compared to GFB-O ($p \leq 0.05$). Overall, the use of Type I sourdough process modified the fermentation dynamics and quality characteristics of GFBs, thereby affecting both technological and nutritional properties in the formulations.



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Sciforum-195741: Effect of the incorporation of *Neltuma affinis* pod and soybean extruded-expeller meal flours on the technological properties of gluten-free fresh pasta

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Developing gluten-free (GF) pasta with high nutritional and technological quality remains a critical challenge for the food industry, requiring the substitution of gluten with alternative matrices. This study evaluated the effect of incorporating exocarp-mesocarp flour obtained from the milling process of *Neltuma affinis* pod (EMF: 0–10 g/100g), soybean extruded–expelled meal (SEE: 0–10 g/100g), and dough hydration level (WH: 35.5–40.5 mL/100g) on the technological properties of GF fresh pasta. A Box-Behnken design with three central points by triplicate was implemented. Optimal cooking time (OCT) and mass gain (MG) were determined using standard AACC methods. Colour profiles (L*, a*, b*, Chroma, and ΔE; CIELAB) were evaluated in cooked pasta. Model adequacy was corroborated by coefficient of determination (R^2) $>$ 70%, Durbin-Watson statistics $>$ 1, and lack-of-fit tests ≥ 0.05. All response variables were fitted to a second-order polynomial model. OCT was significantly affected ($p<0.05$) by a negative linear effect and a positive quadratic effect of SEE, describing a parabolic behaviour. MG exhibited a pronounced curvature with positive quadratic effects for all factors studied and a significant synergetic EMF-SEE interaction ($p<0.05$); where the combined incorporation of maximum levels of EMF and SEE promoted a dense matrix increasing MG. As regard chromatic profiles ($p<0.05$), EMF reduced L* and increased a*, whereas SEE enhanced b* via linear and positive quadratic effects. Chroma exhibited a negative linear and a positive quadratic EMF effect, denoting lower purity at intermediate levels and specific pigment dilution. ΔE analysis revealed that EMF increased thermal sensitivity, whilst both higher WH levels and SEE exerted a protective, stabilising effect on surface colour. The strategic combination of local regional flours and soy by-products, as functional ingredients, allows for the improvement of the technological properties of GF fresh pasta.



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Sciforum-195843: Blackcurrant and Tomato Seed Oils: Distinct Fatty Acid Profiles with Shared Functional Potential

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Seed oils recovered from agro-industrial by-products represent promising ingredients for the development of functional foods and nutraceuticals. This study comparatively investigated the fatty acid composition and selected biological activities of the lipid fractions obtained from Ribes nigrum and Solanum lycopersicum seeds. Fatty acid profiles were determined by GC–MS analysis. Antioxidant activity was evaluated by ABTS and DPPH assays; neuroprotective-related activities were assessed by inhibition of acetylcholinesterase (AChE), and butyrylcholinesterase (BChE). The two oils exhibited markedly different lipid signatures. Tomato seed oil was dominated by oleic acid (74.56%), whereas blackcurrant seed oil was characterized by high levels of linoleic (46.45%) and α-linolenic acids (21.37%). Despite these compositional differences, several biological activities were comparable between the two oils. Similar AChE inhibitory potency expressed as IC_{50} was comparable (16.91 and 17.98 µL/mg), while no BChE inhibition was detected under the tested conditions. A comparable antioxidant capacity was also observed in the ABTS assay (17.63 and 17.36 µM TE/g). In contrast, blackcurrant seed oil showed stronger DPPH radical scavenging activity (EC_{50} = 3.90 vs. 5.12 µL/mL DPPH). Conclusions: Although characterized by different fatty acid compositions, blackcurrant and tomato seed oils exhibited largely comparable functional properties. These findings indicate that differences in the predominance of MUFAs and PUFAs were not consistently associated with differences in the biological activities evaluated in this study, suggesting that minor constituents and interactions among lipid components may also contribute to the overall functional properties of seed oils.



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Sciforum-195990: Unlocking the Potential of Spent Coffee Grounds: From Agro-Industrial Waste to Functional Bioactive Ingredients

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The increasing interest in sustainable food systems and circular economy approaches has heightened attention toward the valorisation of agro-industrial by-products as valuable sources of bioactive compounds. Among these, spent coffee grounds (SCG), the residue generated during coffee brewing, represent one of the most abundant food industry wastes worldwide. Despite being commonly discarded, SCG retain considerable amounts of valuable bioactive phytochemicals, making them a promising raw material for nutraceutical and food applications. To assess the influence of coffee matrix composition on SCG characteristics, three samples derived from a 60% Arabica/40% Robusta blend, 100% Arabica, and 100% Robusta coffee were investigated for their colorimetric properties, phenolic composition, and antioxidant activity. The observed differences among the samples underscore the substantial impact of coffee variety on the preservation of bioactive compounds in spent coffee grounds following extraction. The Arabica/Robusta blend was characterized by the highest total phenolic content (149.4 mg GAE/g extract) and radical scavenging potential, exhibiting IC_{50} values of 44.5 and 27.5 μg/mL in the DPPH and ABTS assays, respectively. The UHPLC-DAD profiling enabled the identification of key phenolic compounds, including gallic, protocatechuic, chlorogenic, caffeic, and *p*-coumaric acids, along with caffeine, thereby confirming the potential of SCG as a valuable reservoir of bioactive molecules with recognized health-promoting properties. Although the 100% Robusta sample exhibited the highest concentrations of most phenolic acids, the Arabica/Robusta blend was characterized by the highest caffeine content and the strongest overall antioxidant activity. These findings highlight the potential of spent coffee grounds as a valuable source of phenolic compounds and antioxidants. Their rich bioactive profile supports their valorisation as sustainable functional ingredients for the development of value-added products, thereby promoting waste reduction and resource recovery within a circular economy framework.



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Sciforum-196112: Multiphenolic inulin obtained by grafting with phenolic compound from *Sambucus peruviana* using a novel and hybrid dual intermediate frequency ultrasound procedure

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This study developed a novel hybrid dual intermediate-frequency ultrasound (hD-IFUS) process for the simultaneous grafting of phenolic compound (PC-SP) extracted from *Sambucus peruviana* onto inulin (INUL-mPhe) using an H_2O_2/ascorbic acid redox-pair system. The process, which combined sonication at 582 kHz (23.7 ± 0.9 W, continuous mode) and 1144 kHz (0.42 ± 0.04 W, pulsed mode; 1800 ms ON/200 ms OFF), was optimized in a small-scale reactor and subsequently scaled up to a laboratory-scale reactor. The highest grafting efficiency was achieved at INUL/PC-SP mass ratio of 2:1, as indicated by UV–Vis spectroscopy and total phenolic content (TPC) analysis (51.25 ± 3.05 mg GAE g^{-1}). Second-derivative UV–Vis spectra confirmed the presence of PC-SP. Although chemical dosimetry was similar at both scales, the laboratory-scale process produced INUL-mPhe with a higher TPC (68.21 ± 2.10 mg GAE g^{-1}), likely due to enhanced mixing. UV–Vis, FT–IR, and thermal analyses confirmed the successful incorporation of PC-SP into the inulin backbone. Furthermore, INUL-mPhe exhibited markedly enhanced antioxidant capacity measured by Single Electron Transfer (SET) and Hydrogen Atom Transfer (HAT) assay such as DPPH (418.62 ± 4.92 μmol Trolox g^{-1}) and ABTS (322.78 ± 6.76 μmol Trolox g^{-1}) and HAT assay as ORAC (1194.75 ± 18.02 μmol Trolox g^{-1}). Overall, hD-IFUS represents a rapid, green, and effective strategy for producing multiphenolic inulin conjugates using PC-SP extracted by low frequency ultrasound.



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Sciforum-196176: Physico-chemical properties of a novel plant based milk alternative using coconut protein concentrate (CoPROTINA) and coconut dietary fiber (CoFBR): screening of formulation parameters

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The shift in consumer preferences toward sustainability and healthier food products has given rise to the increasing demand for plant-based milk alternatives. Coconut protein concentrate (CoPROTINA™) and coconut dietary fiber (CoFBR™) are extracted from virgin coconut oil processing wastes, coconut skim milk and coconut residue, respectively. This preliminary study evaluated the effects of combining the said upcycled products on the physico-chemical properties of a novel plant-based milk alternative (PBMA). CoPROTINA™ were tested at 1% to 3% levels while CoFBR™were evaluated using 0.1 to 1% levels. Treatments were subjected to color measurement, viscometry and informal qualitative descriptive sensory evaluation (3 trained panelists) based on color/appearance, aroma, mouthfeel, taste and flavor. Viscosity of samples varied with formulation composition (5.00 - 19.30 mPa·s) but were generally lower compared to commercial cow milk (10.00 - 20.8- mPa·s) at different spindle speeds (20-100 rpm). Color attributes also varied with composition, wherein higher protein and fiber increased lightness (L*), and shift to a more neutral or yellowish hue value (H°). The sensory attributes of the four plant-based milk samples varied according to protein and fiber content with higher protein and fiber levels increasing body and slight fibrousness in the PBMA, while also intensifying aroma. Tastes are generally sweet, with minor off-notes in some high-fiber samples. Overall, the study showed the potential of using CoPROTINA and CoFBR in PBMA production and can be further optimized.



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Sciforum-196179: Preserved hepatic, renal, and intestinal antioxidant enzyme activity in mice supplemented with an olive pomace extract

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Olive pomace (OP), a semi-solid by-product of olive oil production, is rich in phenolic compounds with recognized antioxidant and anti-inflammatory properties, supporting its potential valorization as a sustainable bioactive ingredient. However, given the relevance of antioxidant enzymes as markers of tissue redox homeostasis, assessing their activity *in vivo* is an important step before further exploring the functional application of OP extract. This study aimed to evaluate hepatic, renal, and intestinal antioxidant enzyme responses in female mice (*Mus musculus*) supplemented with an OP extract.

All experimental procedures were conducted in accordance with Directive 2010/63/EU and approved by national authorities (approval no. 014139). Twenty FVB/n female mice (6–8 months old) were randomly assigned to four groups (n=5) receiving diets containing 0% (CTRL), 2.5%, 5%, and 8% of OP extract for 28 days. Body weight, food and water intake, and wellbeing were monitored throughout the study. At the end of the study, animals were euthanized by anesthetic overdose (sodium pentobarbital) followed by cardiac puncture. Following euthanasia, liver, kidney, and intestinal samples were collected for the assessment of antioxidant enzyme activity using spectrophotometric methods, namely catalase, glutathione peroxidase, glutathione S-transferase, and superoxide dismutase.

No mortality, behavioral alterations, or relevant changes in body weight or intake parameters were observed. Hepatic and renal antioxidant enzyme activities did not differ significantly among experimental groups. In the intestine, antioxidant enzyme activity was also largely unchanged, although glutathione peroxidase activity was significantly higher in the 2.5% group than in the 8% group ($p < 0.05$), with both groups remaining comparable to CTRL.

In conclusion, dietary supplementation with an OP extract did not significantly alter hepatic, renal, or intestinal antioxidant enzyme activities under the tested conditions. These results support the potential of OP as a sustainable nutraceutical or functional food ingredient.



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Sciforum-196227: Smart, Ready-to-Use Nutritive Formulations of *Portulaca oleracea* L.-Loaded Food-Grade NADESs for Functional Food Development

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Background: Natural deep eutectic systems (NADESs) are increasingly explored as sustainable extraction media for bioactive compounds. Beyond extraction, food-grade NADESs may function as biocompatible carrier matrices for labile phytochemicals, eliminating energy-intensive solvent removal and supporting their direct use in functional food formulations as stabilizing, "ready-to-use" delivery platforms.

Objective: This study evaluated the yield of total phenolics and flavonoids, alongside the antioxidant activity, of selected food-grade NADESs loaded with *Portulaca oleracea* L. leaf extracts (POL), emphasizing their dual role as extraction media and bioactive ingredient platforms.

Methods: Four NADESs formulations were prepared to obtain POL extracts, which were assessed for total phenolic and flavonoid yields. The antioxidant activity of pure NADESs and corresponding POL-loaded extracts was evaluated using DPPH radical scavenging kinetics (expressed as IC_{50}) and Trolox Equivalent Antioxidant Capacity (TEAC) assays. A conventional ethanol extract served as the control, and ascorbic acid as the reference antioxidant.

Results: NADESs extracts were highly rich with TPC and TFC, consequently the POL-loaded NADESs showed markedly higher antioxidant activity than the pure NADES vehicles and the ethanol extract, which presented an IC_{50} of 1615.96 ± 5.34 µg/mL and a TEAC value of 0.53. Among the tested systems, the menthol/lactic acid extract showed the strongest radical-scavenging activity, with an IC_{50} of 18.33 ± 0.72 µg/mL and a TEAC value of 5.37, remarkably outperforming the ascorbic acid reference under the same assay conditions. The menthol/β-citronellol extract also showed high antioxidant activity (IC_{50} = 51.51 ± 1.21 µg/mL; TEAC = 4.26). The β-citronellol/capric acid and menthol/acetic acid systems maintained relevant antioxidant capacity, with TEAC values of 4.12 and 4.14, respectively.

Conclusions: Selected food-grade NADESs can enhance the antioxidant performance of POL extracts and serve as promising carrier matrices for functional foods. Further studies should evaluate their sensory acceptability, storage stability, compatibility with real food systems, and safety.



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Sciforum-196554: Partial Substitution of pork Fat by a Gelled Emulsion Formulated with Pomegranate Peel Flour and Quinoa Oil: Impact on Chemical Composition, Physicochemical Attributes, and Sensory Quality of Beef Burgers

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Animal fat has a high impact on technological and sensorial properties of meat product. However, its high content in saturated fatty acids is being a problem for consumers who are worried about their health. A way to satisfy this demand is reformulating meat products with healthier lipid sources. A gelled emulsion (GE) prepared with quinoa oil and pomegranate peel flour was used to replace pork back fat in beef burgers. Three different formulations were prepared: Control (CS) with 30% pork back fat, and the following two to achieve 25% and 50% fat substitution by GE (GE25 and GE50, respectively). The chemical composition, physicochemical, and sensorial properties of the beef burgers were determined. The replacement of animal fat by GE25 and GE50 produced an increases in the moisture content ($p<0.05$) with respect to CS. On the other hand, the fat, protein and ash content of GE25 and GE50 was lower ($p<0.05$) than CS. Additionally, in GE25 and GE50 the amount of palmitic, stearic, and oleic fatty acids was decreased while increased the amount of linoleic (from 5.68 to 16.94 g/100g fat) and α-linolenic (from 0.30 to 1.68 g/100g fat). Replacing pork backfat with GE did not significantly ($p<0.05$) affect the physicochemical properties of beef burgers, except for texture profile, where hardness and chewiness were reduces compared with CS. In reference to lipid oxidation values, the higher the degree of fat replacement, the higher the lipid oxidation values. Thus, lipid oxidation increased 26% and 40% for GE25 and GE50 with respect to CS. In sensorial analysis, burger GE25 had similar scores that CS being GE50 the worst valued. So, this study demonstrated that the use of GE elaborated with pomegranate peel flour and quinoa oil may be a promising strategy in the reformulation of healthier meat products.



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Sciforum-196716: Supercritical CO_2 Extraction of the Oat Lipids for Functional Food Ingredients

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Introduction: Oats (*Avena sativa* L.) contain 5–9% lipids with a unique fatty acid profile rich in oleic, linoleic, and palmitic acids. While conventional solvent extraction raises environmental concerns, alkaline methods cause undesirable phenolic oxidation. This study investigates supercritical CO_2 (SC-CO_2) extraction as a green biorefining strategy to recover lipid-enriched fractions from oat matrices, supporting a sustainable valorization model where defatted residues can be further processed for protein and fiber recovery.

Methods: Proximate analysis was first conducted on various oat fractions: fine powder (70 mesh), husk with powder (18 mesh), and husk (7 mesh). Because the fine powder fraction exhibited the highest lipid (5.77%) and protein (11.19%) content, it was selected for SC-CO_2 extraction. Extraction was performed at varying temperatures (40–50 °C) and pressures (250–450 bar). The extracted oils were analyzed for fatty acid profiles, triacylglycerols, total carotenoids, tocopherols, phytosterols, and oxygen radical absorbance capacity (ORAC) antioxidant activity.

Results: Proximate analysis confirmed that ash content was highest in the husk fraction (3.14%). For the extraction phase, pressure and particle size emerged as the most significant factors influencing oil yield. SC-CO_2 extraction yielded the highest oil content from the fine powder at the maximum pressure of 450 bar, which was lower than the yield obtained via traditional Soxhlet solvent extraction with hexane. However, co-extracted polyphenols significantly contributed to the extracted oil's antioxidant activity.

Conclusions: Although SC-CO_2 extraction resulted in a lower lipid yield compared to traditional methods, these results confirm that this green technology successfully produces a solvent-free, bioactive oat lipid ingredient. Furthermore, this approach preserves the defatted oat residue, allowing for subsequent downstream isolation of valuable beta-glucans and proteins within a circular biorefinery concept.



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Sciforum-196747: Short-term effects of *Opuntia dillenii* fruit-derived products consumption on plasma antioxidant capacity in healthy adults: A pilot study

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Introduction: Oxidative stress is involved in the pathogenesis of several chronic diseases and may be attenuated through the intake of dietary antioxidants. Fruits of *Opuntia dillenii* (prickly pear) have demonstrated antioxidant properties in preclinical studies; however, evidence in humans remains scarce. **Methods**: This pilot study aimed to assess the short-term effects of *O. dillenii* fruit-derived products on plasma antioxidant capacity in healthy adults. Six participants were randomly allocated into three groups (n = 2 per group) and consumed for 30 days either dehydrated fruit powder (15 or 30 g/day) or fruit juice (250 mL/day). Plasma antioxidant capacity was evaluated before and after the intervention using TEAC and ORAC assays. Additionally, total phenolic content, total betalain content, and antioxidant capacity (TEAC and ORAC) were determined in the tested products. **Results and Discussion**: Post-intervention, plasma TEAC values increased significantly in the groups consuming 15 g/day of fruit powder (+16.9%) and juice (+14.2%), whereas the 30 g/day fruit powder group showed a non-significant increase (+7.1%). Interestingly, only the juice group exhibited a significant increase in ORAC values (+51.1%). Based on the estimated daily intake, the juice provided a higher antioxidant load than the powder formulations, supplying higher amounts of phenolic compounds (178 *vs.* 57.1-114.2 mg/day), betalains (43.3 *vs.* 24.9-49.8 mg/day), and antioxidant capacity, as determined by TEAC (592 *vs.* 81.2-163.5 µmol Trolox equivalents/day) and ORAC assays (6330 *vs.* 1608.5-3212.9 µmol Trolox equivalents/day). This higher antioxidant load may partly explain the stronger response observed following juice consumption, whereas the lack of response in the 30 g/day powder group may could be attributable to individual participant characteristics. **Conclusions**: These preliminary findings suggest that short-term consumption of *O. dillenii* fruit-derived products may enhance plasma antioxidant capacity, with fruit juice showing the most pronounced effects. Further studies in larger populations are warranted to confirm these results.



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Sciforum-196784: Impact of Beetroot Stem Fl1our as a Functional Ingredient in Fresh Gluten-Free Pasta: Valorization of Agro-Industrial By-Products

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The growing demand for functional foods and the need to reduce agri-food waste have encouraged the use of natural ingredients derived from agro-industrial by-products, promoting the circular economy and the development of foods with enhanced nutritional and technological properties. This study aimed to evaluate the effect of incorporating beetroot stem flour (BSF) at concentrations of 1% (R1%) and 3% (R3%), compared with a control sample (CNT) without BSF, on pH, color parameters, and antioxidant activity (DPPH) of fresh gluten-free pasta. The results showed that BSF incorporation did not significantly affect pH, with values of 6.48 ± 0.08 for CNT, 6.38 ± 0.04 for R1%, and 6.31 ± 0.06 for R3%, although a slight decrease was observed as the BSF concentration increased. Lightness (L*) decreased from 75.26 ± 0.17 in CNT to 42.87 ± 1.30 in R1% and 37.00 ± 1.24 in R3%, indicating progressive darkening. This was accompanied by an increase in the a* parameter, from -1.17 ± 0.48 in CNT to 29.25 ± 0.73 in R1% and 34.66 ± 0.39 in R3%, reflecting a greater intensity of red hues associated with the betalains naturally present in BSF. Likewise, the b* parameter decreased from 9.68 ± 0.55 in CNT to 1.43 ± 0.54 in R1% and 2.39 ± 0.06 in R3%, indicating a reduction in yellow tones and a shift toward red and purple coloration. The DPPH, values increased from 0.739 mmol/100 g in CNT to 1.37 mmol/100 g in R1% and 2.21 mmol/100 g in R3%. Both R1% and R3% exhibited greater free radical scavenging capacity than the control, confirming the contribution of betalains to the antioxidant potential of the pasta. In conclusion, beetroot stem flour improves the functional properties and color of fresh gluten-free pasta by enhancing its antioxidant activity and imparting a natural red coloration, highlighting its potential as an alternative to synthetic colorants. Furthermore, its use contributes to the valorization of agro-industrial by-products and supports the circular economy through the development of sustainable functional foods.



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Sciforum-196806: Optimization of rye protein hydrolysis with Flavourzyme for the obtention of hydrolysates with radical scavenging properties

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Rye is an underappreciated cereal, despite its high protein content and bioactive compounds, including polyphenols and arabinoxylans. It has been demonstrated that enzymatic hydrolysis of rye protein yields multifunctional hydrolysates with notable radical-scavenging activity and the ability to inhibit ACE and DPP-IV enzymes in vitro. Additionally, the commercial *Aspergillus oryzae* peptidase preparation known as Flavourzyme is recognized for producing bioactive hydrolysates without undesirable sensory attributes, making such hydrolysates suitable for the development of functional foods. Therefore, the objective of this study was to optimize the enzymatic hydrolysis of a rye protein isolate using Flavourzyme to maximize its antioxidant properties. The rye protein isolate was obtained using a solubilization-precipitation method, and the systems to be hydrolyzed were prepared at 10% (w/v) in phosphate buffer at pH 7.5 and sterilized prior to hydrolysis. A central composite design was used, in which the factors evaluated were hydrolysis time (2, 5, and 8 h) and the enzyme-to-protein ratio (3, 6, and 9%), with temperature and oscillatory agitation held constant at 60 °C and 130 rpm, respectively. Likewise, the output signal to be optimized was antioxidant capacity, measured using the DPPH assay. The optimization process yielded a model with a coefficient of determination (R^2) of 0.981, with optimal conditions of a 10.24% enzyme-to-protein ratio and 9.24 h of hydrolysis, achieving an antioxidant activity of 50.12 ± 0.41%, which fell within the confidence interval of the predictive model. The results obtained allow for the establishment of reproducible hydrolysis conditions that can be scaled up to production processes for the development of functional foods or nutraceuticals based on rye protein.



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Sciforum-196912: Development of Plant-Based Beverage Made of Cassava (*Manihot Esculenta)* and Sweet Potato *(Ipomoea Batatas)* Using Response Surface Methodology

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The industry of plant-based beverages (PBB) is expanding rapidly due to rising consumer demand for sustainable, ethical food options, and restrictions such as lactose intolerance and hypercholesterolemia. This study aims to optimize the production of PBB made from underutilized crops using robust experimental designs in overcoming issues with product quality and consumer acceptance. A Response Surface Methodology (RSM) was used to improve stability and sensory acceptability of PBB by testing different combinations of ingredients and processing methods. This included adjusting the amount of cassava *(Manihot esculenta)* [0.5%, 1.0%], inclusion of other root crops [0%, 0.5%], homogenization pressure [2, 20 MPa], cassava-to-water ratio [1:2, 1:5], and using flavors like sweet potato *(Ipomoea batatas)* and purple yam *(Dioscorea alata)*. The effects and correlation between the factors and responses (physicochemical and sensory properties) were evaluated using Analysis of Variance (ANOVA), diagnostic tests, equations, and model graphs. Results showed that the significant models ($p < 0.05$) are color b^* coordinate, chromaticity, sensory taste, and overall acceptability, with R^2 values from 0.7445 to 0.8769, non-significant lack-of-fit ($p > 0.05$), and adequate precision ratios of more than 4.0. While the numerical optimization using the desirability function identified optimal parameters— 1:5 dilution ratio for the extraction of cassava using water, then preparation of PBB composed of 0.5% cassava and 0.5% sweet potato (w/w), and homogenization at 20 MPa for producing consumer acceptable beverage with viscosity of 2.19- 8.39 mPa.s, 7.57-9.55 °Bx, pH of 6.40-6.56, 286.89 - 355.11 color hue values and sensory rating of *"like slightly"* to *"like moderately"*. This highlights how local crops can be used as raw materials in PBB, offering more choices for people with dietary restrictions. Future research should investigate the addition of stabilizers, nutrient strategies, and comprehensive microbiological shelf-life testing to meet commercial safety standards.



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Sciforum-197208: Contribution of bioactive compounds from walnut and almond by-products to the modulation of oxidative stress and cell survival in Caco-2 cells.

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Nut flours, byproducts of the oil industry, are an edible source for functional foods from a safe, gluten-free, sustainable, and raw material. In particular, walnut (WF) and almond (AF) flours are enriched in polyphenols and other bioactive substances that could present antioxidant and antiproliferative properties. In the present study, WF and AF phenolic profile were determined and their impact on antioxidant and cell viability has been examined through a cellular model.

Partially defatted flours by screw press were defatted, and polyphenols were extracted [MetOH 80 :H2O 20]. The total amount of polyphenols (PT) was evaluated by FOLIN-CT and the phenolic profile by UPLC-QqQ mass spectrometry. Intracellular oxidation (DCFH-DA) and cell death (Trypan Blue) were assessed as mean intensity by flow cytometry in Caco-2 cells with increasing PT doses for 24 h (WF: 17-250 µg/mL of PT; AF: 1.7-25.0 µg/mL of PT). H_2O_2 (1.5 mM, 1 h) was used as an oxidative stress model after treatments. Statistics: MLGM, (n=3). DCG post-test.

The WF major compounds found were: Quercetin pentoside isomer> Glansreginin A> Catechin>Gallic acid. Regarding AF, the major compounds were: Quinic acid> Hesperidin> Isorh-3-O-rutinoside> Epicatechin. WF exhibited a reduction in oxidation (50%), while did not compromise cell viability except at 250 µg/mL. The AF showed a 20% a decrease in oxidation and a dose-dependent increase in cell death (90%). Also, WF showed a notable attenuation of H_2O_2-induced oxidation (200%) and cell death (100%). The AF provoked a dose-dependent reduction of oxidation (200%). AF doses increased the toxicity of the oxidative model.

In conclusion, WF showed a strong preventive antioxidation response, meanwhile AF notably induce antiproliferative action, suggesting a chemoprotective potential linked to their specific phenolic profile. This study highlights the importance of analyzing the phenolic composition in correlation with the bioactivity assessment of different nut flours from a nutritional therapy perspective.



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Sciforum-197222: Multifunctional cream cheese enriched with co-encapsulated polyphenols from sweet potato waste and probiotics

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Growing consumer demand for healthy foods has increased interest in products containing polyphenols and probiotics. Polyphenols are recognized for their antioxidant properties, while probiotics provide benefits related to gut health and immune modulation. However, their incorporation into food systems requires maintaining stability, bioactivity, and sensory quality. This study developed a multifunctional cream cheese enriched with co-microencapsulated (co-ME) sweet potato waste polyphenols and the commercial probiotic strain *Lactiplantibacillus plantarum* 01 (LP01; Probiotical SpA, Novara, Italy), aiming to provide antioxidant and probiotic properties while promoting agro-industrial waste valorization. Cream cheese formulations containing 2.5% (F1), 5% (F2), and 10% (F3) (w/w) co-ME were prepared. Microcapsules were obtained by spray drying sweet potato waste phenolic extract and LP01 using a maltodextrin:cheese whey (1:1; 20% w/v) carrier system. Functional (total polyphenols, anthocyanins, antioxidant capacity by FRAP and ABTS, and probiotic viability), physicochemical (pH, acidity, syneresis, fat, and protein), and sensory properties were evaluated. The selected formulation was further monitored during 28 days of storage at 4 °C. In all studies, formulations were compared with a control cream cheese (without co-ME). All formulations met probiotic requirements ($> 1.66 \times 10^8$ CFU/g). Total polyphenols, anthocyanins, and antioxidant capacity increased with co-ME concentration. Co-ME reduced acidity, fat, and protein contents and increased syneresis, without affecting pH. Sensory analysis identified F2 as the most acceptable formulation, closely resembling the control cheese. During storage, F2 maintained probiotic viability above the recommended level (7.38×10^7 CFU/g average). Total phenolics, anthocyanins, and FRAP values decreased over time, whereas ABTS activity increased. Compared with cream cheese containing only encapsulated polyphenols, F2 showed changes in phenolic compounds and antioxidant activity from day 14 onward, suggesting possible LP01-mediated phenolic metabolism. Co-ME containing probiotics and waste-derived polyphenols represents a promising functional ingredient for cream cheese, enhancing multifunctional properties while preserving technological and sensory quality.



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Sciforum-197377: Enriching croissants with orange peel by-product powder: Impact on FTIR fingerprint and bioactive quality

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Citrus fruits are among the most widely cultivated crops, with sweet orange accounting for about 70% of global production, exceeding 67 Mt annually. Citrus consumption is associated with health benefits, including antioxidant, anti-cancer, and anti-inflammatory effects, mainly attributed to bioactive compounds such as ascorbic acid, carotenoids, and phenolics, particularly glycosylated flavanones. However, during handling and processing, more than 30% of the fruit is discarded as peel waste. This study embraced a circular economy approach to develop a functional bakery product. Croissants were formulated by replacing wheat flour with organic, unwaxed dried orange peel powder at 0% (CTRL), 2%, 3%, 4% and 5% (w/w). The resulting products were characterized using Fourier-transform infrared spectroscopy (FTIR) combined with Principal Component Analysis (PCA), total phenolic content (TPC), total antioxidant capacity (TAC) via FRAP, ABTS, and DPPH assays, and sensory analysis.

FTIR analysis of freeze-dried orange peel revealed bands corresponding to cell wall polysaccharides, while croissant spectra were dominated by signals from wheat flour and butter. PCA of the spectral data (PC-1: 92%, PC-2: 5%) clearly discriminated CTRL from enriched formulations, with inter-group variance exceeding intra-group variance, confirming compositional differences. Orange peel addition significantly enhanced the functional properties: TPC increased up to 56.1% (45.3 g GAE eq. 100 g^{-1} dw) regarding CTRL, from the lowest concentration tested (2%), with no differences among enriched samples. The 4% enriched sample showed TAC increases of 90% (FRAP), 42.8% (ABTS), and 100% (DPPH) compared to CTRL. In all cases, taste and texture remained acceptable and well-received by consumers, supporting the incorporation of orange peel as a viable alternative. These findings demonstrate chemical composition changes and antioxidant enrichment of a butter-rich, easily oxidizable bakery product, highlighting a viable, economically and health-advantageous strategy for the valorization of bioactive secondary metabolites derived from a waste product generated in millions of tons annually.



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Sciforum-197536: Worker Bee Larvae Powder in 3D-Printed Bioinks

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Introduction

Three-dimensional food printing offers a strategic approach to reducing consumer neophobia toward edible insects by incorporating them into visually appealing, technologically advanced products that mask their origin while delivering superior nutrition and the additional appeal of being 3D printed. Integrating local crops with alternative proteins creates culturally appropriate, nutrient-dense food solutions. This study evaluates Apis mellifera simensis worker bee larvae flour as a functional ingredient in 3D printing bioinks formulated with teff and soybean flours, addressing both technological feasibility and consumer acceptance barriers. Methods: Worker bee larvae powder was characterized for particle size distribution and techno-functional properties critical for bioink formulation: water-holding capacity, water absorption capacity, oil absorption capacity, swelling power, foam stability, and gelation concentration. Bioink formulations combining bee larvae flour with teff and soybean flours were evaluated for printability and compatibility with extrusion-based 3D printing, based on rheological requirements.

Results

Particle size distribution optimal for extrusion printing was 0.250-0.355 mm (44.9%) and > 0.355 mm (42.2%), compatible with standard printing nozzles. Critical printing-relevant properties demonstrated excellent printability potential: WHC 6.00 g/g and WAC 2.42 g/g facilitated optimal dough consistency when combined with teff's water-binding capacity; OAC 2.16 g/g complemented soybean's lipid content; swelling power 5.31 g/g supported layer adhesion; foam stability of 98.15% contributed to structure formation; and gelation concentration of 28% enabled post-printing stabilization in composite formulations.

Conclusion

Worker bee larvae flour exhibits exceptional compatibility with underutilized crops, teff and soybean, for 3D printing bioink development. The combination leverages teff's gluten-free profile and mineral richness, soybean's protein complementarity, and bee larvae's superior functional properties to create printable, nutritionally enhanced bioinks. This approach addresses multiple sustainability dimensions: utilizing local agricultural resources, valorizing worker bee larvae as an alternative protein source, and enabling customized food production for vulnerable populations.



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Sciforum-197540: Worker Bee Larvae as a Novel Edible Insect – Advancing EU Novel Food Authorization

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Introduction

Edible insects offer sustainable alternatives to conventional proteins for addressing global food security. While the EU has authorized four insect species under Novel Food Regulation (EU) 2015/2283, the bee larvae, specifically European honey bee, Apis mellifera drone larvae, are under administrative processing. Meanwhile, Apis mellifera simensis, the honey bee larvae typical for Ethiopia, remain unevaluated despite their potential. This study provides a comprehensive characterization of the nutritional and bioactive profile of Apis mellifera simensis worker bee larvae.

Methods

Bee larvae flour was analyzed for proximate composition (protein, fat, carbohydrates, and fiber), energy value, color parameters (CIELab), and antioxidant activity (2,2′-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid radical (ABTS), 2,2-diphenyl-1-picrylhydrazyl radical (DPPH), ferric reducing antioxidant power (FRAP assays), total phenolic content (TPC), and reducing sugars (DNS)).

Results

Proximate composition revealed protein 35.47%, fat 25.51%, carbohydrates 26.90%, soluble fiber 0.38%, insoluble fiber 2.65%, and energy 479.09 kcal/100g. Color values were L*=43.82, a*=+6.76, b*=+25.18, c=26.06, and h=75.05. Antioxidant activities were ABTS (4.10 mg TxE/g DM), DPPH (0.32 mg TxE/g DM), FRAP (7.79 mg $FeSO_4$/g DM), with TPC (2.21 mg GAE/g DM) and reducing sugars (10.72 mg glucose/g DM).

Conclusion

Bee larvae flour demonstrates exceptional nutritional density, significant antioxidant potential, and superior techno-functional properties comparable to EU-authorized insect species. These comprehensive characterization data provide essential scientific evidence to support novel food authorization applications to EFSA, positioning A. mellifera simensis as a promising candidate for expanding the EU's sustainable protein portfolio.



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Sciforum-197541: Exploring *Poncirus trifoliata* Fruits as a Source of Natural Antioxidants: Influence of Ripening Stage

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Introduction

Poncirus trifoliata (L.) Raf. (Rutaceae), known as trifoliate orange, is a deciduous species characterized by small yellow-orange fruits, closely related to *Citrus* species. The fruits are traditionally employed in the preparation of jams, beverages and as herbal remedies in some Asian countries. **Recently**, *P. trifoliata* has attracted scientific interest because of its phytochemical profile including phenolic acids, flavonoids, coumarins, limonoids and essential oils. These phytochemicals have been associated with several biological activities, such as antioxidant, anti-inflammatory, antimicrobial and anticancer effects. **The novelty of this study is the comparative investigation of immature and mature *P. trifoliata* fruits, providing new insights into the influence of fruit maturity on phytochemical composition and bioactive properties while supporting their sustainable reuse as agro-industrial by-products.**

Methods

The peel of immature and mature fruits of *P. trifoliata* has been exhaustively extracted by maceration using ethanol as solvent. The antioxidant activity was assessed by applying different *in vitro* tests including DPPH, ABTS, FRAP and b-carotene bleaching assays and results were analysed in relation to **the total phenol content (TPC) and total flavonoid content (TFC).**

Results and Discussion

The total phenolic and flavonoid contents were found to be slightly higher in **mature** fruits (106.7 mg chlorogenic acid equivalents/g and 37.3 mg quercetin equivalents/g, respectively) compared to **immature** fruits (100.3 mg/g and 33.0 mg/g). The results showed that both **immature** peel (FA) and **mature** peel (FM) extracts of *P. trifoliata* possess significant antioxidant potential. The FM extract exhibited stronger activity in the DPPH and b-carotene bleaching tests. Conversely, the FA extract showed higher efficacy in the ABTS test and a greater FRAP value (17.20 μM Fe(II)/g) compared to the FM extract (10.90 μM Fe(II)/g).

Conclusions

These **preliminary** findings highlight the potential of *P. trifoliata* fruit by-product as a valuable source of natural antioxidants.



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Sciforum-197549: “Reformulation of ‘Longaniza de Pascua’ with *Locusta migratoria* Powder: Nutritional and Technological Evaluation”

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Edible insects are gaining increasing interest as sustainable protein sources due to their nutritional value and lower environmental impact. *Locusta migratoria* powder (LMP) is a promising ingredient for the development of innovative meat products. This study aimed to evaluate the feasibility of using *L. migratoria* powder in traditional Spanish longaniza de Pascua as a partial replacement for lean meat. The control batch (CTB) was formulated with 70% lean meat and 30% back fat, together with water, salt, and spices. LMP was incorporated at different levels [5% (B5%) and 10% (B10%)] as a replacement for lean meat, and its effects on technological properties (pH, water activity (aw), color, texture profile analysis (TPA), and Warner–Bratzler shear force), nutritional composition (proximate composition, mineral profile, and fatty acid profile), and sensory characteristics were evaluated using 50 untrained panelists. Significant differences among treatments were determined by analysis of variance (ANOVA) followed by Tukey’s test ($p < 0.05$). Fat content was significantly reduced, particularly in B10%. The reformulated products were also darker and exhibited greater cohesiveness and hardness than CTB. Their fatty acid profiles showed increased proportions of linoleic and α-linolenic acids in both B5% and B10% compared with CTB. The reformulated products maintained a mineral profile comparable to that of the control, particularly for K, Mg, and P, while Na concentration decreased in a level-dependent manner. B10% received the lowest overall acceptability scores, mainly due to its color, texture, and off-flavor. The incorporation of LMP demonstrated the feasibility of this reformulation strategy, improving the nutritional profile without affecting pH, water activity, or mineral content. However, the highest inclusion level (10%) negatively affected consumer acceptance, suggesting that lower inclusion levels may provide a better balance between nutritional improvement and sensory quality.



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Sciforum-197589: The Role of UC-Associated Microbiota in Fiber Fermentation and Tolerance

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Objectives: Patients with ulcerative colitis (UC) often restrict fiber intake due to poor tolerance. Furthermore, how dietary fibers interact with dysbiotic microbiomes and whether their functional capacity is conserved remain unclear. This study aimed to determine fiber physicochemical property(ies) that dictate efficacy and tolerance in healthy and UC-associated microbiotas.

Methods: Four dietary fibers—high-methoxyl pectin (HMP), chicory inulin (ChIn), resistant maltodextrin (RMD), and wheat bran (WB)—differing in solubility, structural complexity, and fermentation rate, were evaluated. After simulated gastrointestinal digestion (INFOGEST), fibers were fermented with fecal microbiota from two healthy donors and two pediatric donors with UC. Patients were stratified into moderate (1,195 µg/g) and severe (3,000 µg/g) groups based on fecal calprotectin. Samples were incubated for 6, 12, 24, and 48 h. SCFAs, pH, and gas production were measured. The V4 region of the 16S rRNA gene was sequenced on a MiniSeq.

Results: UC-associated microbiota exhibited lower fermentation capacity, particularly under severe dysbiosis. HMP produced the highest SCFA levels at 24-48 h in moderate UC and at 48 h in severe UC. Surprisingly, the linear fructan ChIn failed to stimulate robust fermentation in the UC cohorts despite its high fermentability in healthy groups. No butyrate production was detected in severe UC. HMP in moderate UC reached SCFA concentrations comparable to those of healthy donors by 48 h, without excess gas production. HMP enriched primary fiber degraders in moderate UC (e.g., *Lachnospira*). However, as disease severity increased, butyrate-producing taxa (e.g., *Faecalibacterium*) were depleted, explaining why butyrate production was not restored.

Conclusions: Dietary fiber fermentation was modulated by disease severity and substrate structural complexity. These findings challenge the use of generalized fiber supplementation and underscore the need for stratified nutritional interventions based on disease severity.

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Sciforum-197597: Probiotics and Fermentation-Derived Metabolites: Advances in Functional Food Science

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Fermented foods and probiotics represent two interconnected yet distinct pillars of functional nutrition, both driven by microbial metabolism and the generation of health-relevant metabolites. Fermented foods rely on complex microbial consortia, comprising lactic acid bacteria, acetic acid bacteria, yeasts, and filamentous fungi, that transform raw matrices through enzymatic activities, producing organic acids, bioactive peptides, vitamins, exopolysaccharides, and postbiotic compounds. These metabolites contribute to improved sensory properties, extended shelf life, enhanced nutrient bioavailability, and the reduction of antinutritional factors, mycotoxins, and pesticide residues. Probiotics, in contrast, require strain-specific characterization, documented safety, and evidence-based health benefits, distinguishing them from the broader and more variable microbial communities found in traditional fermented foods. Recent advances in multi-omics technologies have deepened our understanding of microbial interactions, metabolic pathways, and the formation of functional metabolites during fermentation. These insights support the development of precision-fermented foods and targeted probiotic formulations capable of modulating gut microbiota, strengthening epithelial integrity, and influencing key physiological pathways involved in oxidative stress, inflammation, and metabolic regulation. Despite these promising outcomes, safety considerations remain essential. Fermentation processes may introduce microbiological hazards, biogenic amines, or antimicrobial resistance determinants if not properly controlled, highlighting the need for standardized production, rigorous microbial monitoring, and risk assessment. In any case, the integration of traditional fermentation practices with modern microbial biotechnology offers a powerful strategy for designing next-generation functional foods. By combining sustainable biotransformation, controlled microbial ecology, and clinically validated probiotic strains, it is possible to develop food products that deliver reproducible, safe, and scientifically supported health benefits.



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Sciforum-197643: Fruit Peel Wastes as Potential Sources of Functional Ingredients with Antioxidant and Antimicrobial Activities

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Food waste represents a major global environmental and economic challenge, particularly within the food processing industry, including fruit and juice manufacturing and canteens, where significant amounts of peel and pomace residues are generated annually without effective valorization. This study evaluated the potential of mango, orange, and pineapple peel wastes as sustainable sources of functional ingredients. Fruit peel samples collected from university canteens were processed into flours and subjected to Soxhlet extraction (ethanol/water, 70:30, v/v), followed by concentration under reduced pressure. Antioxidant activity was assessed using DPPH and FRAP assays, while free sugars, organic acids, and phenolic compounds were characterized by HPLC-RI-PDA. Antimicrobial activity against *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli*, and *Pseudomonas aeruginosa* was evaluated using agar diffusion and broth microdilution methods. Statistical analysis was performed by one-way ANOVA followed by Tukey's HSD test ($p < 0.05$). The results demonstrated a clear relationship between phytochemical composition and bioactivity. Mango peel extract showed the highest antioxidant capacity, associated with higher levels of phenolic compounds, flavonoids, and organic acids, including caffeic, p-coumaric, ferulic, and ellagic acids, as well as rutin, apigenin, and myricetin and a stronger antimicrobial performance. Orange peel extract was characterized by higher levels of naringin, procyanidin, and synaptic acid, whereas pineapple peel extract showed higher kaempferol content, corresponding to moderate bioactivity. Overall, mango and pineapple peel extracts exhibited the most pronounced antimicrobial effects against all tested bacterial strains. Furthermore, the remaining biomass after extraction demonstrated potential for composting and conversion into organic fertilizer, supporting integrated waste valorization strategies. The findings indicate that fruit peel wastes from industrial processing represent promising and sustainable sources of bioactive compounds that could be explored for the development of functional ingredients for food, nutraceutical, and pharmaceutical applications, while contributing to circular economy approaches and supporting Sustainable Development Goals 2, 9, and 12.



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Sciforum-197697: Plant sterol supplementation does not inhibit intestinal cholesterol absorption in subjects with obesity

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Introduction: Plant sterols (PS) have a recognized cholesterol-lowering effect at daily doses of 1.5–3 g, but their effects in subjects with obesity remain scarcely studied. PS mainly lower cholesterol by inhibiting intestinal absorption; however, this process is already reduced in subjects with obesity, raising concerns about PS efficacy in this population. Serum sterols provide valuable information on intestinal PS and cholesterol absorption, and on endogenous cholesterol synthesis. Only one study has measured serum sterols in overweight/obesity individuals after PS supplementation (phytostanols, BMI=28.4 kg/m^2, *n*=11). **Methodology:** Randomized, double-blind, placebo-controlled, crossover clinical trial was conducted in 23 subjects with overweight/class I–III obesity and mild hypercholesterolemia (LDL $>$ 115 mg/dL) (NCT06481020). Participants received 2 g/day of PS or placebo for 8 weeks (6-week washout). Serum β-sitosterol, campesterol (PS absorption markers), lathosterol and desmosterol (cholesterol synthesis markers) were quantified at baseline and after each treatment. **Results and Discussion:** After PS supplementation, serum β-sitosterol significantly increased by 28.8% (absolute) and 36.0% (cholesterol-normalized ratio) ($p<0.05$), and campesterol by 19.5% and 31.2% (p=0.098 and p=0.0522), confirming intestinal absorption. Lathosterol and desmosterol did not change significantly ($p>0.05$), indicating the absence of compensatory cholesterol synthesis due to PS-induced inhibition of intestinal cholesterol absorption. This is consistent with the non-significant changes in serum cholesterol after PS supplementation (201.9 ± 27.6 vs. 199.3 ± 29.6 mg/dL, p= 0.499). In contrast, the previous study in overweight/obesity showed compensatory cholesterol synthesis and total cholesterol reduction after PS supplementation. These discrepancies are likely attributable to the markedly higher BMI of our study (36.4 *vs.* 28.4 kg/m^2). **Conclusions:** This is the first study evaluating PS supplementation in subjects with obesity class I–III. Cholesterol intestinal absorption was not reduced, explaining the lack of total cholesterol lowering, contrary to studies with lower-BMI individuals. Further studies are needed to confirm these findings.



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Sciforum-197707: Identification of Circulating Peptides *In Vivo* Following Amaranth Protein Isolate Ingestion

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Introduction: Hypercholesterolemia and associated cardiovascular diseases are leading causes of mortality worldwide. Certain functional foods, such as amaranth, can lower plasma cholesterol, with recent studies attributing this effect to bioactive peptides released during gastrointestinal digestion. Objective: This study aimed to evaluate the bioaccessibility of amaranth-derived peptides by identifying intact protein fragments in rat blood post-digestion. Methods: Twenty-one-day-old male Wistar rats were divided into three groups: a basal control (B, n=1); a saline control (C, n=2); and an intervention group (I, n=18) administered amaranth protein isolate via gavage at doses of 250, 375 or 500 mg protein/kg body weight. Following anesthesia, blood was collected via cardiac puncture to isolate plasma and serum, which were subsequently analyzed using liquid chromatography-mass spectrometry (LC-MS). To isolate amaranth-specific fragments, peptide sequences common to groups B and C were excluded. Results: Consequently, 16 unique peptides in plasma and 49 in serum were identified, revealing overlapping fragment profiles between the two blood fractions. Notably, the sequence ALGV stood out due to its low molecular mass and low water solubility—characteristics that favor high intestinal absorption. Furthermore, its primary sequence shares homology with known hypocholesterolemic peptides, such as IAEK and IAVP. Conclusion: Several potentially hypocholesterolemic peptides were identified in the blood of amaranth-fed rats, warranting further *in silico* and *in vitro* evaluation.



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Sciforum-197715: Management of chronic low-grade inflammation through plant sterol supplementation: A randomized trial in subjects with obesity

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Introduction: Obesity is linked to chronic low-grade inflammation. Although plant sterols (PS) can exert anti-inflammatory effects, evidence in obesity remains scarce. To date, the only trial in this population reported non-significant changes in pro-inflammatory cytokines after PS supplementation. **Methodology:** A randomized, double-blind, placebo-controlled crossover trial included 23 subjects with overweight/class I–III obesity (BMI: 36.4 ± 4.2 kg/m^2) and mild hypercholesterolemia (LDL > 115 mg/dL) (NCT06481020). Participants received 2 g/day of PS or placebo for 8 weeks (6-week washout). Inflammatory cytokines (IL-1β, IL-6, IL-8, IL-10, IL-12p70, TNF-α) and endothelial markers (ICAM-1, VCAM-1, E-selectin, endothelin-1, PAI-1, nitric oxide, fibrinogen) were measured in serum at baseline and after each treatment. Pearson and Spearman correlations with serum PS were computed. **Results and Discussion:** Endothelin-1 and fibrinogen were excluded (> 30% of patients below the detection limit or with pre-analytical issues, respectively). No significant changes ($p > 0.05$) were observed in the remaining markers after PS supplementation. However, substantial inverse correlations were found between serum PS and IL-1β, IL-12p70 and ICAM-1 (r = –0.56 to –0.37). These findings support an absorption-dependent anti-inflammatory effect of PS, consistent with inverse correlations between serum PS and IL-6 or endothelin-1 reported in normal-weight hypercholesterolemic subjects. IL-1β and IL-12p70 are mainly macrophage-derived following NLRP3 inflammasome activation and M1 polarization, processes linked to intracellular cholesterol handling and triggered by cholesterol crystals forming in sterol-rich membrane microdomains. Once absorbed, PS can incorporate into macrophage membranes, modifying these microdomains by displacing cholesterol, which may reduce IL-1β and IL-12p70 secretion. In contrast, IL-6 and IL-8 in obesity are largely adipose-tissue-derived and NF-κB-regulated, possibly explaining the absence of correlations for these cytokines. **Conclusions:** PS supplementation could exert an absorption-dependent anti-inflammatory effect in subjects with overweight or class I–III obesity. Further studies are needed to confirm these findings.



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Sciforum-197718: Effect of plant sterol supplementation on oxidative stress markers in adults with obesity

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Introduction: The effect of plant sterols (PS) on oxidative stress in subjects with obesity is uncharacterized, and evidence in non-obese subjects is heterogeneous. In hypercholesterolemic subjects, PS reduced 8-isoprostane and oxidized LDL, whereas other similar studies in the same population reported no significant changes. **Methodology:** Randomized, double-blind, placebo-controlled crossover trial (NCT06481020) in subjects with overweight or class I–III obesity and mild hypercholesterolemia (BMI: 36.4 ± 4.2 kg/m^2; LDL $>$ 115 mg/dL; *n*=23). Participants received 2 g/day PS or placebo for 8 weeks (6-week washout). Reduced and oxidized glutathione, ophthalmic acid, S-adenosylhomocysteine, S-adenosylmethionine, 3-nitrotyrosine, *o*-tyrosine, *p*-tyrosine, 8-hydroxy-2′-deoxyguanosine, malondialdehyde, 8-isoprostane, oxidized LDL, and cholesterol oxidation products (COPs), absolute and cholesterol-normalized, were quantified in serum before and after each treatment. **Results and Discussion:** Oxidized glutathione was undetectable in most participants (below the detection limit, 4.9 ng/mL, in $>$50%) and excluded. PS did not significantly affect any measured biomarker except the following. Ophthalmic acid increased *versus* baseline in both periods (placebo: +27.7%, *p*=0.006; PS: +26.6%, *p*=0.020), without between-group difference (*p*=0.857). S-adenosylhomocysteine decreased only after PS (-15.5%, *p*=0.023) despite unchanged S-adenosylmethionine, possibly reflecting a modest improvement in methylation potential, though the relevance of this isolated change remains uncertain. The cholesterol-normalized ratios of four COPs significantly decreased after PS: 7α-hydroxycholesterol (-1.8%, *p*=0.040), 5α,6α-epoxycholesterol (-2.3%, *p*=0.008), 5β,6β-epoxycholesterol (-2.4%, *p*=0.030), and cholestane-3β,5α,6β-triol (-2.6%, *p*=0.004). These ratio reductions, but not in absolute concentrations, indicate an active antioxidant effect rather than a passive consequence of cholesterol lowering, which would otherwise have reduced absolute COPs in parallel. **Conclusions:** PS may exert a mild but specific antioxidant effect on cholesterol oxidation in subjects with obesity, independently of cholesterol lowering. Although COPs are biologically relevant oxidative species, the reduction was small and its clinical significance is uncertain. Larger trials are needed to confirm these findings.



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Sciforum-197738: Bioactive Phenolic Extracts from Native Argentine Chaco Plants: Characterization and Potential Food Applications

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Native plant species from the Argentine Chaco constitute an underexplored source of bioactive phytochemicals with potential applications as functional ingredients and natural preservatives. This study characterized the phenolic composition and evaluated the antioxidant, anti-inflammatory, and antimicrobial activities of hydroalcoholic extracts obtained from native woody species and aromatic herbs. Leaves from *Celtis tala*, *Prosopis alba*, *Acacia aroma* Gillies ex Hook. & Arn, *Larrea divaricate* Cav., *Ziziphus mistol* Griseb, *Libidibia paraguariensis* (D. Parodi) G.P. Lewis, *Cercidium praecox* (Ruiz & Pav.), and *Capparis atamisquea*, together with *Rosmarinus officinalis* and *Peumus boldus*, were extracted using 70% methanol. Total phenolic compounds, flavonoids, and condensed tannins were determined by spectrophotometric assays. Individual phenolic profiles were analyzed by HPLC-DAD. Antioxidant activity was assessed using DPPH, ABTS, and FRAP assays. Anti-inflammatory activity was evaluated through lipoxygenase (LOX) inhibition, while antimicrobial activity was determined by agar disk diffusion against foodborne pathogens. Significant interspecific variability was observed in phytochemical composition and bioactivities. *L. divaricata*, *Z. mistol*, and *P. boldus* exhibited the highest phenolic contents and antioxidant capacities. HPLC-DAD analysis identified gallic acid, chlorogenic acid, syringic acid, rutin, ferulic acid, and quercetin as major constituents. Extracts from *L. divaricata* and *Z. mistol* showed the strongest LOX inhibition, with IC_{50} values lower than those of naproxen. *C. tala* demonstrated high antimicrobial activity against *Salmonella enteritidis*, whereas *A. aroma* and *C. paraguariensis* showed moderate inhibition. Strong positive correlations were found between total phenolic content and antioxidant and anti-inflammatory activities. Native species from the Argentine Chaco represent promising sources of multifunctional phytochemicals with antioxidant, anti-inflammatory, and antimicrobial properties, supporting their potential application in the development of functional foods and natural preservatives.



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Sciforum-197744: The role of plant sterols in modulating the gut microbiota: implications for health and disease

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Introduction: Plant sterols (PS) have a recognized cholesterol-lowering effect at daily doses of 1.5–3 g. Over 90% of ingested PS reaches the colon, where they interact with the gut microbiota (GM) and may exert additional health benefits. This pathway has attracted growing attention, but no systematic review has comprehensively assessed PS-induced GM modulation in different pathophysiological contexts. **Methodology:** A systematic review was conducted following PRISMA guidelines and registered in PROSPERO (CRD420261301487). PubMed, Scopus, and Web of Science were used to search original research studies evaluating the effect of PS on GM composition and function. A total of 28 preclinical and clinical studies were included, covering four pathophysiological contexts: health status, lipid metabolism dysfunction, inflammatory bowel disease (IBD) and cancer. Risk of bias was assessed using RoB 2 for clinical trials and the SYRCLE Risk of Bias tool for preclinical studies. **Results and Discussion:** In healthy models, PS exhibited prebiotic activity, enriching health-associated genera and enhancing short-chain fatty acid (SCFA) production, with GM preferentially metabolising PS over cholesterol. In lipid metabolism dysfunction, PS consistently restored microbial diversity and reduced bile salt hydrolase-producing bacteria, increasing faecal excretion of bile acid and supporting a compensatory hepatic cholesterol catabolism mechanism, which ultimately contributed to a reduction in serum total cholesterol levels. In IBD models, PS increased the abundance of SCFA-producing genera, with antibiotic depletion and faecal microbiota transplantation experiments providing direct evidence that the GM mediates the PS anti-inflammatory effects. In cancer models, PS restored GM composition, notably increasing the abundance of *Lactobacillus* and promoting SCFA-mediated antiproliferative effects. Specific taxonomic changes and their functional implications varied according to the pathophysiological context. **Conclusions:** PS exert context-dependent effects on the GM that contribute to health benefits beyond cholesterol reduction. Clinical evidence remains limited, and future trials with comprehensive multi-omics assessment are needed.



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Sciforum-197747: Exploring the effect of cricket (*Acheta domesticus*)-enriched pasta on gut microbiota after *in vitro* colonic fermentation

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Introduction: Cricket (*Acheta domesticus*) is a sustainable high-quality protein source that can be incorporated into Western diet in pasta-based products. Although cricket powder is rich in chitin, a potential prebiotic fiber, its effect on gut microbiota remains underexplored. **Methodology:** Static *in vitro* colonic fermentation was performed using the non-bioaccessible fractions from simulated gastrointestinal digestion (INFOGEST 2.0) of cricket-enriched pasta (10% *A. domesticus* powder) and durum wheat pasta, compared with a control (non-bioaccessible fraction of digested Milli-Q water). Fermentation comprising a simple medium, the non-bioaccesible fractions and a pooled fecal inoculum from three healthy donors were incubated under simulated colonic conditions (anaerobiosis, 37 °C, 85 rpm, 20 h; n=3). Bacterial DNA was extracted, the V3–V4 region of 16S rRNA was sequenced (Illumina MiSeq), and α-/β-diversity, taxonomic abundances and differential taxa (LEfSe) were analyzed using MicrobiomeAnalyst. **Results and discussion:** After fermentation, all substrates showed reduced Bacteroidota and increased Bacillota and Pseudomonadota, consistent with nutrient depletion and metabolite accumulation. Pasta supplementation significantly decreased α-diversity (observed ASVs, Shannon, Simpson) *versus* the control. β-diversity (PCoA, Bray–Curtis and UniFrac) mainly separated samples by fermentation time, with no clear separation between non-supplemented and pasta-supplemented samples after incubation (PERMANOVA, $p > 0.05$). Nevertheless, LEfSe analysis revealed that both pastas similarly increased the abundance of *Acidaminococcus* (25–33%), an amino-acid-utilizing butyrate producer, and of *Phascolarctobacterium* (acetate/propionate producer), reflecting a general substrate response rather than a cricket-specific effect. In contrast, the abundance of *Bifidobacterium* increased more markedly with cricket-enriched pasta (5% vs. 2%), consistent with its utilization of chitin and chitooligosaccharides from cricket exoskeleton as carbon sources. These shifts could be associated with enhanced short-chain fatty acid production and positive fiber-driven ecosystem modulation. **Conclusion:** Cricket-enriched pasta produced a slight but favorable gut microbiota modulation, supporting a potential prebiotic effect that requires further research.



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Sciforum-197791: Food microstructure as a modulator of the bioaccessibility and anti-inflammatory activity of bioactive compounds in pumpkin snacks enriched with thyme essential oil

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Pumpkin snacks enriched with essential oil represent promising candidates in functional foods market. The present study evaluated the bioaccessibility and anti-inflammatory activity of pumpkin snacks (Cucurbirta moschata) enriched with free (FO) and β-cyclodextrin-microencapsulated thyme essential oil (MO). Undigested snacks microstructure analysis was also performed to assess potential trends with bioactivity and bioaccessibility of bioactive compounds. Samples were subjected to an in vitro gastrointestinal digestion model (INFOGEST). Total phenolic content was determined by the Folin–Ciocalteu assay in the undigested snacks and in the gastric and intestinal digesta. The expression of IL-6 and TGF-β in the intestinal digesta was determined by RT-qPCR. The microstructure of the undigested snacks was characterized by scanning electron microscopy (SEM). Fractal dimension and lacunarity were determined from SEM images using ImageJ. Microstructural analysis showed higher lacunarity in control (C) and FO samples than in MO samples (0.514 and 0.400 vs. 0.292, respectively, at 500X magnification), indicating greater spatial heterogeneity. In contrast, MO exhibited a higher fractal dimension, reflecting a more homogeneous and structurally complex organization. Phenolic compound bioaccessibility differed significantly among treatments, reaching 141% for MO samples. The enhanced bioaccessibility observed in MO snacks may be associated with the structural modifications induced by microencapsulation, which could influence the release and protection of bioactive compounds during digestion. Intestinal digests from all formulations did not significantly increase IL-6 expression. Conversely, only FO and MO intestinal digests promoted TGF-β transcription, increasing its expression approximately 25-fold and 13-fold relative to the control, respectively, highlighting the potential anti-inflammatory properties of these thyme-enriched samples. The results demonstrate that microencapsulation improved phenolic compound bioaccessibility, while both free and microencapsulated thyme essential oil exhibited biological activity after digestion. Overall, the findings suggest that food matrix microstructure and microencapsulation play an important role in modulating the release and functionality of thyme-derived bioactive compounds during digestion.



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Sciforum-197838: The effect of fenugreek seeds addition on selected quality characteristics of hamburgers

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The incorporation of plant-derived functional ingredients into meat products has attracted increasing interest. However, information on the effects of different inclusion levels of crushed fenugreek (*Trigonella foenum-graecum* L.) seeds on the technological and sensory quality of beef hamburgers remains limited. Therefore, this study aimed to evaluate the influence of fenugreek seeds on the technological, physicochemical, textural and sensory characteristics of beef hamburgers.

Four variants of hamburgers were produced, i.e. a control one (without the addition of fenugreek seeds), and three variants of hamburgers differing in the content of fenugreek seeds, i.e. 1%, 2% and 3%. The addition of fenugreek seeds significantly reduced weight losses during refrigerated storage of raw hamburgers (from 1.02% for the control sample to 0.34% for 2% fenugreek addotion, $p < 0.05$) and during thermal processing (from 38.5% to 25.8% respectively, $p < 0.05$). No significant differences were observed in pH, water activity, thermal shrinkage or most instrumental colour parameters. Instrumental texture was only moderately affected, although cohesiveness decreased in all fortified samples, while burgers containing ≥2% fenugreek showed lower springiness, chewiness and cutting force after storage ($p < 0.05$). Sensory evaluation demonstrated that fenugreek addition increased the intensity of its characteristic aroma and flavour, whereas inclusion levels of ≥2% significantly reduced meaty flavour intensity and overall desirability (from 8.3 to 4.9 points, $p < 0.05$). In contrast, burgers containing 1% fenugreek maintained acceptable sensory quality while exhibiting improved technological performance.

These findings indicate that the effects of crushed fenugreek seeds are dose-dependent. Under the conditions of this study, the incorporation of 1% crushed fenugreek seeds provided the best balance between improved technological properties and consumer-relevant sensory quality.



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Sciforum-197848: In vitro biochemical investigation of the antioxidant, anti-inflammatory and antithrombotic bioactivities of wine extracts from Pangeo Mountain originated organic grapes with health promoting properties

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The growing demand for sustainable and natural resources has intensified interest in the valorization of bioactive-rich natural matrices within the frameworks of green chemistry and the circular economy. Wine represents a valuable yet underexploited source of bioactive compounds with considerable health-promoting and cosmetic potential. This study investigates the extraction, quantification, and functional characterization of amphiphilic (TAC) and lipophilic (TLC) compounds from red wine of the Greek variety *Mavroudi* using the Bligh-Dyer extraction method. The primary objective is to valorize the rich bioactive content of wine into high-value ingredients for functional applications, including nutraceutical and cosmetic products. Wine, originating from organically cultivated *Mavroudi* red grapes, was subjected to a conventional extraction and fractionation protocol to selectively obtain TAC and TLC fractions for further analysis. Quantitative determination of total phenolic content (TPC), total carotenoid content (TCC), and antioxidant activity (DPPH, ABTS, and FRAP assays) was carried out using UV-Vis spectrophotometry. Structural characterization of the extracted bioactives was performed by ATR-FTIR spectroscopy, revealing the presence of key amphiphilic constituents and functional groups associated with phenolics, polyphenolics, flavonoids, and polar lipids. UV-Vis spectral features further confirmed the presence of conjugated systems, indicating potential anti-UV and photoprotective applications in cosmetic formulations. Biological assays further indicated that the extracts under examination potently inhibit platelet aggregation via PAF and ADP pathways, suggesting anti-inflammatory and antithrombotic potential. Challenges related to raw material variability, bioactive stability, process scalability, and cost-effectiveness are also discussed. Overall, the findings support a circular bioeconomy approach to the valorization of natural health-promoting compounds, highlighting the potential of red wine as a rich source of functional bioactives for clean-label foods and cosmeceutical applications.



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Sciforum-197903: Characterization of bioactive peptides released during the fermentation of amaranth seeds with their endophytic bacteria

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Introduction

Increasing interest has been taken in the therapeutic potential of Bioactive Peptides (BAPs), which are released from native proteins through hydrolysis. A promising method for breaking down food proteins is fermenting high-protein grains and seeds. To date, the application of fermentation of amaranth seeds with their endophytic microorganisms to produce BAPs has not been explored. Therefore, this study aimed to characterize the peptidome of fermented amaranth seeds and evaluate the potential bioactivity of the released peptides.

Methods

Amaranth seed protein hydrolysis was performed by spontaneous fermentation at a 1:2.5 solid-liquid ratio for 72h. Extracted peptides were screened for bioactivity using *in vitro* assays, and peptidomic analysis was conducted by using LC-MS/MS.

Results and Discussion

Amaranth flour fermentation resulted in peptide enrichment below 3.5 kDa with a total protein degradation percent of 79.5%. More than 250 unique peptides were identified and tested in BIOPEP-UWM to assess their potential bioactivities. The most prevalent was the dipeptide Glu-Glu, which has been linked to neuroprotective, antihypertensive, anticancer, and antibacterial activities. Furthermore, released peptides exhibited DPPH–inhibitory activity *in vitro* with IC_{50} values of 0.96 ± 0.1 mg/mL, 1.06 ± 0.1 mg/mL, and 1.36 ± 0.1 mg/mL for peptides under 3 kDa, below 3kDa, and the whole peptide population, respectively.

Conclusions

Data show that spontaneous fermentation of amaranth seeds is an effective and reliable method for producing BAPs. The assay to test the neuroprotective and antihypertensive potential of these peptides is in progress.



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Sciforum-197965: Amino acid and fatty acid composition of two sweet tomatillo species (*Physalis gracilis* and *Physalis grisea*)

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Sweet tomatillos *Physalis gracilis* (costomate, costomatillo) and *Physalis grisea* (ground cherry) are underutilized species with potential nutritional value. This study evaluated the physicochemical properties, amino acid composition, and fatty acid profiles of ripe fruits from both species. Ripe fruits were harvested from open-field cultivation at the University Center for Biological and Agricultural Sciences (CUCBA), University of Guadalajara, in Zapopan, Jalisco, Mexico. Fruits were transported to the laboratory for physicochemical evaluation, then were frozen and freeze-dried. The resulting material was used for amino acid composition and fatty acid profile determination using standardized analytical methods. Fruits from both species showed total soluble solids content above 10° Brix, indicating high sugar levels typical of sweet fruits. Glutamine was the predominant amino acid in both species, in *P. gracilis* (4.17 g/100g DW) and *P. grisea* (4.10 g/100g DW), followed by glutamic acid (2.33 and 2.71 g/100 g DW, respectively). Essential amino acids such as leucine, valine, and lysine were present in both species, contributing to their nutritional value. Unsaturated fatty acids predominated in the lipid profile of both species. Linoleic acid, an essential fatty acid, was the major fatty acid, reaching 5.09% DW in *P. grisea* and 1.26% DW in *P. gracilis*. Polyunsaturated fatty acids accounted for 6.50% and 1.33% DW, respectively. The presence of essential amino acids and unsaturated fatty acids highlights the nutritional value of sweet tomatillos, provides novel compositional information for two understudied *Physalis* species.



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Sciforum-198062: Coffee Silverskin Extract as a Functional Ingredient for the Development of Caffeinated Gummies

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Coffee silverskin (CS), the thin tegument released during coffee bean roasting, is one of the main by-products of the coffee industry. Although traditionally considered a waste material, CS contains valuable bioactive compounds, including caffeine, making it a promising ingredient for functional foods. This study evaluated the incorporation of CS extracts at different concentrations into gummy formulations: a diluted extract (ED; 4.35 mg/g caffeine) and a concentrated extract (EC; 11.45 mg/g caffeine).

Three formulations were prepared: control (C), gummies containing diluted CS extract (ED), and gummies containing concentrated CS extract (EC). Physicochemical properties included pH, measured using a pH meter, and water activity (Aw), measured using a Novasina instrument. Texture parameters (hardness, gumminess, and resilience) were determined by Texture Profile Analysis (TPA) using a texture analyzer. Caffeine was extracted from the samples and quantified by HPLC. Statistical analyses were performed to identify significant differences among formulations ($p < 0.05$).

The primary finding was that CS extract significantly increased caffeine content in a concentration-dependent manner. No caffeine was detected in control samples, whereas ED gummies contained 1.51 ± 0.25 mg/g, corresponding to 9.79 mg per gummy (6.5 g). EC gummies showed the highest caffeine concentration, reaching 18.03 ± 1.58 mg/g, equivalent to 117.18 mg per gummy.

As secondary findings, CS extract did not significantly affect physicochemical or textural properties. pH values ranged from 5.55 to 5.58, while Aw remained between 0.819 and 0.823. Hardness ranged from 14.97 to 15.65 N, gumminess from 22,475.89 to 24,816.85, and resilience from 0.86 to 0.87, indicating that CS extract did not compromise gummy texture.

These findings demonstrate that CS extract can be successfully incorporated into gummies, increasing caffeine content while maintaining physicochemical and textural properties. Thus, CS represents a sustainable functional ingredient for valorizing coffee industry by-products and developing innovative value-added foods.



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Sciforum-198094: Drying Technology and Thermal Pre-Treatment Shape the Nutritional, Phytochemical, and Safety Profile of Wine Lees Powders from Different Grape Varieties

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Wine lees, the sediment remaining after fermentation, are the second most abundant winemaking by-product and a rich, underexploited source of proteins, phenolic compounds, B-group itamins, and yeast-derived polysaccharides. Converting this residue into stable functional powders supports circular-economy goals in the wine sector, however the choice of dehydration technology and pre-treatment may strongly influence nutritional and bioactive quality. Methods Fresh lees from three white grape varieties (Muscat Ottonel, Roze cupaj, Sauvignon Blanc) were divided into autoclaved and untreated subsets, then dehydrated by freeze-, spray-, and oven-drying. Resulting powders were characterized for proximate composition, B vitamins, amino acids, phenolic compounds, and polysaccharide molecular-weight distribution (HPLC/HR-SEC), antioxidant capacity (DPPH, FRAP, CUPRAC, TPC), and mycotoxin safety, with two-way ANOVA used to assess processing and varietal effects. Drying method was the dominant factor governing antioxidant retention: oven-drying consistently depressed DPPH, FRAP, and CUPRAC values relative to freeze- and spray- drying, which performed comparably. Autoclaving raised FRAP and CUPRAC by mobilizing bound phenolics, while reducing thermolabile B vitamins (B1, B6, B9) and free lysine via Maillard reactivity. Protein and carbohydrate content were governed primarily by grape variety rather than processing, with Sauvignon Blanc lees richest in protein and phenolics. Mycotoxin screening confirmed safety for aflatoxin B1, though zearalenone levels warrant monitoring. Conclusions Spray-drying offers a scalable alternative to freeze-drying for preserving bioactive quality, while autoclaving trades vitamin and amino acid integrity for enhanced phenolic extractability. These findings support tailored processing strategies for valorizing wine lees as functional food ingredients.

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Sciforum-198136: Valorization of underutilized okara via integrated thermal processing and microbial co-fermentation to formulate a clean-label, B_{12}-biofortified vegan mayonnaise

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Okara, a nutrient-rich soybean byproduct generated in massive volumes (14–20 million tonnes annually), remains primarily underutilized in food systems due to the rapid onset of lipoxygenase-catalyzed off-flavors ("beany," "grassy," "rancid"). This study presents an integrated circular-economy approach to valorize okara into a shelf-stable functional food by overcoming three critical barriers: lipoxygenase inactivation, clean-label emulsification, and in situ vitamin biofortification. A scalable multi-stage thermo-soaking pretreatment (0.1% NaCl soak, 60°C blanching, 90°C heating, and hot-air drying) effectively eliminated sensory off-odors and completely inactivated lipoxygenase, yielding a deodorized okara flour retaining 25.12 ± 0.33% protein (dry basis). Combining this deodorized flour (3% w/w) with soy milk created a novel, clean-label emulsifying system to serve as the structural foundation for the plant-based emulsion. Variants were subsequently subjected to microbial co-fermentation using a vitamin B-producing co-culture of *Lactiplantibacillus plantarum* (MTCC 25432, 25433, NCDC 772) and *Bacillus megaterium* NCDC 067. This integrated bioprocessing induced a porous, web-like microstructure that significantly enhanced water-holding capacity and emulsion stability (>98% oil retention under thermal-centrifugal stress). Crucially, in situ microbial biosynthesis biofortified the Honey-Mustard variant with 804.52 ± 65.1 μg/kg of vitamin B_{12} and 300.13 ± 24.5 μg/kg of vitamin B_2, **delivering 469% and 0.32%** of the adult recommended dietary allowance, respectively, per 14 g serving. Supported by comprehensive microbiological safety profiling confirming the complete absence of pathogens, this study successfully transforms an abundant industrial waste stream into a high-value, in situ biofortified plant-based emulsion with superior techno-functional and nutritional properties.



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Sciforum-198151: Optimization of Gluten-Free Vegan Bread Production Based on *Quercus pubescens* Acorn Flour

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Introduction: Producing gluten-free vegan bread presents significant technological challenges, often resulting in low specific volume, poor crumb elasticity, and limited sensory appeal due to the absence of gluten and animal-derived stabilizers. This research investigates the potential of *Quercus pubescens* acorn flour – a nutrient-dense, sustainable ingredient rich in fiber and polyphenols – as a functional component to improve the quality of specialized bakery products.

Methods: Response Surface Methodology (RSM) with a two-factor full factorial design was used to optimize the proportions of acorn flour and xanthan gum in a formulation containing chickpea flour and psyllium husks. Bread quality was evaluated by measuring specific volume, CIELAB color, and Texture Profile Analysis (TPA). Digital image analysis objectively quantified crumb porosity and pore size distribution, while sensory acceptability was assessed using a 9-point hedonic scale.

Results: Statistical analysis showed that xanthan gum significantly increased bread volume, elasticity, and porosity ($p < 0.05$). In contrast, higher concentrations of acorn flour decreased specific volume and crumb brightness (L^*) while significantly increasing firmness. No significant interaction was observed between the two factors, indicating independent effects. Multi-criteria optimization using the desirability function identified an optimal formulation with 47.1% acorn flour and 1.47% xanthan gum.

Conclusions: The results demonstrate that *Quercus pubescens* acorn flour is a viable functional ingredient for developing high-quality gluten-free vegan bread. The study shows that simultaneous optimization of multiple quality parameters using RSM is an effective strategy for creating nutritionally improved bakery products that meet consumer expectations for texture and taste.



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Sciforum-198171: Natural Solid Lipid Nanoparticles as an Emerging Platform for Vitamin E Delivery in Functional Foods

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Nanostructured delivery systems have emerged as effective strategies to improve the performance of bioactive compounds by enhancing their stability, bioavailability and controlled release. Among these systems, solid lipid nanoparticles (SLNs) represent a promising approach for the protection of lipophilic compounds, namely vitamin E (vitE). The use of naturally-based ingredients in SLNs formulation is particularly attractive for food applications, as it promotes sustainability while meeting consumer demand for clean-label products. In this context, candelilla wax (CW) and soybean lecithin (SL) were investigated as natural structuring and emulsifying agents for the development of vitE-loaded SLNs.

The aim of this study was to optimize vitE-loaded SLNs formulation, assess their physicochemical stability during storage, and evaluate vitamin E bioaccessibility following simulated gastrointestinal digestion. A Central Composite Rotatable Design (CCRD) was employed to determine the optimal CW and SL concentrations, ranging from 1.5 to 3.0% (w/w). The resulting vitE-loaded SLNs were characterized by particle size, polydispersity index (PDI), z-potential, and morphology evaluation. SLNs stability was monitored over a one-month storage period. To investigate vitE bioaccessibility and stability throughout digestion, the optimized vitE-loaded SLNs were subjected to *in vitro* digestion using the harmonized INFOGEST protocol.

The optimized vitE-loaded SLNs formulation exhibited mean particle size of approximately 220 nm, z-potential values close to -22 mV, and low PDI values (≈0.180), indicating the formation of homogeneous nanoparticle dispersions. Furthermore, the SLNs maintained their physicochemical integrity throughout one month of storage. Following digestion, vitE stability reached 2.5%, while its bioaccessibility was determined to be close to 90%.

Overall, this work demonstrates the potential of CW and SL as natural and sustainable materials for SLNs production. The developed nanoparticles showed suitable physicochemical properties, storage stability, and promising performance as delivery systems for vitE, supporting their future incorporation into functional food products.



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Sciforum-198198: Development and Evaluation of a Low Glycemic Index Nutrient Bar made with Finger Millet (*Eleusine coracana*), Kodo Millet (*Paspalum scrobiculatum*) and Kithul Palm (*Caryota urens*) Jaggery as a Natural Sweetener

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The increasing prevalence of metabolic disorders has driven demand for functional snack alternatives with low glycemic index (GI) potential. This study aimed to develop a millet-based nutrient bar using finger millet (*Eleusine coracana*), kodo millet (*Paspalum scrobiculatum*), Kithul Palm Jaggery as a natural sweetener, and locally sourced nuts and seeds. The optimized formulation was selected at a 70:30 finger millet to kodo millet ratio from five formulation trials and evaluated for proximate composition, in-vitro starch digestibility, total phenolic content (TPC), total flavonoid content (TFC) and microbiological stability. Sensory acceptability was conducted using a 9-point hedonic scale with 55 untrained panelists. The developed bar was compared with two commercial reference bars from Sri Lanka and the United Kingdom. Data in triplicates were analyzed by one-way ANOVA, followed by Tukey's HSD test ($p<0.05$). The developed bar had 433 kcal/100g energy, 13.0g/100g crude protein, 6.13±0.07% moisture, 2.50±0.14% ash, 13.50±0.14% crude fat and 64.8g/100g total carbohydrates. Crude fibre content was $<0.1\%$, possibly due to the use of refined millet. The developed bar had a higher protein content than the UK reference bar (7.0g/100g). In-vitro starch hydrolysis indicated a delayed digestibility peak and lower hydrolysis rate compared with commercial bars, indicating low GI potential. TFC (0.52±0.05 mg QE/g) was significantly lower than the Sri Lankan bar (1.21±0.03mg QE/g) but comparable to the UK bar (0.61±0.02mg QE/g). TPC (0.097±0.00mg GAE/g) was similar to the Sri Lankan bar but significantly lower than the UK bar (0.302±0.00mg GAE/g). Sensory evaluation revealed no significant difference in overall compared with commercial products. A 21-day shelf life was established based on microbiological stability, with total plate counts (9.4×10^2CFU/g) and yeast and mould counts (1.8×10^2CFU/g) within acceptable limits for low-moisture ready-to-eat foods. Overall, the developed nutrient bar demonstrates potential as a nutritious, consumer-acceptable and a low GI snack.



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Sciforum-198271: SUGAR-FREE CAFFEINE GUMMIES ENRICHED WITH COLLAGEN AND PECTIN

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Recently, the gummy product segment has been particularly popular. Research indicates that gummies can be an effective matrix for incorporating a variety of bioactive ingredients while maintaining attractive sensory characteristics. Caffeine, which is being widely analyzed for its potential health benefits and impact on exercise capacity, has attracted particular research interest in recent years, as has collagen, the main structural protein in the human body. The contemporary food market lacks products that combine caffeine and collagen, especially in gummy form, as available preparations typically focus on single functions. Therefore, combining both components in a single, low-sugar gel form still represents a niche market, which may indicate untapped potential for the development of this type of product.

The aim of this study was to develop and investigate the feasibility of using freeze-drying and coating as methods for preserving sugar-free gelatin-pectin gummies enriched with caffeine and collagen hydrolysate. The scope of the work included developing a recipe and preparing the gummies. Samples were freeze-dried and shellac-coated, and their water activity, mechanical properties, and color were then assessed.

Analysis of the results showed that freeze-drying reduced water activity, positively impacting the gummies' shelf life. The addition of pectin and the use of shellac coating influenced textural properties and limited color changes after freeze-drying. The developed gummies represent an innovative alternative to commercially available functional products, combining a sugar-free formulation with the addition of caffeine and collagen, and the use of modern technological processes.



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Sciforum-198333: Valorisation of oyster mushroom stems in meat formulations: Effects on physicochemical, technological and sensory properties

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Pleurotus ostreatus, commonly known as the oyster mushroom, is widely valued for its nutritional and functional properties [1]. However, mushroom processing generates considerable amounts of stems, which are often discarded despite their potential as value-added food ingredients [2,3]. This study evaluated the incorporation of oyster mushroom stem flour as a functional ingredient in beef burgers. Four formulations were prepared: a control burger (CB) and burgers containing five percent (B5%), ten percent (B10%), and twenty percent (B20%) mushroom stem flour, based on meat weight.

Physicochemical, colour, technological, and sensory properties were assessed through moisture, ash content, pH, water activity, CIELab colour parameters, cooking yield, descriptive sensory analysis, and purchase intention testing. Mushroom stem flour significantly affected the physicochemical characteristics of the burgers. Moisture content decreased progressively from 72.84 in CB to 70.20, 66.88, and 62.47 in B5%, B10%, and B20%, respectively. In contrast, ash content increased from 1.91 in the control to 2.66 in B20%, suggesting an increase in mineral constituents derived from mushroom stem flour.

A slight increase in pH was observed, while water activity remained stable across formulations. Colour parameters were also affected, particularly at the highest incorporation level, which increased lightness and yellowness while reducing redness. This resulted in a lighter and more yellow product, with a reduced characteristic beef colour. Cooking yield improved with increasing mushroom flour incorporation, rising from 70.69% in the control to 77.76%, 81.71%, and 82.97% in B5%, B10%, and B20%, respectively.

Sensory analysis showed increased mushroom-related attributes as flour incorporation increased, while undesirable attributes remained low. However, purchase intention decreased with higher substitution levels, with B5% showing the highest acceptance among enriched formulations. Overall, oyster mushroom stem flour can be successfully incorporated into beef burgers, improving technological performance and contributing to the valorisation of mushroom-processing by-products. The five percent incorporation level provided the best balance between improved cooking yield and consumer acceptance, supporting its use in more sustainable meat products.



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Sciforum-198346: Oleogel-Based W/O Emulgels as Fat Replacers in Dough Systems: Rheological and Structural Characterization

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The growing demand for healthier food options has driven the development of functional ingredients aimed at reducing saturated and/or trans fat content without compromising product quality. In this context, oleogelation has emerged as a promising strategy to structure liquid oils without altering their degree of unsaturation. More recently, the formulation of W/O emulgels has been explored, enabling a reduction in caloric content while eliminating the need for added emulsifiers. This study aimed to characterize W/O emulgels and to evaluate their applications as fat replacers in laminated doughs. Thus, emulsions containing 20 and 30 g of water/100 g were developed using oleogel as the continuous phase, structured with binary mixtures of beeswax (BW) and carnauba wax (CW) (9 g/100 g). Emulsification was carried out at 90 °C, followed by rapid cooling. Storage stability (20 °C, 15 days), interfacial tension, microstructure, and rheological properties were evaluated. The emulsions incorporated up to 99.7% of the initial water, with losses below 1% during storage. Microscopy and interfacial tension measurements revealed a significant decrease in droplet size and interfacial tension when CW content was increased, suggesting the presence of naturally occurring surface-active compounds in the waxes. Additionally, binary mixtures exhibited higher elastic moduli compared to systems structured with individual waxes. The emulgels with 6 g BW and 3 g CW/100 g (BBC), were used as a fat replacer in a standard laminated pastry dough formulation (20g fat/100g flour). Rheological and textural properties (TPA and extensibility) of the doughs were similar to those of a formulation using a commercial animal fat. These findings demonstrate the feasibility of producing stable and mechanically robust water-in-oil (W/O) emulgels without added emulsifiers, capable of mimicking the animal fat in laminated dough formulations.



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Sciforum-198382: Vitamin Composition of Fresh Young Banaba (*Lagerstroemia speciosa*) and Malunggay (*Moringa oleifera*) Leaves: A Comparative Evaluation

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Fresh young Banaba (*Lagerstroemia speciosa*) leaves may serve as a potential source of dietary micronutrients due to their reported vitamin content. This study compared the vitamin composition (e.g A, C, B1, and B2) of fresh young Banaba leaves with that of fresh malunggay (*Moringa oleifera*) leaves, a commonly consumed leafy vegetable recognized for its nutritional value. Vitamin concentrations of Banaba leaves previously quantified using High-Performance Liquid Chromatography (HPLC) were evaluated and compared with reference values for malunggay from the Philippine Food Composition Tables (PhilFCT). Nutrient adequacy and safety assessments were conducted using the Philippine Dietary Reference Intakes (PDRI) and established Tolerable Upper Intake Levels. Results showed that 100 g of fresh young Banaba leaves provided more than 100% of the Recommended Nutrient Intake (RNI) for vitamins A and B1. Vitamin B2 contributed 20.77–24.55% of the RNI, while vitamin C contributed only 2.00–2.33%. Comparative analysis indicated that Banaba leaves contained substantially higher levels of vitamins A and B1 than malunggay. In contrast, malunggay had higher concentrations of vitamins B2 and C. Safety assessment showed that the measured vitamin levels in Banaba leaves remained below established upper intake limits. These findings demonstrate distinct differences in the vitamin profiles of Banaba and malunggay leaves. While malunggay remains a richer source of vitamins B2 and C, Banaba leaves exhibit higher concentrations of vitamins A and B1, highlighting their potential as an alternative leafy plant resource for functional food development and dietary diversification.



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Sciforum-198400: Effect of Thermomechanical Extrusion on the Antioxidant Activity of Peanut Skin: An Exploratory Study

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Peanuts ranks fourth among the most cultivated oilseeds worldwide, with an annual global production of 55 Mt. Given that peanut skin (PS) accounts for about 3% of the grain's gross weight, global processing generates an estimated 1.6 Mt of this by-product. Frequently discarded or combusted, PS concentrates nearly 90% of the grain's total phenolics compounds (PCs) (90–150 mg/g), positioning them as a promising source of bioactive compounds. Thermomechanical extrusion is a sustainable technology that has been widely used to improve the nutritional and functional properties of agro-industrial by-products.

The aim of this study was to evaluate the effect of extrusion on the antioxidant activity (AA) of PS for the development of a functional ingredient. PS was processed in a co-rotating twin-screw extruder (128°C, 400 rpm). The resulting extruded peanut skin (EPS) was dried and milled. After cold defatting, free PCs were extracted from both (PS and EPS) by hydroalcoholic maceration (70%-ethanol). Bound PCs were subsequently recovered from the extraction residue by alkaline hydrolysis followed by ethyl-acetate partitioning. Total phenolic content and AA were determined using the Folin–Ciocalteu, DPPH and ABTS assays.

Extrusion reduced free PCs and AA by approximately 30–34% in EPS compared with PS. However, bound PCs increased from 0.5 to 9.3 mg gallic acid equivalents (GAE)/g sample and AA from 6.9 to 35.6 μmol Trolox equivalents/g sample in PS and EPS, respectively. These results indicate that extrusion retains nearly 70% of the free PCs while promoting structural changes—such as the release of bound phenolics from the matrix—that could plausibly influence their bioavailability, although this aspect was not assessed in the present study and warrants further investigation. Overall, extrusion represents a strategy for the valorization of PS, generating a functional ingredient with potential antioxidant applications in the food industry, thus promoting the circular economy.



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Sciforum-198405: Comparative phenolic composition of Swiss chard and spinach microgreens

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Microgreens have attracted considerable scientific and commercial interest due to their phytochemical composition, nutritional value, and desirable sensory attributes. Swiss chard (*Beta vulgaris* L. var. *cicla*) and spinach (*Spinacia oleracea* L.) are widely cultivated and appreciated for their nutritional and phytochemical characteristics, including phenolic compounds with recognized antioxidant and health-promoting properties. However, comparative information on the phenolic profiles of these species at the microgreen stage remains limited. This study aimed to compare the phenolic profiles of Swiss chard and spinach microgreens cultivated under identical indoor conditions. Seeds were sown in vermiculite-filled trays and cultivated in a walk-in growth chamber under LED lighting, a 14/10 h light/dark photoperiod, 20–25 °C, and ~60% relative humidity. Plants were irrigated with a 3:1:6 NPK nutrient solution. Spinach and Swiss chard microgreens were harvested 14 and 17 days after sowing, respectively, and their phenolic profiles were characterized by high-performance liquid chromatography coupled with diode-array detection and electrospray ionization mass spectrometry (HPLC-DAD-ESI/MS). Flavonoids constituted the predominant phenolic class in both species. Swiss chard microgreens were characterized by the predominance of vitexin derivatives, whereas spinach microgreens exhibited a phenolic profile dominated by spinacetin and patuletin derivatives. Overall, these findings revealed distinct phenolic signatures in Swiss chard and spinach microgreens, highlighting their phytochemical diversity and relevance as dietary sources of bioactive compounds.



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Sciforum-198413: Enhancing storage and thermal stability of lactic acid bacteria through electrospinning/electrospraying encapsulation

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The incorporation of probiotic microorganisms into functional foods requires the maintenance of high cell viability throughout processing and storage. However, lactic acid bacteria (LAB) frequently exhibit reduced survival under adverse environmental conditions, particularly during prolonged storage and thermal processing, limiting their functionality and effectiveness. Encapsulation techniques have therefore attracted considerable interest as a strategy to protect probiotic cells and enhance their stability. Among the various encapsulation approaches proposed to overcome these limitations, electrohydrodynamic processing has emerged as a promising technique for improving probiotic stability and facilitating their incorporation into functional food products. Electrohydrodynamic processing was applied for the encapsulation of *Lpb. plantarum*, a potential probiotic strain isolated from a Kefalonian Feta-type cheese. Different encapsulation materials, including polyvinyl alcohol (PVA) and whey protein concentrate (WPC), were evaluated, along with the effect of locust bean gum supplementation on bacterial survival. The electrohydrodynamic encapsulation process provided significant protection to *Lpb. plantarum*, with encapsulated populations remaining above 9 log CFU/g after 150 days of storage, whereas non-encapsulated cells reached 5.7 log CFU/g over the same period. Furthermore, encapsulated cells showed enhanced thermal resistance under different heat-processing conditions, maintaining viability above 7 log CFU/g. These findings demonstrate that electrohydrodynamic encapsulation effectively protected bacterial cells against storage and thermal stresses. Overall, the developed encapsulation system represents a promising approach for improving the stability of probiotic cultures and facilitating their incorporation into functional foods subjected to thermal processing and extended storage conditions.



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Sciforum-198499: Impact of fruit and vegetable enrichment on functional profile and sensory acceptance of yogurts

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Introduction: Fruit- and vegetable-enriched dairy products may enhance the nutritional and functional value of fermented foods. The objective of this study was to develop and characterize fermented yogurts enriched with fruit–vegetable combinations by evaluating their antioxidant capacity, probiotic potential and sensory acceptance compared with conventional yogurt.

Methods: Plain yogurt was prepared from whole milk supplemented with milk powder, gelatin and 3% commercial plain yogurt as the starter culture, then fermented at 37 °C for 8 h. Fruits and vegetables were washed, peeled when required, steam-cooked for up to 15 min, homogenized into purees and incorporated after fermentation. Four formulations were produced: a control yogurt (CT) and three enriched yogurts containing 15% fruit puree and 5% vegetable puree: blueberry–tomato (BT), apple–eggplant (AE) and strawberry–beetroot (SB), without added sugar. Total antioxidant capacity (TAC) was determined by ORAC (Oxygen Radical Absorbance Capacity) and TEAC (Trolox Equivalent Antioxidant Capacity), and total polyphenol content (TPC) by the Folin–Ciocalteu method in extractable and non-extractable fractions after 1, 7 and 14 days of refrigerated storage. Lactic acid bacteria (LAB) viability and sensory acceptance were evaluated using a five-point hedonic scale.

Results and Discussion: Fruit and vegetable enrichment influenced antioxidant capacity. BT showed the highest TPC, AE the highest ORAC values and SB the highest TEAC values. The non-extractable fraction accounted for 55–96% of TAC. LAB populations remained above 10^8 CFU/g throughout storage, indicating stable probiotic potential. Sensory evaluation showed significant differences in overall acceptability, with CT and AE receiving the highest ratings.

Conclusions: Fruit and vegetable incorporation enhanced yogurt antioxidant properties without compromising probiotic stability. Although enriched formulations showed slightly lower sensory acceptance than the control, none were negatively perceived by consumers. These findings support the development of fermented dairy products with enhanced functional value and potential health benefits.



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Sciforum-198539: Effect of Yacon Flour and Allulose on the Browning Index and Antioxidant Capacity of Cookies

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The combination of allulose and yacon flour (YF) in cookie formulation represents an innovative strategy to improve their nutritional profile. The aim of this study was to evaluate the effect of the partial or total replacement of wheat flour and sucrose with YF and allulose on the browning index (BI) and antioxidant capacity (AC) of the final product.

A 2^2 factorial design with a center point was applied. The factors and their levels were YF content (0-25-50% of the wheat flour content) and allulose content (20-60-100% of the sucrose content), yielding 5 formulations. For the preparation, oil, sucrose, allulose, and vanilla extract were mixed until a homogeneous blend was obtained. Then, oats, wheat flour, YF, and baking powder were incorporated. The dough was cooled at 5±1°C for 30 minutes. It was then cut into circles (26 mm diameter, 10 mm thick), which were baked at 160±1°C for 8 minutes. Subsequently, moisture content, diameter change after baking, AC, and color parameters (L*, a*, b*) were evaluated for all formulations; the latter was used to calculate the BI. Data were analyzed using ANOVA and an LSD test ($P<0.05$) to determine significant differences between means.

No significant differences were observed regarding the moisture content of the cookies, which averaged 7.63±0.63%. The cookies increased their diameter by 29-38%, with no observable trend among the formulations. The presence of allulose significantly increased both AC and BI, whereas the addition of YF significantly increased AC and reduced color parameters. The highest AC (4.23±0.13 mg Trolox/g dw) was observed in the formulation containing 100%allulose/0%YF.

The substitution of both ingredients proved technologically feasible and successfully improved the nutritional profile of the cookies without affecting their moisture or spread, with allulose having the greatest overall impact.



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Sciforum-198545: Grape Antioxidant Dietary Fibre Enhances Nrf_2-Linked Redox Protection in Rat Colonic Mucosa

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Introduction. Grape pomace combines dietary fibre with poorly extractable and bound polyphenols that can reach the large intestine as a fibre–polyphenol bioactive matrix. This study evaluated whether a 5% grape antioxidant dietary fibre (GADF) diet promotes Nrf_2-linked antioxidant remodelling in proximal and distal rat colonic mucosa.
Methods. Male Wistar rats were fed a control diet with or without 5% GADF supplementation for four weeks. Proximal and distal colonic mucosa were analysed for SIRT1,p-Nrf_2 (ser40), HO-1, Cu/ZnSOD, MnSOD, catalase, GPx and GR by immunohistochemistry. In addition, protein carbonyls and lipid peroxidation were measured in cytosolic and mitochondrial mucosal fractions to determine the extent of cellular oxidative damage. Statistical comparisons were performed using Mann–Whitney U tests; percent changes are descriptive.
Results and Discussion. GADF increased p-Nrf_2 in proximal and distal mucosa by 86% and 96%, respectively ($p<0.005$), while HO-1 increased by approximately 110% in both regions (p=0.005 and p=0.02). SIRT1 also increased, supporting activation of the SIRT1/p-Nrf_2/HO-1 axis. Concurrently, Cu/ZnSOD and MnSOD decreased significantly in both segments ($p<0.01$), which may reflect reduced superoxide radical pressure, whereas catalase and GPx showed no significant changes. GR increased most markedly in distal mucosa (+114%, p=0.004), suggesting reinforcement of glutathione-dependent redox recycling. Accordingly, cytosolic oxidative damage was reduced, with lower protein carbonyls in proximal (-69%, p=0.0002) and distal mucosa (-33%, p=0.03), and reduced cytosolic lipid peroxidation in both regions (-44%, p=0.005; -32%, p=0.006). Mitochondrial damage markers showed limited changes.
Conclusions. Dietary supplementation with GADF promoted segment-specific redox remodelling in rat colonic mucosa by combining Nrf_2-linked signalling, GR-dependent recycling and preferential cytosolic protection. These findings support grape pomace-derived fibre as a sustainable functional ingredient for intestinal redox homeostasis.



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Sciforum-198548: Quantification of Anthocyanins in Red Cabbage (Brassica oleracea var. capitata f. rubra) Leaf Powder and Their Potential Implications for Neuroprotection

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Anthocyanins flavonoid pigments abundant in red cabbage (Brassica oleracea var. capitata f. rubra) exhibit potent antioxidant anti-inflammatory and neuroprotective properties relevant to Parkinson's disease pathology. However their instability during post-harvest processing limits therapeutic potential. This study evaluates drying method effects and quantifies cyanidin as a stable marker of anthocyanin content for neuroprotective relevance In red cabbage leaf powders, processed by shade drying and freeze-drying preservation.Efficiency was comparatively assessed with emphasis on neuroprotective phytochemical standardization for Parkinson's disease applications research translation context.Fresh red cabbage leaves were processed into shade-dried and freeze-dried powders Preliminary analysis showed loss of anthocyanin detectability in shade-dried samples indicating degradation.Thus freeze-dried samples were selected for quantitative analysis Anthocyanins were acid hydrolysed to convert cyanidin glycosides into cyanidin aglycone simplifying chromatographic profiling. HPLC-PDA analysis was performed using Agilent 1260 system with C18 column and gradient elution of 0.5% formic acid in water and acetonitrile at 1.0 mL/min detecting cyanidin at 520 nm across replicate measurements ensuring analytical reliability and method reproducibility for phytochemical standardization purposes.Freeze-dried samples showed consistent cyanidin levels across four replicates 8.95 9.12 8.89 and 9.07 mg/g with a mean of approximately 9.01 mg/g indicating strong reproducibility and effective preservation.In contrast shade-dried samples exhibited complete loss of detectable anthocyanins Acid hydrolysis enabled conversion of multiple glycosidic forms into a single cyanidin peak improving analytical clarity significantly enhancing precision analysis.Freeze-drying effectively preserved anthocyanins whereas shade drying caused complete degradation of neuroprotective phytochemicals in red cabbage. The quantified cyanidin supports red cabbage as a functional food candidate relevant to Parkinson's disease through modulation of oxidative stress and inflammatory pathways. The HPLC-PDA method provides robust standardization for neuroprotective nutraceutical development and research applications.



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Sciforum-198562: A Sustainable Route to Functional Food Ingredients

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The aim was to perform vegetable oil extraction using high-pressure equipment, optimizing quality and yield, and to promote the application in food products as chocolate. A project was developed for the extraction of vegetable oil from upcycled food materials, with the use of High Pressure Parr Reactor-4520, working pressure 131 psi, temperature 45°C a 60°C.. Oilseed husks from Brazilian biodiversity were used. The suggested benefits are high purity and yield of the oil, no abundant chemical solvents, preservation of antioxidants and essential fatty acids. A method with ethanol co-solvent was used, known to increase yield and facilitate the extraction of bioactive compounds, especially in more resistant oilseed materials. The separation of ethanol occurred by evaporation. This process is ideal for more delicate materials or when higher solvent yield is sought. Higher temperatures increase efficiency, but intermediate ranges (40–55°C) was ideal for maintaining quality and yield and not degrading antioxidants or aromatic compounds. The lower viscosity of ethanol at elevated temperatures facilitated penetration into the shell tissues. As a conclusion, a yield of 39.5% was obtained in the extraction of the total lipid content of the raw material, which was higher than expected. The defatted residue and oil can be reused and used for application in food formulations such as chocolate, with proven sensory acceptance.



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Sciforum-198589: Influence of sprouting conditions on compositional changes and techno-functional properties of adzuki bean (*Vigna angularis*) flours

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Germination is a biotechnological strategy capable of inducing metabolic changes that modify the chemical composition and functional properties of pulses. This study evaluated the effect of germination conditions on the compositional and techno-functional characteristics of adzuki bean (*Vigna angularis*) flours. Grains were soaked and germinated at different temperatures (20 or 25 °C) and time periods (72 or 120 h). After drying and milling, the germinated flours (GF20-72, GF20-120, GF25-72, and GF25-120) were compared with ungerminated adzuki flour (UGF). Proximate composition, α-amylase activity, reducing sugars, free amino acids, dietary fiber, phytic acid, condensed tannins, and RVA pasting properties were evaluated.

Germination promoted the mobilization of starch reserves, as evidenced by a reduction in starch content from 41 to 36 g/100 g, together with up to a 12-fold increase in α-amylase activity and a 45% increase in reducing sugars. The most pronounced effects were observed in GF25-120. These changes were associated with a marked reduction in pasting parameters. Peak viscosity decreased from 1123 cP in UGF to 460 cP in GF25-120, representing a reduction of nearly 60%. Although total protein content remained unchanged, free amino acid levels increased by up to 94%, with the highest values observed in GF25-120. In addition, germination reduced insoluble dietary fiber content by up to 30% and condensed tannin content by up to 60%, whereas phytic acid reduction was condition-dependent, with the lowest levels observed in GF20-120.

In conclusion, germination enhances the metabolic activity of adzuki beans, leading to changes in their chemical composition and the techno-functional properties of the resulting flours. The observed modifications suggest that these flours may represent promising functional ingredients with the potential to improve nutrient availability during digestion.



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Sciforum-198593: Engineering Biopolymer Hydrogels for 3D/4D Food Printing in Personalized Nutrition for Elderly Dysphagia Management

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Introduction: As the population ages, dysphagia and sarcopenia have become significant nutritional challenges. Traditional texture-modified diets often reduce sensory quality, nutrient retention, and patient acceptance. Biopolymer hydrogels, such as protein–polysaccharide composites and bigels, combined with 3D/4D printing, can help create personalized, IDDSI-compliant foods that are both safe and functional. While previous reviews have examined printability, materials science, or elderly nutrition in isolation, none have brought together hydrogel design, 4D stimulus-responsiveness, and clinical nutrition goals.

Methods: Following PRISMA 2020 guidelines, this systematic review searched ScienceDirect, Scopus, and Web of Science for peer-reviewed English articles published from January 2020 to February 2025. The search used terms related to 3D/4D food printing, hydrogels, biopolymers, and nutrition for the elderly or people with dysphagia. Grey literature and non-peer-reviewed sources were not included.

Results and Discussion: Protein–polysaccharide hydrogels and bigels can be adjusted for rheology, porosity, and phase organization, which affect printability, bolus cohesion, and oral safety. 4D systems that use biopolymers responsive to pH, temperature, or moisture, such as anthocyanin-rich purple sweet potato and pea protein blends, can change shape, texture, and color to make foods safer to swallow and more appealing. Encapsulation methods such as Pickering emulsions and bigels help protect bioactive ingredients, such as curcumin and essential oils, by enabling controlled release in the digestive system and providing antioxidant and antimicrobial benefits important for older adults. Using AI to optimize ink formulations also improves batch-to-batch consistency.

Conclusions: Combining biopolymer hydrogel engineering with 4D stimuli-responsive design offers a practical approach to creating safe, nutrient-rich, and acceptable foods for the elderly and people with dysphagia. However, there are still important gaps, such as the need for standardized IDDSI texture measurements, clinical testing in older adults, and more data on storage and transport durability. These areas should be priorities for moving these technologies into clinical use.

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Sciforum-198618: Valorization of Grape Pomace for the extraction of phenolic compounds using Natural Deep Eutectic Solvents (NaDES)

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The wine industry generates substantial amounts of grape pomace, an agro-industrial by-product rich in phenolic compounds with recognized antioxidant and health-promoting properties. The recovery of these bioactive molecules represents an attractive strategy for the sustainable valorization of winery by-products and the development of value-added ingredients. Natural deep eutectic solvents (NaDES) have emerged as promising green alternatives to conventional organic solvents. This study aimed to evaluate the effectiveness of different NaDES formulations for the extraction of phenolic compounds from white (WP) and red grape pomace (RP) collected from wineries located in the Alto Valle region of Río Negro, Argentina. Eight NaDES formulations were prepared using naturally derived components: betaine, glucose, glycerol, choline chloride, citric acid, mallic acid, and lactic acid. Extractions were carried out at 60 °C under continuous stirring for 2h using both WP RP as raw materials. The extracts obtained were characterized by determining total phenolic content (TPC) and antioxidant capacity (AC) in order to compare the extraction performance of the different solvent systems. The results demonstrated that extraction efficiency was strongly influenced by NaDES composition. RP extracts exhibited higher TPC and AC than those obtained from WP. Among the evaluated solvent systems, the combination betaine: citric acid, and betaine: mallic acid showed the highest extraction performance, yielding extracts with superior TPC (2358 ± 23 mg gallic acid equivalents (GAE)/100 g wet basis (wb)) and AC (1140 ± 33 mg GAE/ 100 g wb). Overall, NaDES-based extraction constitutes an effective and sustainable approach for the recovery of phenolic compounds from grape pomace. These findings highlight the potential of green solvents for winery waste valorization and support the development of environmentally friendly processes to obtain natural antioxidant-rich ingredients for food, nutraceutical, and pharmaceutical applications.



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Sciforum-198620: Phenolic-Enriched Extracts from Lulo (*Solanum quitoense*) Obtained by Flash Vacuum Expansion and Incorporated into Whey Protein Concentrate Hydrogels

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Lulo (*Solanum quitoense*) is a tropical fruit recognized for its high content of phenolic compounds and associated functional properties. However, these compounds are susceptible to degradation during processing and storage, limiting their application as food ingredients. The present study evaluated the use of Flash Vacuum Expansion (FVE) to enhance the recovery of phenolic compounds from lulo and their subsequent incorporation into a whey protein concentrate (WPC) hydrogel. Extracts obtained from untreated fruits and FVE-treated fruits were characterized in terms of moisture content, titratable acidity, total phenolic content, and color. Subsequently, the FVE extract was incorporated into a WPC hydrogel prepared by an emulsion-heat gelation method. FVE significantly increased the total phenolic content from 4.99 ± 0.41 to 25.08 ± 0.86 mg GAE g^{-1} dry basis, representing a fivefold increase compared with the untreated extract. In addition, the treatment modified the color characteristics of the extracts, shifting from yellow-green tones toward more orange-yellow hues, reflecting the color changes induced by FVE treatment. Following incorporation into the hydrogel, the phenolic content reached 10.33 ± 0.59 mg GAE g^{-1} dry basis. The hydrogel exhibited an intermediate yellow coloration and showed a moisture content of 77.35 ± 0.76%, water activity of 0.97 ± 0.014, and a particle size of 6.72 ± 0.90 μm. These findings demonstrate that FVE is an effective strategy for enhancing the recovery of phenolic compounds from lulo, while WPC hydrogels enable the incorporation of phenolic-rich extracts and maintain the measured physicochemical characteristics of the hydrogel. The combination of FVE and WPC hydrogel technology represents a promising approach for developing phenolic-enriched food ingredients from tropical fruits.



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Sciforum-198621: Fatty Acid Composition and Nutritional Quality of Marine Fish Species from the West African Coast

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Introduction: Fish represents an important dietary source of high-quality protein and long-chain omega-3 polyunsaturated fatty acids (PUFAs), which are associated with cardiovascular, cognitive, and metabolic health benefits. However, information regarding the lipid composition of several commercially important fish species from the West African coast remains scarce. This study aimed to characterize the fatty acid profile and nutritional quality of three marine fish species, *Ethmalosa* sp., *Priacanthus* sp., and *Caranx* sp., collected along the West African coast.

Methods: Total lipids were extracted and fatty acid methyl esters were analysed by gas chromatography with flame ionization detection (GC–FID). Individual fatty acids were quantified and grouped into saturated fatty acids (SFAs), monounsaturated fatty acids (MUFAs), and polyunsaturated fatty acids (PUFAs). Nutritional quality indices, including ω6/ω3, ARA/EPA, and EPA/DHA ratios, were also calculated.

Results and Discussion: Marked interspecific differences were observed in lipid composition. *Ethmalosa* sp. showed the highest concentration of eicosapentaenoic acid (EPA; 695.0 mg/100 g), with an EPA/DHA ratio of 3.54, indicating a particularly rich source of marine omega-3 fatty acids. *Priacanthus* sp. presented intermediate PUFA levels (11.0%) and the highest proportion of monounsaturated fatty acids (36.2%). In contrast, *Caranx* sp. exhibited the highest PUFA content (32.1%), together with the greatest concentration of docosahexaenoic acid (DHA; 476.0 mg/100 g). All species displayed favourable ω6/ω3 ratios (< 0.23), highlighting their nutritional value and potential contribution to a balanced diet.

Conclusions: The studied fish species constitute valuable dietary sources of health-promoting fatty acids, particularly EPA and DHA. These findings provide novel compositional data for underexplored West African marine resources and support their role in promoting nutritional security and sustainable food systems.



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Sciforum-198628: Advances in the design and optimization of a functional purée for sous vide processing

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Current consumer demands for healthy and convenient options have driven the development of ready-to-eat vegetable products. These cooked, vacuum-packed, and ready-to-consumer foods guarantee high organoleptic quality and food safety. This study aimed to design and optimized a bioactive compound-fortified food made from carrot (Z) and butternut squash (ZA), preserved via vacuum-cooking technology (*sous vide*). To optimize the production process, cutting type, steam cooking times, homogenization periods, and blending ratios (100:0, 75:25, 50:50, 25:75, and 0:100 % w/w Z:ZA) were evaluated. To control pH—a critical barrier against pathogenic microorganisms in vacuum-packed foods—two additive blends were tested: T1 (0.20% citric acid [AC] + 0.30% ascorbic acid [AA]) and T2 (0.15% AC + 0.15% AA + 0.15% glucono delta lactone [GDL]), against an untreated control sample (TC). A trained panel of 10 judges evaluated sensory quality (overall appearance, consistency, color, odor, and flavor). Furthermore, soluble solids (SS, °Brix) and instrumental color (Minolta CR-350, illuminant C) were determined using color parameters L* (lightness), a* (redness), and b* (yellowness). The optimized manufacturing process consisted of raw material selection, sanitization (NaClO, 150 ppm, 5 min), conditioning, slicing (1 mm), steam cooking (20 min for Z; 5 min for ZA), Z:ZA blending (25:75 % w/w), pH regulator addition, and homogenization (10 min). SS values ranged between 11.40 and 11.82 °Brix. Regarding pH, TC exhibited the highest value (5.65) and was therefore discarded. Treatment T2 proved to be optimal, stabilizing the pH at a safe level (4.31) while displaying superior color parameters and an enhanced sensory profile that successfully masked the extreme acidity of the acidulants. Consequently, this study successfully optimized the development of a microbiologically safe and sensorially acceptable Z and ZA mixed purée suitable for *sous vide* processing.



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Sciforum-198637: Optimization of the sous-vide cooking process in pumpkin and carrot puree using response surface methodology

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The current food market trend demands safe, ready-to-eat products with acceptable sensory and nutritional attributes. To meet these demands, sous-vide technology (vacuum cooking under controlled temperatures) emerges as an effective alternative to preserve food properties. This study aimed to optimize the time and temperature parameters of the sous-vide cooking process for a mixed vegetable puree using response surface methodology. The formulation consisted of a mixed puree (75% pumpkin and 25% carrot) incorporated with acidity regulators (citric acid, ascorbic acid, and glucono-delta-lactone at 0.15% each) to achieve a target pH of 4.3. The experimental design comprised 12 runs, including factorial and axial points, alongside five replicates of the central point (75°C- 37.5 min). The independent variables investigated were temperature (53.8°C–96.2°C) and processing time (5.7–60 min). The monitored response variables included pH, soluble solids (SS, °Brix), instrumental color (Minolta CR-350, illuminant C) evaluating L* (lightness), a* (redness), and b* (yellowness) parameters, ascorbic acid (AA) content (mg AA/100 g puree), total phenolic compounds (TPC, Folin-Ciocalteu), and antioxidant capacity (AC, DPPH). Additionally, a sensory evaluation was performed by a trained panel of 10 judges who assessed overall appearance, color uniformity, aroma, sour/sweet balance, overall flavor, and mouthfeel using a 9-point hedonic scale. Results indicated no significant differences ($p > 0.05$) in SS (9) and pH (4.1–4.2) among treatments. Higher L* values occurred at 60°C, whereas maximum a* values (9.3) were recorded at the central point. Treatments at 60°C exhibited greater AA retention (150 mg AA/100 g) than intense thermal treatments (90°C- 60 min and 96.2 °C- 37.5 min: ~120 mg AA/100 g). A similar trend was observed for TPC and AC. Sensory attributes showed no significant differences across treatments. Response surface methodology proved to be a robust tool for process modeling, demonstrating that moderate cooking temperatures (60°C) maximize bioactive compound retention.



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Sciforum-198714: Influence of Olive Tree Age and Interannual Variability on Nutritional and Health-Related Compounds in Verdeal Transmontana Olive Oils

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Introduction: Olive oil composition is influenced by cultivar, environmental conditions, agronomic practices, and fruit maturity. Although olive trees undergo marked physiological changes throughout their lifespan, the effect of tree age on olive oil quality remains poorly understood. This study evaluated the influence of tree age on the chemical composition and bioactive properties of olive oils from the Portuguese cultivar Verdeal Transmontana.

Material and methods: Olive oils were obtained from three age groups of olive trees: young (≤25 years), middle-aged (≤50 years), and centenarian (≥100 years), all grown under the same agronomic and environmental conditions in Mirandela (northern Portugal). Sampling was carried out over four consecutive crop years (2022-2025). Olive oils were analyzed for physicochemical quality parameters, antioxidant activity, oxidative stability, fatty acid composition, tocopherol profile, and hydroxytyrosol and tyrosol derivatives. Data were evaluated using two-way ANOVA, followed by Tukey's HSD test. PCA and LDA were applied to explore sample discrimination according to tree age and crop year.

Results: All samples complied the legal standards for extra virgin olive oil. Although significant differences were found among tree age groups, crop year had a stronger influence on most parameters. Oils from centenarian trees exhibited higher oleic acid (80.0 %), lower polyunsaturated fatty acids (3.1 %), and higher total phenolic compounds, including hydroxytyrosol derived, contributing to enhanced oxidative stability and bioactivity. In contrast, oils from younger trees showed higher polyunsaturated fatty acids (5.5 %) and tocopherol (459 mg/kg). PCA clear separated samples, mainly according to antioxidant activity, oxidative stability, tocopherols, and phenolic compounds, while LDA confirmed the discriminatory effect of tree age.

Conclusion: Olive tree age influenced the composition of cv. Verdeal Transmontana oils, but interannual variability had a greater overall impact, highlighting the predominant role of environmental conditions in olive oil quality.



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Sciforum-199986: Effects of Different Drying Methods on Bioactive Compounds and Antioxidant Capacity of Cushuro *(Nostoc sphaericum)*

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Introduction: Cushuro (*Nostoc sphaericum*) is an Andean cyanobacterium recognized for its nutritional value and its content of bioactive compounds, such as phenolic compounds, carotenoids, and chlorophylls, which are associated with antioxidant properties and potential health benefits. However, preservation processes, particularly drying, may modify the concentration and stability of these compounds. The aim of this study was to evaluate the effect of different drying methods on the content of bioactive compounds and the antioxidant capacity of cushuro.

Methodology: Three kilograms of fresh cushuro were allocated to each treatment. Four drying methods were evaluated: solar drying (S1; 27–31 °C, 2 days × 8 h/day, 08:00–16:00 h; total 16 h), oven drying (S2; 40 °C for 24 h), electric air drying (S3; 40 °C for 10 h 30 min), and microwave drying (S4; 400 W for 50 min in five 10-min cycles), with fresh cushuro as the control (S0). Chlorophylls, carotenoids, and total phenolic compounds were determined spectrophotometrically. Antioxidant capacity was evaluated using DPPH, FRAP, and ABTS assays. Results were expressed as relative percentages (%) using the maximum value for each parameter as the reference to facilitate comparison among drying treatments.

Results: Compared with the fresh sample (S0), chlorophyll content was higher in S3, reaching increases of 135.1% for chlorophyll a and 26.8% for chlorophyll b. Carotenoids also reached their highest value in S3, with a 97.4% increase compared with the control. In contrast, total phenolic compounds were highest in S4, with an increase of 1207.7%, followed by S3 with 749.3%. Regarding antioxidant capacity, S4 showed the greatest increases in the DPPH (2836.4%), FRAP (10277.1%), and ABTS (1198.3%) assays. All dried samples showed higher antioxidant activity than the fresh sample.

Conclusions: Drying methods significantly influenced the bioactive composition and antioxidant capacity of cushuro. Electric air drying favored the preservation of photosynthetic pigments, whereas microwave drying promoted higher concentrations of phenolic compounds and antioxidant activity. These findings suggest that selecting an appropriate drying method can optimize the functional properties of cushuro and enhance its potential as a value-added functional food.



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Sciforum-200157: Development of High-Fiber Functional Pasta Enriched with Oat β-Glucan, Apple Pomace, Inulin and Psyllium Husk: Technological and Sensory Evaluation

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Consumer demand for functional foods rich in dietary fiber and bioactive compounds has increased substantially due to growing awareness of the relationship between diet and health. Pasta, one of the most widely consumed cereal-based foods worldwide, represents an excellent vehicle for incorporating functional ingredients. Simultaneously, the valorization of agro-industrial by-products supports sustainable food production and circular economy strategies. Therefore, this study aimed to develop high-fiber pasta enriched with selected plant-derived fiber sources and to evaluate its technological, functional, and sensory properties.

Three formulations based on durum wheat semolina were prepared: Formulation I contained 5% oat β-glucan and 5% oat fiber, Formulation II contained 10% apple pomace and 3% inulin, and Formulation III contained 5% psyllium husk and 5% apple pomace. Functional properties of the flour blends, including water-holding capacity, water absorption index, water solubility index, swelling power, emulsifying activity and stability, foaming capacity, and oil absorption capacity, were determined. The quality of uncooked and cooked pasta was evaluated by instrumental measurements of color, texture, and cooking performance. Sensory quality was assessed by a trained panel using a 9-point hedonic scale for appearance, texture, flavor, taste, and overall acceptability. Data were analyzed using one-way analysis of variance (ANOVA), and significant differences among means were determined by Duncan's multiple range test ($p < 0.05$).

Dietary fiber type significantly affected ($p < 0.05$) the technological and sensory characteristics of pasta. Formulation I achieved the highest sensory scores and the most favorable texture after cooking, whereas Formulation III also showed satisfactory consumer acceptance despite a less homogeneous structure. Formulation II received lower sensory ratings, likely due to the darker color and characteristic flavor of apple pomace. All enriched formulations demonstrated improved water-binding capacity and functional properties compared with conventional pasta. These findings indicate that oat β-glucan, oat fiber, psyllium husk, inulin, and apple pomace are promising ingredients for developing nutritionally enhanced, sustainable pasta products.



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Sciforum-200664: Effect of Milk Thistle (Silybum marianum L.) Addition on the Quality and Nutritional Value of Rye Bread

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Effect of Milk Thistle (Silybum marianum L.) Addition on the Quality and Nutritional Value of Rye Bread

The growing consumer demand for functional foods has encouraged the development of bakery products enriched with bioactive plant materials. Milk thistle (*Silybum marianum* L.) is a valuable source of dietary fiber, protein, lipids, and silymarin, a complex of flavonolignans known for its hepatoprotective and antioxidant properties. The aim of this study was to evaluate the effect of ground milk thistle fruits on the technological quality and nutritional value of rye bread.

Commercial rye flours type 580 and 720 were supplemented with milk thistle at levels of 2, 5.5, 8, and 10% (w/w). Flour blends were analyzed for protein content, falling number, amylographic properties, and dough rheology using the Mixolab system. Rye breads were produced by the direct method and evaluated for loaf volume, crumb porosity, moisture, color, sensory quality, protein content, and total dietary fiber.

The addition of milk thistle significantly increased the protein and dietary fiber contents of both flour blends and breads. The highest protein levels were observed in samples containing 8–10% milk thistle, while dietary fiber content increased proportionally with the supplementation level. Flour type 720 produced breads with higher protein, fiber, and moisture contents, whereas type 580 breads exhibited greater loaf volume. Milk thistle supplementation had no significant adverse effect on dough rheological properties, amylographic characteristics, crumb porosity, crust and crumb color, or sensory acceptance. Although a slight reduction in loaf volume was observed at higher supplementation levels, the overall technological quality remained acceptable.

The results indicate that milk thistle can be successfully incorporated into rye bread at levels up to 10% without compromising consumer-relevant quality attributes. Such enrichment enhances the nutritional profile of bread and may contribute to the development of novel functional bakery products with added health-promoting potential.



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Sciforum-201652: Antioxidant-rich functional mini-baguette: The role of rose petal fortification and sourdough fermentation

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Rose, a member of Rosaceae family, is one of the most important commercial flower due to its economic, medicinal, and spiritual impact. The aim of this study was to develop sourdough mini-baguettes (SMBs) fortified with rose petal powder (RPP) and to examine the role of sourdough fermentation on their physical, antioxidant characteristics, as well as consumer acceptability. Particularly, four formulations were prepared: SMBs without RPP (SMB-0), SMBs with 2.5% of RPP (SMB-2.5), SMBs with 5.0% of RPP (SMB-5), and SMBs with 7.5% of RPP (SMB-7.5). The total polyphenol content ranged between 67.94 and 345.03mg GA/100g, total flavonoid content varied between 57.21 and 345.03mg GA/100g, and total anthocyanin content reached 24.32 and 63.17mg CGE/100g in fortified formulations. The highest DPPP radical scavenging activity was attested in SBM-7.5 (83.74%) in comparison with SMB-0 (9.24%). The sourdough fermentation enhanced antioxidant potential through acidification, while also interacting with technological and sensory quality. The highest acidity, ΔE, hardness, belonged to SMB-7.5. The overall acceptability results clearly showed that the addition of rose at a concentration of 7.5% caused significantly decreased overall acceptance due to astringent taste. RPP fortification may decrease the porosity, which is an important quality attribute of SMBs. Slight variations were found in baking loss parameters. The incorporation of RPP at 2.5% in SMB formulation extended the shelf-life for one day. Delays in SMBs molding and the lowest mold count in fortified SMBs are due to ability to produce a variety of antimicrobial compounds in dough during fermentation. SMBs fortified with rose exhibited promising characteristics, suggesting its potential as an aesthetic and nutritional impact on bakery products, though industrial-scale studies are still required.

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Sciforum-202171: Impact of Bean-Flour Sourdough on Technological Quality, Colour and Antioxidant Properties of Wheat-Based Bread

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Introduction: Sourdough fermentation is a useful biotechnological approach for improving the technological and functional potential of bakery products enriched with legume ingredients. Bean flour may provide additional functionality, but its influence on bread quality depends on fermentation behaviour and formulation. This study investigated the effect of bean-flour sourdough and wheat-bean flour formulations on wheat-based bread properties.

Methods: Bean flour sourdoughs were incorporated into wheat-based formulations. Doughs were fermented at 35 °C for 2 h and baked at 220 °C for 15 min. Breads were assessed for pH, baking loss, water activity, colour, aroma profile, total phenolics, reducing sugars and antioxidant properties.

Results and Discussion: The soaked-bean sourdough showed stronger acidification than the boiled-bean sourdough, with pH values of 4.59 and 5.28, respectively. Baking loss ranged from 12.36% in the control bread to 18.80% in bread prepared with the wheat–boiled bean flour blend and boiled-bean sourdough, while water activity remained high and stable (0.977-0.984). Bean-flour formulation and sourdough addition affected bread colour, especially crust lightness, which decreased to 35.51 and 34.48 in breads with wheat-boiled bean and wheat-soaked bean flour blends, respectively, compared with 50.53 in the control. Electronic-nose analysis showed that bean-flour formulation influenced the volatile profile of the breads, with the clearest differences related to sensor responses associated with nitrogen-containing compounds and sulfur- and terpene-related volatiles. Antioxidant properties were modified; in the crumb of bread prepared with the wheat-boiled bean flour blend and boiled-bean sourdough, total phenolic content reached 0.922 mg GAE/g DM in water extract and 1.387 mg GAE/g DM in ethanol extract.

Conclusions: Bean-flour sourdoughs and wheat–bean flour formulations influenced baking performance, colour, aroma profile and antioxidant properties, supporting their potential for functional wheat-based bread.



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Sciforum-202198: Valorization of Pumpkin Flesh and Peel Flours as Sustainable Ingredients for Semolina Pasta: Effects on Color and Cooking Quality

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The incorporation of plant-derived ingredients and food processing by-products into cereal products is a promising strategy for improving the sustainability of food production. Pumpkin peel, a vegetable processing by-product, and pumpkin flesh have potential as alternative ingredients for pasta manufacture. This study evaluated the effects of partially replacing durum wheat semolina with pumpkin flesh flour (10, 25, and 50%) or pumpkin peel flour (10, 20, and 30%) on the color of dough and cooked pasta, as well as on cooking quality. Pasta samples were prepared by substituting semolina with the respective pumpkin flours at different levels. Color parameters (L*, a*, b*, chroma, and hue angle) were measured using the CIELab color system, while cooking quality was evaluated by determining cooking loss. The significance level was set at $p < 0.05$. Pumpkin flour incorporation significantly ($p < 0.05$) affected the color of both dough and cooked pasta. Increasing the proportion of pumpkin flesh flour decreased lightness (L*) and increased redness (a*) and yellowness (b*), resulting in a more intense orange color with higher chroma values. Cooked pasta containing 50% pumpkin flesh flour exhibited the highest color intensity ($a^* \approx 7$; $b^* > 32$). Pumpkin peel flour also reduced lightness but produced smaller changes in redness, preserving the characteristic yellow color of semolina pasta. Cooking loss increased with increasing substitution level but remained below the acceptable quality limit of 8% for all formulations. The control sample showed the lowest cooking loss (1.29%), whereas pasta containing 50% pumpkin flesh flour exhibited the highest value (4.19%). Formulations containing up to 10% pumpkin flesh flour or 30% pumpkin peel flour maintained satisfactory cooking performance. These findings indicate that pumpkin flesh and pumpkin peel flour can be incorporated into semolina pasta to modify product color while maintaining acceptable cooking quality under the conditions evaluated. The use of pumpkin peel also represents a potential approach for the valorization of vegetable processing by-products.



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Sciforum-202224: Ursolic And Oleanolic Acid-Rich Extract From *Rosmarinus Officinalis* L.: *in vitro* and *in vivo* biological potential

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Rosmarinus officinalis L. is an aromatic plant containing ursolic (UA) and oleanolic (OA) acids, known for their anti-inflammatory activity. In this work different extracts were evaluated for their *in vitro* and *in vivo* biological potential.

The n-hexane (R-H), ethyl acetate (R-A) and water (R-W) extracts were prepared from *Rosmarinus officinalis* L. The R-A extract underwent to a double crystallization obtaining white solid crystals enriched with UA/OA. UA and OA were quantified by HPLC-DAD. The total phenolic (TPC) and flavonoid (TFC) contents were determined through spectrophotometric assays. DPPH, ABTS, FRAP, CUPRAC, MCA and PBD antioxidant assays were also performed. Enzyme inhibition was determined against AChE, BChE, tyrosinase, α-amylase, and α-glucosidase. SH-SY5Y cell viability was determined by MTT after the treatment with the R-A extract and UA/OA combination. Zymosan-induced edema formation, Zymosan-induced thermal hyperalgesia and Formalin test were applied to determine the anti-inflammatory and analgesic effects *in vivo*.

R-H showed the highest TPC, while R-A exhibited the highest TFC. The R-H extract showed the highest radical scavenging activity, while the R-W demonstrated the strongest reducing power effect. In MTT assay, R-A induced a time and concentration dependent reduction in SH-SY5Y cell viability, similarly to UA/OA combination. This indicates that UA and OA are primary contributors to the triterpene-rich fraction's activity. The R-A extract showed lower cytotoxicity, suggesting that other constituents may partially reduce UA/OA-induced toxicity. Finally, *in vivo* R-A and R-W extracts showed a significant inhibition of edema formation. The hyperalgesia induced by Zymosan was reversed in this order: R-W > R-A > R-H. R-A and R-W extracts significantly decreased the nociceptive response in the late phase of the Formalin test.

The R-A extract showed the highest TFC and analgesic and anti-inflammatory effects *in vivo*, suggesting its potential as a natural anti-inflammatory agent.



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Sciforum-202278: Effect of Convective Drying on the Bioactive Compounds and Antioxidant Activity of Honey Powder Compared with Conventional Drying Methods

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Honey powder (HP) is a value added product of growing interest to the food industry due to its versatility and improved stability. It is mainly produced by spray drying (SD) and freeze drying (FD), both relatively costly processes. However, little is known about the effects of short time convective drying (CD) on HP bioactive compounds. This study evaluated the influence of CD (6h; 60°C) on the bioactive compounds and antioxidant activity of HP and compared its performance with powders produced by SD and FD. The HP formulation was based on Rivero et al. (2021). Methanolic extracts from liquid honey (n = 3) and HP samples (n = 9; three per drying method) were prepared following Chandrakar et al. (2024) to determine total phenolic content (TPC; mg gallic acid/100 g), total flavonoid content (TFC; mg quercetin/100 g), 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity (DPPH; % radical scavenging activity), and ferric reducing antioxidant power (FRAP; mg ascorbic acid/100 g). Compared with the original honey, CD showed a significantly lower TPC (80.4 ± 2.4 vs. 103.5 ± 1.4; Dunn's test, $p < 0.05$). A similar reduction was observed for SD (70.4 ± 2.2) but not for FD (86.8 ± 2.9), with no significant differences among drying methods. Likewise, CD did not differ significantly from the original honey in TFC, FRAP, or DPPH. When the drying methods were compared, no significant differences were observed in TFC. In contrast, CD exhibited higher antioxidant activity than both FD and SD, as determined by FRAP (42.2 ± 4.4) and DPPH (10.0 ± 0.5%). These findings suggest that CD is a promising and potentially cost effective alternative for honey powder production, preserving flavonoid content and antioxidant capacity at levels comparable to SD and FD while exhibiting higher antioxidant activity than both conventional drying methods.



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Sciforum-202307: Antioxidant Capacity, Metabolite Profiles and In Silico Analysis of Purple Passion Fruit Peel Tea under Different Drying and Brewing Conditions

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The peel of purple passion fruit (*Passiflora edulis f. edulis*) is an underutilised agro-industrial by-product that holds potential for valorisation as a tea ingredient because of its phenolic compounds.This study investigated the impact of various drying and brewing procedures on the phenolic composition, antioxidant activity, and metabolite profiles of purple passion fruit peel tea, while integrating network pharmacology, molecular docking, and molecular dynamics simulations to explore its potential bioactive mechanisms. Peel samples underwent specific drying processes (oven and freeze-drying) and brewing conditions (cold and hot brew). The findings indicated that both drying and brewing conditions substantially influenced TPC, TFC, TAC, antioxidant activity, and metabolite profiles of the peel tea. Cold-brewed samples demonstrated markedly elevated TPC values (10.313 ± 0.258 to 10.795 ± 0.645 mg GAE/g sample) in contrast to hot-brewed samples. TFC, conversely, had the highest value in the freeze-dried cold-brewed sample, measuring 1.209 ± 0.007 mg QE/g sample. In relation to TAC, notable impacts were detected between the drying and brewing processes ($P < 0.05$), with findings varying from 0.409 ± 0.012 to 1.670 ± 0.094 mg/L. Both DPPH and ABTS assays demonstrated that cold-brewed samples exhibited greater free radical inhibition compared to hot-brewed samples. Metabolite profiling conducted via liquid chromatography–quadrupole time-of-flight mass spectrometry (LC–QTOF–MS) indicated the potential identification of malic acid, quercitrin, and vitexin. Three intersecting targets between *P. edulis* and oxidative stress were identified: XDH, PDE5A, and ACLY. The PPI network revealed the antioxidant-related molecular targets of *P. edulis* peel components, highlighting the five identified hub genes: NADPH oxidase 4 (NOX4), acetylcholinesterase (ACHE), xanthine dehydrogenase (XDH), prostaglandin-endoperoxidase synthase 2 (PTGS2), and tumor necrosis factor (TNF). These genes play critical roles in regulating oxidative stress and inflammatory responses. The findings underscore the significance of drying and brewing conditions in influencing the chemical composition and antioxidant qualities of purple passion fruit peel tea, offering insights on the utilisation of fruit peel by-products.



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Sciforum-202772: Development of gluten-free premixes with an improved nutritional profile: effect of Jerusalem artichoke powder on the technological quality of millet–legume blends

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Gluten-free (GF) foods are produced mainly from refined flours and starches, resulting in products with low nutritional value. The incorporation of legume flours and fiber-rich plant ingredients to improve the nutritional profile of GF products remains a technological challenge. This study evaluated the effect of incorporating a fructan-rich dried Jerusalem artichoke (*Helianthus tuberosus* L.) powder (JAP) on the techno-functional, pasting, and thermal properties of nutritionally enhanced GF premixes. Three formulations were prepared using 68% millet flour (M) as the base ingredient, 23% legume flour —pea (P), red lentil (R), or lupin (L)— and 9% JAP. The techno-functional properties of JAP and the individual flours were determined by measuring water absorption capacity (WAC), water holding capacity (WHC), oil absorption capacity (OHC), and swelling capacity (SC). Pasting properties were assessed using a Rapid Visco Analyzer, while thermal properties were evaluated by differential scanning calorimetry in millet–legume premixes with JAP (MPJAP, MRJAP, and MLJAP) and without JAP (MP, MR, and ML). Compared with the flours, JAP exhibited significantly higher WAC (6.8±0.5 g H_2O/g d.b), WHC (3.15±0.24 g H_2O/g d.b), and SC (7.5±0.2 mL/g d.b) values. The incorporation of JAP resulted in lower peak (915-1523 cP) and final viscosities (898-2110 cP), higher pasting temperatures (87.5-90 °C), and lower setback values (320-1135 cP), suggesting a reduced tendency toward amylose retrogradation. In addition, JAP modified the thermal behavior of the blends by increasing gelatinization temperatures (64-88 °C), reducing gelatinization enthalpy (0.7-7.4 J/g), and inhibiting starch retrogradation in all formulations. These findings suggest that JAP regulates water availability within the system, delaying starch gelatinization and limiting molecular reorganization. This effect is mainly attributed to fructans, although legume components may also contribute. Overall, JAP provides technological advantages for the development of gluten-free premixes with improved processing stability and the potential to produce higher-quality gluten-free products.



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Sciforum-202789: Brown onion peel as a functional ingredient: antioxidant and anti-inflammatory potential after in vitro digestion

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Onion peel is an abundant byproduct of the food industry with high content of bioactive compounds, so its valorization is of interest. In this work, the objective was to evaluate the bioaccessibility and the biological activity of breads supplemented with 7% of brown onion peel (BOP). BOP and breads (with and without the byproduct) were subjected to in vitro simulation of digestion by INFOGEST protocol, obtaining after centrifugation the bioaccessible (supernatant) and colonic (precipitate) fractions (BF and CF, respectively). BF and CF antioxidant capacity was evaluated by total phenolic content (TPC, Folin reaction) and ABTS assays. Intracellular antioxidant activity was performed by measuring reactive oxygen species (ROS) in intestinal Caco-2 cells and anti-inflammatory activity by inhibition of NO production in RAW264.7 macrophages.

BOP BF and CF exhibited high TPC (72.2 and 56.7 mgGAE/g) and ABTS [656.9 and 472.1 µmol Trolox equivalents (TE)/g] values, respectively. Regarding onion peel-enriched bread (OPEB), BF and CF showed higher TPC compared to the control bread (5.5 and 3.7 mgGAE/g, respectively, $p < 0.05$). Similarly, ABTS values were higher for OPEB (102.9 and 270.1 µmolTE/g in the respective fractions, $p < 0.05$). Cell assays were performed with concentrations of BF and CF up to 0.5 mg/mL of BOP and OPEB as no cytotoxicity was shown by MTT. Intracellular ROS levels were reduced at concentrations above 0.05 mg/mL for BOP fractions compared to AAPH control ($p < 0.05$). In the same line, OPEB showed inhibition of intracellular ROS levels compared to the AAPH control, whereas control bread showed no inhibition. Furthermore, the BF and CF of BOP and breads inhibited the production of nitric oxide when compared to LPS control ($p < 0.05$).

In conclusion, OPEB exhibited enhanced antioxidant properties and showed potential biological activity after in vitro digestion, highlighting its potential as an ingredient for the development of sustainable functional foods.



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Sciforum-202799: From the Andean Grain to the Functional Ingredient: Thermomechanical Extrusion of Amaranth for High-Value Food Applications

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Amaranth (*Amaranthus* spp.) is an Andean crop with high nutritional value, however, native flours present some functional limitations, such as low hydration capacity and high retrogradation tendency. Thermomechanical extrusion enables modification of starch and protein structures through temperature, pressure, and shear, improving physic-chemical properties. This study evaluated the effect of extrusion conditions on pre-cooked amaranth flours for potential use as food ingredients. A twin-screw extruder was used at varying temperature (110–140°C), moisture (15–30%), and screw speed (400–700 rpm). Extrudates were dried, milled, and characterized for pasting properties (RVA), water absorption (WAI) and solubility (WSI) index, and color (CIELAB). Extrusion significantly increased WAI in all samples versus native flour (225%), reaching a maximum at 30%H-140°C-400rpm (357%). It also showed the lowest WSI (4.0%), while native flour had 9.3%. Conversely, 15%H-140°C-700rpm yielded the highest WSI (11.4%). RVA profiles revealed that extruded flours developed substantially higher cold peak viscosities (1100–1179 cP) than native flour (103 cP), indicating faster hydration. Hot peak viscosity ranged from 2321 to 3204 cP, with 15%-110°C-400rpm retaining the greatest swelling capacity. Final viscosity decreased in all extruded samples, with the lowest final viscosity observed for 30%-110°C-700rpm (6984 cP), reflecting reduced starch reorganization during cooling. Color differences relative to native flour were moderate, with 30%-140°C-400rpm showing the closest match (ΔE=2.19). In conclusion, extrusion proved a versatile tool for enhancing amaranth functionality. The 30%-110°C-700rpm condition combined low retrogradation with high water absorption, suggesting potential for use in frozen foods. The 30%-140°C-400rpm maximized WAI and preserved color, indicating potential as a thickening ingredient. The 15%-140°C-700rpm maximized the WSI while maintaining a high WAI, suggesting suitability for instant beverage formulation. Extruded amaranth flours exhibited enhanced techno-functional properties, positioning them as promising ingredients for functional and gluten-free food formulations.



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Sciforum-202801: THERMAL WATER-ASSISTED PRODUCTION OF SHELL-ENRICHED FLOUR FROM NON-MARKETABLE PORTUGUESE CHESTNUTS

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Producing chestnut flour from chestnuts that fail to meet commercial calibre standards offers a dual opportunity: it valorises an otherwise discarded fraction of the harvest and enables whole-fruit processing without peeling and shell-separation, reducing processing steps and costs. This work investigates a shell-enriched chestnut flour obtained from non-marketable chestnuts cooked with thermal water, incorporating both the pericarp and pellicle. Cooking was selected for its documented capacity to reduce antinutritional compounds such as tannins via leaching and thermal degradation, as shown for other tannin-rich foods including lupin beans. Kernel and shell fractions were characterised separately, raw and after cooking in tap water and in two thermal waters (Chaves and Ourense), to establish the compositional basis for the flour formulation. Cooking with Chaves thermal water significantly increased kernel fibre content (10.75 ± 0.21 g/100 g DW) relative to raw (9.82 ± 0.26) and tap-water-cooked samples (10.32 ± 0.13; $p < 0.05$), whilst significantly reducing lipid content (2.16 ± 0.04 vs. 3.17 ± 0.05 g/100 g DW; $p < 0.05$). Shell protein content was also significantly higher after Chaves cooking (5.21 ± 0.18 g/100 g DW) than under any other condition ($p < 0.05$). Shell fibre remained within a comparable range across conditions (61–69 g/100 g DW) but was significantly reduced after thermal-water cooking relative to raw and tap-water samples ($p < 0.05$). The shell-enriched flour formulation (85% kernel, 15% shell) reflects the natural shell proportion rather than an arbitrary fortification level. Its theoretical composition across processing conditions was: moisture 4.87–9.62, protein 5.70–7.44, fat 1.97–2.78, dietary fibre 17.95–19.08, and ash 1.78–1.98 g/100 g DW. Resistant starch and antinutrient content — both expected to benefit from cooking — remain under analysis and will be presented at the conference. These findings support whole-fruit processing with thermal-water cooking as a sustainable strategy to improve nutritional quality and value while reducing waste.



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Sciforum-202961: Comparative Evaluation of the Cytotoxic Effects of Selected New Improved and Traditional Red and White Sri Lankan Rice (*Oryza sativa* L.) Varieties on Human Colorectal Cancer (Caco-2) Cells

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Sri Lankan rice, the country's staple food, is known to possess various functional properties. Despite its richness in health-promoting properties, limited studies have evaluated its anticancer activity. This study evaluated cytotoxicity of freeze dried 70% ethanolic bran extracts of 15 new improved and 11 traditional red and white Sri Lankan rice varieties (RVs) against human colorectal cancer cell line (Caco-2) using sulforhodamine-B cytotoxicity assay (n=4). Initially, all extracts were screened at 250 and 500 µg/mL at 24, 48, and 72 h incubation time periods (ITPs). Extracts showing notable cytotoxicity were further evaluated at 31.25, 62.5, 125, 250 and 500 µg/mL. The results showed significant differences ($P < 0.05$) in cytotoxic effects among the tested RVs across the screened concentrations at the investigated ITPs. Overall, red RVs exhibited significantly greater cytotoxicity than white varieties ($P < 0.05$), irrespective of whether they were traditional or new improved RVs. The EC_{50} values of red RVs ranged from 182.14 ± 2.10 to 2019.00 ± 23.31, 1.58 ± 0.01 to 615.20 ± 4.45, and 1.12 ± 0.01 to 15.92 ± 0.22 µg/mL at 24, 48, and 72 h, ITPs respectively. Among the red RVs, Goda Heeneti exhibited the highest cytotoxicity against Caco-2 cells at all ITPs. The EC_{50} values of Goda Heeneti at studied ITPs were 182.14 ± 2.10, 1.58 ± 0.01, and 1.12 ± 0.01 µg/mL, respectively. These findings suggest that Sri Lankan red rice bran especially bran of Goda Heeneti variety may serve as a promising nutraceutical source for cancer management. Further studies are warranted to identify the active compounds, elucidate the underlying mechanisms, and evaluate the efficacy through *in vivo* studies.



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Sciforum-203002: Development of Microencapsulated Probiotic Formulation using Spray Drying

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Lactiplantibacillus plantarum Lp91 (MTCC 5690), a promising probiotic strain with proven safety and efficacy in pre-clinical studies. However, orally-administered probiotics must withstand the harsh gastrointestinal environment and during food processing and storage. Spray drying serves as an efficient method for probiotic encapsulation, enhancing their stability and viability through the use of appropriate wall materials that provides protection against thermal and environmental stresses. Among various wall materials, maltodextrin is widely used due to its high glass transition temperature, which supports the formation of a stable glassy matrix. In this study, Lp91 was encapsulated using maltodextrin combined with denatured whey protein isolate (DWPI) where DWPI forms a protective protein network that shields probiotic cells from harsh processing conditions. The Lp91 was propagated in MRS broth and incubated at 37 °C for 18 h. Following incubation, cellular biomass was harvested and the cells were washed twice with sterile phosphate-buffered saline and incorporated at 10% (w/v) into the feed solution containing 10% (w/v) maltodextrin and 10% (w/v) DWPI. Encapsulation of the probiotic cells was carried out by spray drying under optimized conditions, with an inlet air temperature of 180 °C, out let air temperature of 70 °C and a feed flow rate of 1 mL/min. The obtained encapsulated powder was comprehensively characterized for physicochemical, microbial, and microstructural properties. The moisture content was 3.03±0.05%, and bulk density was 249±0.06 kg/m^3. SEM analysis showed mostly spherical particles with smooth to slightly wrinkled surfaces and absence of major fractures indicate good structural integrity and effective encapsulation. Particle size analysis revealed a unimodal distribution, predominantly between 1 and 10 µm. The survival rate of Lp91 after encapsulation was 91.1%, with a final viable population of 8.3×10^{10} CFU/g. Finally, the encapsulated probiotic formulation met all the quality criteria to be used as a nutraceutical in foods and dairy products.



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Sciforum-203008: Maillard Reaction Progression During Storage of Lactose Free Milk Powder Formulated with Maltodextrin and Ultrafiltration Permeate

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Lactose-free milk powders (LFMPs) are susceptible to the Maillard reaction during storage because enzymatic lactose hydrolysis generates reactive reducing sugars, glucose and galactose. This study evaluated storage induced Maillard reaction progression in LFMPs produced through an optimized process integrating ultrafiltration (UF), UF permeate recombination, maltodextrin addition, enzymatic lactose hydrolysis, and spray drying. Skim milk was ultrafiltered to obtain a protein-rich retentate, then recombined with UF permeate and incorporated with 5% maltodextrin before β-galactosidase-mediated lactose hydrolysis to achieve complete lactose removal (<0.1% residual lactose) and facilitate spray drying. Three formulations were prepared: control (without UF permeate recombination or maltodextrin), UF (with UF permeate recombination but without maltodextrin), and optimized (with UF permeate recombination and 5% maltodextrin). Glass transition temperature (Tg) was determined by differential scanning calorimetry, and powders were stored at 30°C for 180 days. Maillard reaction progression was monitored using furosine (early-stage marker), 5-hydroxymethylfurfural (HMF) (intermediate-stage marker), available lysine (nutritional damage marker), and carboxymethyl lysine (CML) (advanced glycation end product).

The optimized formulation exhibited a significantly higher Tg (51.30°C) than the control (28.36°C) and UF (29.92°C) formulations. Between Day 0 and Day 180, furosine increased from 201.24 to 1017.24 mg/100 g protein in the optimized formulation compared with 499.84 to 1716.32 mg/100 g protein in the control and 304.32 to 1651.45 mg/100 g protein in the UF formulation. Likewise, HMF increased from 43.53 to 79.13 μmol/L in the optimized formulation, whereas the control and UF formulations increased from 62.80 to 243.65 μmol/L and 44.51 to 242.19 μmol/L, respectively. Available lysine loss after 180 days was limited to 20.93% in the optimized formulation compared with 41.90% and 47.72% in the control and UF formulations, respectively. The optimized formulation also exhibited the lowest CML concentration (194.31 mg/kg protein). The higher Tg of the optimized formulation effectively retarded the progression of the Maillard reaction from early to advanced stages, thereby preserving the nutritional quality of lactose-free milk powder during ambient storage.



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Sciforum-203121: Autochthonous lactic acid bacteria from Gran Canaria (Canary Islands) enhance the functional properties of goat cheese via modulation of bioactive fatty acids and antioxidant capacity

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Introduction: Dairy products are an important source of antioxidant bioactive compounds. Fermentation with autochthonous lactic acid bacteria can enhance their functional properties while promoting the sustainable use of local microbial resources. **Methods**: Semi-cured raw goat milk cheeses were manufactured using five combinations of autochthonous strains of *Lactococcus lactis* and *Leuconostoc mesenteroides* (designated 1A, 1B, 2A, 2B, and 3A), together with a control cheese without starter culture. Proximate composition (moisture, protein, fat, ash, carbohydrates, and fatty acid profile) and antioxidant capacity were determined. Antioxidant activity was evaluated by TEAC and ORAC before and after *in vitro* gastrointestinal digestion (INFOGEST 2.0) to assess the effect of digestion on antioxidant potential. **Results and Discussion**: The incorporation of autochthonous lactic acid bacteria did not significantly alter the proximate composition of the cheeses or the overall fatty acid distribution (SFA, MUFA, and PUFA). However, fermentation selectively modulated minor fatty acids, reducing butyric acid (1.58–1.88 *vs.* 2.62% in the control) and increasing petroselinic acid (0.75–1.26 *vs.* 0.20%), cis-vaccenic acid (0.25–0.37 *vs.* 0.20%), and behenic acid (0.11–0.15%; not detected in the control). Simulated gastrointestinal digestion reduced antioxidant capacity by 87.7–94.9% (TEAC) and 90–94% (ORAC). Nevertheless, formulations 1B and 2A retained significantly higher TEAC values than the control (45.4 and 42.8 *vs.* 34.9 μmol TE/100 g DW, respectively), whereas formulation 1A showed a significantly higher ORAC value (562.2 *vs.* 494.1 μmol TE/100 g DW). **Conclusions**: Selected combinations of autochthonous lactic acid bacteria modulated the functional properties of goat cheese through modulation of bioactive fatty acids and antioxidant capacity. These findings support the further evaluation of these formulations in preclinical models and human studies to validate their potential for the prevention of oxidative stress-related diseases.



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Sciforum-203139: Antiglycation Activity of Plant Extracts Evaluated through the Kinetics of Advanced Glycation End Product (AGE) Formation in Model Systems and Apple Juice

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The formation of Advanced Glycation End Products (AGEs) during food processing and storage is associated with the deterioration of nutritional and sensory quality, as well as with potential adverse health effects. Plant extracts rich in phenolic compounds have emerged as promising alternatives for inhibiting glycation and non-enzymatic browning reactions. This study evaluated the antiglycation activity of optimal extracts obtained from *Neltuma ruscifolia* and *Schinus molle* by analyzing the kinetics of browning compound formation in model systems and in a real food matrix. Antiglycation activity was assessed in a BSA/glucose model system heated at 105 °C for 6 h and in apple juice stored at 40 °C for 30 days. The reaction rate (v, $\Delta A \cdot h^{-1}$) and the apparent kinetic constant (k, h^{-1}) were calculated using a pseudo-first-order kinetic model. In the BSA/glucose system, the control exhibited the highest kinetic constant (k = 0.29 h^{-1}), whereas both extracts significantly reduced the reaction rate. *Neltuma ruscifolia* showed the strongest inhibitory effect (k = 0.13 h^{-1}), followed by *Schinus molle* (k = 0.19 h^{-1}). These findings suggest inhibition of glycation and browning reactions, likely due to the antioxidant properties and reactive intermediate scavenging capacity of the phenolic compounds present in the extracts. In apple juice, kinetic constants were markedly lower because of the milder processing conditions. *Schinus molle* exhibited a slight inhibitory effect, while *Neltuma ruscifolia* showed values comparable to the control, indicating a matrix-dependent response. The results demonstrate the potential of these extracts as natural antiglycation agents, particularly in thermally processed foods, supporting their possible application as functional ingredients to reduce AGE formation.



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Sciforum-203162: Multi-Enzyme Inhibition and Anti-Inflammatory Effects of Dammar Bee Honey: An In Vitro Study

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Inflammation plays an important role in the development of many chronic diseases, creating a growing interest in natural compounds with anti-inflammatory potential. Dammar bee honey is a phytochemical rich natural product that remains largely unexplored for its therapeutic properties. The present study investigated the anti-inflammatory activity of dammar bee honey using a series of in vitro biochemical assays targeting different inflammatory pathways. The study evaluated the ability of the honey to inhibit nitric oxide production, cyclooxygenase (COX), lipoxygenase (LOX), myeloperoxidase (MPO), and protease enzymes, along with its effect on protein denaturation. Dammar bee honey showed significant inhibition of nitric oxide production in stimulated cultures (reducing nitrite levels from 70.62 ± 1.79 µg to 21.99 ± 1.47 µg at 100 µg/mL), indicating immunomodulatory activity. It also effectively inhibited COX (IC50 = 90.05 µL; 54.29% at 100 µg/mL), LOX (IC50 = 96.38 µL; 53.04% at 100 µg/mL), MPO (82.52% at 100 µg/mL), and protease (IC50 = 87.79 µL; 56.57% at 100 µg/mL) activities, suggesting strong anti-inflammatory and antioxidant potential. In addition, the honey reduced protein denaturation (IC50 = 75.72 µL; 64.93% at 100 µg/mL), demonstrating its protective effect against inflammatory protein damage. These multi-pathway inhibitory effects are likely attributable to major bioactive phenolics and flavonoids present in the honey, such as quercetin, kaempferol, apigenin, fisetin, and gallic acid, identified through phytochemical screening. The observed effects were comparable to the standard anti-inflammatory drug diclofenac in selected assays, particularly COX inhibition and protein denaturation. The findings suggest that dammar bee honey can act on multiple inflammatory pathways and may serve as a promising natural agent for the management of inflammatory conditions.



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Sciforum-203164: Prebiotic Potential of Dragon fruit (*Hylocereus costaricensis*) Peel and Pulp on *Lactobacillus acidophilus*

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Prebiotics are non-digestible food components that selectively stimulate the growth and activity of beneficial gut microbiota, thereby promoting host health. This study evaluated the prebiotic potential of *Hylocereus costaricensis* peel and pulp by assessing their effects on the functional properties of *Lactobacillus acidophilus* cultured in freshly prepared MRS broth. The control consisted of *L. acidophilus* grown without the addition of peel or pulp extracts.Autoaggregation increased in a time-dependent manner from 1 to 5 hours across all treatments. The highest autoaggregation was observed in peel-treated cells, ranging from 46.10 ± 0.46% to 80.12 ± 0.35%, followed by pulp-treated cells (32.10 ± 0.30% to 63.25 ± 0.25%), and the control (23.66 ± 0.32% to 59.10 ± 0.46%). This indicates enhanced cell-to-cell adhesion in the presence of peel extract. Similarly, peel extract demonstrated significantly higher coaggregation with *Escherichia coli* (63.02 ± 0.18%) compared with pulp (50.15 ± 0.17%) and control (42.23 ± 0.02%), suggesting improved antagonistic interaction against pathogenic bacteria.In addition, cell surface hydrophobicity was highest in peel-treated cells (61.24 ± 0.50%), indicating improved adhesion capability and probiotic potential. Autolysis was lowest in peel-treated cells (17.75 ± 0.32%), reflecting enhanced cellular stability and membrane integrity. These functional improvements collectively suggest that peel extract positively modulates probiotic behavior more effectively than pulp.Overall, *H. costaricensis* peel exhibited superior prebiotic potential compared to pulp by significantly enhancing multiple probiotic functional attributes. These findings highlight its promise as a sustainable, value-added ingredient for the development of functional foods aimed at improving gut health.



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Sciforum-203214: Proximate analysis, physicochemical and sensory acceptance of crackers formulated with underutilized Artocarpus integer rags

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Artocarpus integer L. or locally known as cempedak, is widely consumed in Malaysia but remains underutilized. The rag is commonly discarded as food waste despite its high dietary fiber content and nutritional potential. Crackers are one of the convenient and inexpensive snacks. Most commercial crackers are carbohydrate-rich and are typically considered low-value-added products. Therefore, this study aimed to determine the physicochemical properties and sensory acceptance of crackers incorporated with *Artocarpus integer L.* rag powder. Crackers were formulated by partially replacing wheat flour with *Artocarpus integer L.* rag powder at 0%, 5%, 10%, and 15% substitution levels. Physicochemical analyses included proximate composition, texture profile, and color measurement. Sensory evaluation was conducted using a 7-point hedonic scale involving 36 untrained panelists. Data were analyzed using one-way analysis of variance. The incorporation of *Artocarpus integer L.* rag powder significantly affected proximate composition and sensory attributes ($p < 0.05$), while no significant differences were observed in hardness and fracturability. Crackers containing 15% *Artocarpus integer L.* rag powder showed the highest mean ± SD (standard deviation) for ash (3.49±0.01), moisture (6.53±0.15), and crude fiber contents (89.14±7.52), respectively. Increasing substitution levels also produced darker cracker color characteristics. Sensory evaluation demonstrated significant improvements in aroma, taste, aftertaste, and overall acceptability, with the 15% formulation receiving the highest overall acceptance score. In conclusion, *Artocarpus integer L.* rag powder can be incorporated up to 15% in cracker production without compromising texture quality while improving dietary fiber content and consumer acceptance. The use of *Artocarpus integer L.* rag also promotes sustainable food production by reducing agricultural waste.



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Sciforum-203238: Harnessing Philippine Seaweeds for Nutrient-Dense Snack Development

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Introduction: Incorporating marine macroalgae into expanded starch matrices offers a sustainable strategy for functional food development, yet determining how these ingredients affect the final macronutrient profile remains critical. This study established the proximate compositional baseline of tapioca starch chips enriched with different combinations of wild-harvested Philippine seaweeds. **Methods:** Three formulations were evaluated at a fixed 3.91% dry weight inclusion rate: Formulation 1 (*Ulva* and *Sargassum*, 50:50), Formulation 2 (*Sargassum* and *Kappaphycus*, 50:50), and Formulation 3 (equal parts of *Ulva, Sargassum, and Kappaphycus*). Pulverized dehydrated seaweeds (40-mesh) were mixed into the starch matrix, steam-gelatinized (5 min), dehydrated (60 °C, 3 h), and deep-fried to induce expansion. Final product parameters were validated using standard replicated AOAC proximate analysis protocols, and energy values were determined via the Atwater conversion system. **Results and Discussion:** All formulations exhibited low final moisture levels between 3.44% and 4.28%, which is favorable for crispness and shelf stability. Formulation 1 (Ulva/Sargassum) yielded the highest crude protein content at 1.35% and a crude ash content of 5.98%, outperforming F2 (3.06% ash) and F3 (2.90% ash). While deep-frying introduced a substantial lipid profile across all variants—ranging from 16.62% in F1 to 23.23% in F3 (with F2 at 21.59%)—the carbohydrate-dense carrier matrix (66.86%–69.89%) successfully accommodated the dried seaweed powder. Caloric density was highest in F2 (477.19 kcal/100 g), followed by F3 (472.87 kcal/100 g) and F1 (434.54 kcal/100 g). **Conclusions:** A binary green-brown macroalgae blend (*Ulva/Sargassum*) enhances crude protein and ash retention while minimizing lipid uptake and total caloric density, providing practical nutritional benchmarks for developing seaweed-incorporated snack products.



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Sciforum-203239: Optimization of pectin recovery from Williams pear processing by-products through pre- and post-extraction washing treatments

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The valorization of agro-industrial by-products represents a sustainable strategy for producing high-value food ingredients. In the Argentine Norpatagonian region, the pear processing industry generates large amounts of waste that constitute an underutilized source of pectins. This study aimed to optimize pectin recovery from waste generated during the mechanical peeling of Williams pears by evaluating the effects of washing treatments applied before and after extraction on pectin yield and quality. Extraction was performed under previously optimized conditions using 2.7% (w/v) citric acid at 95°C for 70.5 min under stirring and a solid-to-liquid ratio of 1:10 (w/v). Pre-washing was performed by water immersion for 0, 5, and 15 min, whereas post-washing comprised four treatments: three successive washes with ethanol at a constant concentration of 96%, 64%, or 70%, and a separate treatment consisting of immersion in 70% ethanol for 15 min. The recovered pectins were characterized by extraction yield (Y%), galacturonic acid content (AGU), equivalent weight (EW), degree of methoxylation (DM), degree of esterification (DE), and color (L*, a*, b*). An initial water washing of 5 min significantly improved pectin recovery compared to untreated samples, resulting in a yield of 70 ± 2% and an AGU content of 54.2 ± 2.1%. When a post-extraction washing step was included, the best results were obtained with three successive washes using 70% ethanol. This treatment significantly reduced the brown coloration of the pectin (L*= 26 ± 2, a*= 2.2 ± 0.5, and b*= 10.6 ± 1.3) while preserving the pectin characteristics (60 ± 1% extraction yield, 53 ± 2% AGU, 8.2 ± 0.5% DM, 5849 ± 21 g/mol EW, and 98 ± 2% DE). Compared with untreated samples, which exhibited 50% extraction yield and 38% AGU, the incorporation of washing steps significantly improved pectin recovery, purity, lighter color and a more desirable appearance.



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Sciforum-203241: Pectooligosaccharides (POS) and Polyphenol-Rich Extracts from Agri-Food By-Products: Valorization of Cocoa (*Theobroma cacao*) Pod Husk (CPH) through Microwave-Assisted Extraction (MAE)

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Introduction. Cocoa (*Theobroma cacao*) industrial processing generates significant by-products volumes that are commonly discarded in landfills or incinerated, causing environmental issues. However, these residues, particularly cocoa pod husk (CPH), contain high-value bioactive compounds. Hence, the main objective of this work was to optimize the Microwave-Assisted Extraction (MAE) of total phenolic compounds and pectooligosaccharides (POS) from CPH.

Methods. MAE optimization was conducted via a Central Composite Design (CCD) with Response Surface Methodology (RSM) with two factors: time (2-10 min) and temperature (100-170 °C). Response variables included extraction yield (EY, %), total phenolic content (TPC, mg GAE/g dry), antioxidant activity (DPPH, µmol TE/g dry), total monosaccharides (TM, mg/g dry), and POS (mg/g dry). The measured pH and the severity factor were used to establish correlations.

Results.

All statistical models (EY, TPC, DPPH, TM, POS) were significant ($p \leq 0.005$), showing high accuracy ($R^2 > 0.9400$; R^2-adj > 0.8800) and non-significant lack-of-fit ($p > 0.05$). Temperature significantly impacted EY, TPC, DPPH ($p < 0.01$), and TM ($p < 0.05$), while time only influenced EY ($p < 0.05$). Quadratic term of temperature significantly affected TM and POS ($p < 0.01$). Positive correlations were observed between TPC and DPPH (r = 0.99), EY (r = 0.95), and severity factor (r = 0.93), while a negative correlation was found with pH (r = -0.97). Optimization maximized TPC and DPPH at 170 °C and 10 min (13.62 mg GAE/g dry and 78.37 µmol TE/g dry), while POS peaked at 138 °C and 6.7 min (36.04 mg/g dry). Multi-objective optimization simultaneously maximizing TPC and POS resulted in 158.7 °C and 8.8 min (predicted TPC: 10.7 mg GAE/g dry; POS: 30.90 mg/g dry; DPPH: 63.85 µmol TE/g dry), with individual desirabilities of 0.7092 and 0.7464, respectively.

Conclusions.

MAE optimization of CPH successfully maximized the recovery of pectooligosaccharides and polyphenols with high antioxidant activity, holding strong potential for functional foods development and industrial food applications.



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Sciforum-203268: Valorization of seabuckthorn pomace powder for production of novel brioche-style buns

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The aim of this research was to develop a novel proposal for incorporating seabuckthorn pomace powder (SPP) into bakery products and to evaluate their physical, antioxidant and sensory attributes. Four different formulations of brioche-style buns were prepared within the study. First two samples were prepared without SPP. First formulation was processed with baking yeast (BYBSB-0) and second one with sourdough (SBSB-0). SPP was used to prepare sourdough brioche-style buns with 2.5% (SBSB-2.5) and with 5.0% (SBSB-5). Results showed that baking loss was varying insignificantly between 9.83% and 9.88% for all evaluated formulations. Phenolic profile of SBSB-2.5 and SBSB-5 attested TPC of 169.87 and 345.03mg GA/100g and TFC of 108.26 and 217mg QE/100g. Total carotenoid content achieved the highest value of 35.64mg/100g in SBSB-5. Incorporation of SPP increased DPPH value till 83.21% and 79.54% in SBSB-2.5 and SBSB-5 samples, in comparison with BYBSB-0 sample of 5.23% and SBSB-0 of 7.33%. ABTS antioxidant activity had the same correlation as DPPH scavenging activity, and ABTS maximum value was achieved in SBSB-5 (70.17%). Although SPP had an effect on color characteristics of brioche-style buns. Formulation containing 5% of SPP recorded the lowest L^* index and the highest a^* and b^* indexes at 50.34, 4.18 and 39.57, respectively. BYBSB-0 sample exhibited the highest L^* index and the lowest a^* and b^* indexes, measuring 70.41, -1.23 and 26.32, respectively. SBSB-2.5 had high scores on all sensory attributes (≥8.31). Notably, SBSB-5 demonstrated a hardness value of 899.32g similar to BYBSB-0 (903.18g) and SBSB-0 (903.18g) samples. Implications of these results are significant for advancing sustainable recovery of natural bioactive compounds from SPP within the bakery industry.

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Sciforum-203320: Chia Sprouts (*Salvia hispanica* L.): Potential as a Source of Bioactive Compounds

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Chia sprouts (CS) (*Salvia hispanica* L.) constitute an emerging source of bioactive compounds with potential applications in the development of functional foods. During germination, physiological changes occur that may increase the synthesis of photosynthetic pigments and secondary metabolites with antioxidant activity. The objective of this study was to characterize CS in terms of their bioactive compounds, carotenoid content, and moisture. Sprouts were obtained from germinated seeds of the commercial brand Genser (Argentina) and cultivated for 7 days under controlled conditions: an enclosed environment with indirect natural light, ambient temperature maintained at 25 ± 1 °C, and a substrate kept constantly moist through periodic irrigation. Photosynthetic pigments were determined by acetone extraction and spectrophotometric readings at 663.2, 646.8, and 470 nm. Total phenolic compounds were quantified using the Folin–Ciocalteu method (725 nm), and results were expressed as milligrams of gallic acid equivalents (GAEq)/g of fresh tissue. Antioxidant capacity was evaluated using the DPPH method (515 nm) and expressed as mg GAEq/g of fresh tissue. Moisture content in the sprouts was 96.98 ± 1.78%. CS showed an average carotenoid content of 18.07 µg/g of fresh tissue. Total phenolic content and antioxidant capacity ranged from 116.60 to 121.95 and from 3.13 to 3.76 mg GAEq/g of fresh tissue, respectively. The results demonstrate that 7-day-old CS are a source of bioactive compounds, including phenolics and antioxidant photosynthetic pigments. The combination of these metabolites suggests strong potential for CS as a natural functional ingredient. Furthermore, CS could be used for the production of bioactive extracts intended for application in food systems, such as spraying onto minimally processed vegetables, or incorporated as functional additives in matrices like flours or purées through dehydrated CS. These approaches contribute to the development of foods with enhanced nutraceutical value and functional properties.



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Sciforum-206445: Cross-Continental Comparison of Chinese and European Producing Zones: Environmental Gradients of Nutritional Components in Naked Oats (*Avena sativa* L.)

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Naked oats feature well-balanced essential amino acids (EAAs) and high protein content, making them a valuable cereal for human nutrition. Cross-continental nutritional comparisons frequently combine hulled and naked oat genotypes, in which nutrient dilution originating from the fibrous husk can substantially mask climate-driven nutritional variation in the edible kernel. In this study, we analysed published regional-mean datasets from three representative naked-oat producing zones: Dingxi (DX-N) and Baicheng (BC-N) in China, and Poland (PO-N) ($n = 3$), representing three aggregated geographical points with contrasting climatic backgrounds. Hulled oat entries were included solely as an informative genotypic reference rather than a strict experimental control for environmental comparisons. Linear regression was applied to quantify the responses of crude protein, crude fat, and essential amino-acid profiles to three key grain-filling variables: altitude, mean grain-filling temperature, and cumulative grain-filling precipitation. A pre-defined threshold of $R^2 > 0.80$ was adopted to define statistically robust fitted trends. Our results revealed that high-altitude and wetter grain-filling environments covaried positively with crude protein concentration and total EAA content, although not all pairwise relationships satisfied the strict fitting threshold. Among individual amino acids, leucine displayed a weak linear response to grain-filling temperature, whereas lysine and the sum of methionine plus cysteine exhibited negligible correlation with the examined environmental predictors. Accordingly, no single dominant environmental driver could be reliably distinguished for kernel nutritional traits. Even after eliminating husk-related dilution bias, cultivar-driven genotypic effects remained partially confounded with environmental signals within the available dataset. Based on long-term climatological normals, this cross-continental analysis provides preliminary, practically oriented insights to support targeted high-quality naked-oat planting strategies across China and Europe, rather than definitive causal or mechanistic conclusions for oat grain nutrition.



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Sciforum-208725: Therapeutic Potential of Oleuropein and Hydroxytyrosol against Obesity Comorbidities: A Systematic Review

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Obesity and its comorbidities are closely linked to chronic low-grade inflammation and oxidative stress. In this context, oleuropein (OLE) and hydroxytyrosol (HT), key bioactive compounds of the Mediterranean Diet derived from *Olea europaea*, emerge as potent regulatory agents at the molecular, tissue, and systemic levels. The aim of this work is to gather *in vivo* and clinical evidence on the antioxidant and anti-inflammatory effects of OLE and HT in the context of obesity. Following the PRISMA methodology, a systematic search was conducted across databases (PubMed, Scopus, and WoS), applying inclusion criteria such as *in vivo* and clinical studies, and exclusion criteria, such as other reviews, studies focused on infectious diseases, and *in vitro* research, resulting in 39 selected articles. Research in animal models and clinical studies demonstrates that the administration of OLE and HT attenuates body weight gain, fat accumulation in adipose tissue, and the presence of visceral adiposity. Both phenolic compounds restore glucose and lipid homeostasis by reducing fasting glucose, triglycerides, and LDL cholesterol, as well as restoring insulin sensitivity and the HOMA-IR index. At the cellular level, they exert a profound anti-inflammatory effect by inhibiting NF-κB signaling and decreasing the expression of pro-inflammatory cytokines (IL-1β, IL-6, TNF-α) and the chemokine MCP-1. Simultaneously, they suppress oxidative stress by activating the Nrf2 transcription factor, restoring endogenous antioxidant enzymes (SOD, CAT, GPx), and consequently reducing biomarkers of oxidative damage, such as malondialdehyde (MDA). In target organs, these polyphenols protect endothelial function, decrease the hepatic steatosis score (NAS), exhibit neuroprotective effects, reduce kidney damage, restore adipose endocrine function, strengthen the intestinal barrier by increasing tight junction proteins, and restore pancreatic function. Despite their remarkable therapeutic potential, the low oral bioavailability of OLE and HT (~5%), conditioned by a rapid phase II metabolism, raises the need to develop innovative formulations, dietary synergy strategies or food enrichment to maximize their clinical efficacy.



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Sciforum-209576: Phytochemical and Bioactive Properties of *Ochna afzelii* and *Steganotaenia araliacea* from Northern Angola

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Northern Angola preserves rich ethnobotanical knowledge of medicinal plants. However, *Ochna afzelii* and *Steganotaenia araliacea*, traditionally used in Bengo and Uíge, remain poorly characterized as potential sources of bioactive compounds for food applications. This study aimed to characterize their phytochemical profiles and evaluate the antioxidant activity, inhibition of lipid oxidation, and antibacterial activity of their extracts. The samples were cleaned, dehydrated, and ground, and aqueous leaf extracts were prepared. Total phenolic content, antioxidant activity, the ability to inhibit lipid oxidation and antibacterial activity against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli* B and *E. coli* O157 were determined.

O. afzelii showed a total phenolic content of 4.74 mg/g of dry plant, with DPPH, FRAP, and ABTS TEAC values of 11.40, 158.2, and 2745.8 µmol Trolox/g of plant, respectively. *S. araliacea* showed a total phenolic content of 2.40 mg/g of dry plant, with DPPH, FRAP, and ABTS values of 22.76, 104.5, and 2717.1 µmol Trolox/g of dry plant, respectively. In the TBARS assay, *S. araliacea* exhibited an EC_{50} of 6.0 µg/mL of dry extract, compared with 8.0 µg/mL for *O. afzelii*. Antibacterial activity was limited under the tested conditions, with no relevant inhibition zones observed for extracts of either species. Phytochemical analysis of the *O. afzelii* extract identified apigenin-C-acetylhexoside and chrysoeriol-8-C-hexoside-6-C-pentoside, both at an individual concentration of 2.8 ± 0.1 mg/g dry extract. In the *S. araliacea* extract, 3,5-di-O-caffeoylquinic acid (45 ± 1 mg/g dry extract), malonyl di-O-caffeoylquinic acid (11.3 ± 0.3 mg/g dry extract), and quercetin-acetylhexoside (8.9 ± 0.3 mg/g dry extract) were identified.

These findings contribute to the scientific valorisation of the ethnobotanical knowledge of Bengo and Uíge and suggest that *O. afzelii* and *S. araliacea* may represent valuable sources of natural compounds for future food applications, particularly as functional ingredients or natural alternatives to certain synthetic additives.



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Sciforum-209579: Bridging the Gap Between Traditional Knowledge and Scientific Evidence for Three Underutilised Fruits of Cabinda

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This study provides the first comprehensive assessment of traditional uses and nutritional value of *Pachylobus edulis*, *Spondias dulcis*, and *Syzygium malaccense*, fruits widely available in Cabinda but underutilised due to seasonality, high perishability, and limited preservation and distribution systems. Although some wild fruits have recently been characterized for Angola, Cabinda constitutes a distinct Guineo-Congolian phytogeographical unit with a markedly different floristic composition. Therefore, a dedicated ethobotanical and nutritional characterization of its underutilised fruit species can provide novel information of this region. An ethnobotanical survey was conducted in fourteen informal markets through semi-structured interviews with 97 vendors, collecting data on plant uses, preparation methods, harvest locations, and seasonal availability. Quantitative indices, including Relative Frequency of Citation (RFC) and Commercial Use Index (CUI), were used to determine the Integrated Economic and Ethnobotanical Importance Index (IIEE). The edible portions of the fruits were dehydrated by forced air at around 45°C. Nutritional composition, total phenolic content (TPC), lipid peroxidation (TBARS) and cytocompatibility were analysed using standardized analytical methods. The IIEE index was 0.6627 for *P. edulis*, 0.3906 for *S. dulcis*, and 0.2933 for *S. malaccense*. The methanolic extracts exhibited protein content ranging from 3.29 to 8.67 g/100 g DW. *P. edulis* showed the highest lipid (52.15 ± 0.99 g/100 g DW) and TPC (54.39 ± 0.65 mg GAE/g DW) contents, whereas *S. malaccense* exhibited the highest potassium (1556 ± 17.1 mg/100 g DW) and total free sugar (46.88 ± 0.86 g/100 g DW) contents. TBARS values ranged from 0.044 to 2.78 mg MDA/kg, indicating differences in lipid oxidation among the fruit species. Preliminary cytocompatibility assays showed cell viability above 70% in intestinal and hepatic models at low and intermediate extract concentrations, indicating no cytotoxicity under tested conditions. Integrating traditional knowledge with scientific evidence may support future fruit valorisation strategies.



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Sciforum-209581: Nutritional and Functional Characterisation of Edible Leaves and Flowers from Selected Traditional Plants in Mozambique

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Hidden hunger remains an important nutritional challenge in sub-Saharan Africa, where diets are frequently based on staple foods with limited micronutrient diversity. Traditional food plants represent valuable resources for improving dietary quality; however, several commonly consumed fractions remain insufficiently characterised. This study evaluated the nutritional composition and biological properties of four traditional or locally available food plants from Mozambique: *Corchorus olitorius*, *Manihot esculenta*, *Moringa oleifera* and *Portulaca oleracea*. Proximate composition, mineral, fatty acids, tocopherols, soluble sugars, organic acids, and total phenolic contents were determined using standard methods. Antioxidant, antibacterial, and cytotoxic activities were also assessed in vitro tests. The results showed clear differences among species and plant fractions. *M. esculenta* leaves presented the highest protein content (28.99 ± 0.01 g/100 g dw), total phenolic content (15.3 ± 0.3 mg GAE/g dw), and antioxidant activity, with TEAC values of 172.6 ± 10.1 μmol TE/g dw and 128.65 ± 8.38 μmol TE/g dw for ABTS and FRAP tests, respectively. *M. oleifera* leaves were notable for their calcium and α-tocopherol contents, reaching 3150.1 ± 145.5 mg/100 g dw and 3727 ± 19 μg/100 g dw, respectively. *C. olitorius* leaves had the highest iron content, 18.3 ± 0.6 mg/100 g dw, and showed antibacterial activity against *Yersinia enterocolitica* with a MIC of 0.31 mg/mL. Regarding other plant parts, *M. oleifera* flowers exhibited considerable phenolic content and antioxidant activity, suggesting potential for valorisation. Most extracts showed low cytotoxicity, although *C. olitorius* leaves presented moderate antiproliferative activity against MCF-7 cells. These results support the value of traditional Mozambican food plants for dietary diversification and future food or nutraceutical applications.



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Session C. Food Physicochemistry & Analysis

Sciforum-176628: Ftir Insights into Wheat Flour Gluten: Linking Secondary Structure of Gliadins and Glutenins with Baking-Related Functionality

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Background: Wheat flour quality is largely determined by the composition and supramolecular organization of gluten proteins, whose three-dimensional network controls dough viscoelasticity and gas retention in baked products. While functional parameters such as gluten content, elasticity, and extensibility are routinely measured, their molecular underpinnings in terms of protein secondary structure are less frequently addressed using rapid, non-destructive spectroscopic tools.

Objective: This study aimed to develop a rapid, non-destructive FTIR spectroscopy approach that links the secondary-structure features of wheat flour gluten proteins (gliadins and glutenins) to their compositional traits and key functional properties relevant for dough viscoelasticity and baking performance.

Methods: Commercial white and whole wheat flours were characterized in terms of colour (CIE *Lab** coordinates), gluten content, and gluten functional properties. All samples (flour, bulk gluten, gliadins, and glutenins) were analysed by FTIR spectroscopy in the amide I region, followed by Gaussian deconvolution to quantify secondary-structure motifs (α-helices, β-sheets, turns, and random coils).

Results: Whole wheat flour exhibited a lower gluten content than white flour and a decreased L* value, indicating a darker appearance consistent with higher extraction rate. Random coil structures predominated in flour, bulk gluten, and gliadin fractions, whereas glutenins showed a higher proportion of intermolecular β-sheet motifs, in line with their fibrillar character and extensive disulfide crosslinking. These structural features were consistent with the observed viscoelastic behaviour, with glutenins primarily supporting elasticity and gliadins contributing to dough extensibility.

Conclusions: The combined evaluation of colour parameters, functional gluten tests, and FT-IR-based secondary-structure profiling provides a coherent, mechanism-oriented picture of wheat flour quality. The proposed FT-IR deconvolution approach emerges as a rapid, non-destructive tool for relating molecular-level protein organization to technological performance and may support the rational formulation of wheat-based products and gluten-reduced or gluten-free alternatives.



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Sciforum-180070: A Rapid and Non-Destructive Cosy NMR Approach for Distinguishing Butyric and N-3 Fatty Acid Moieties in Dairy Fat Matrices

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Background: Milk fat is a high-value food ingredient frequently targeted for adulteration with cheaper non-dairy fats and oils. Butyric acid is a characteristic marker of dairy fat, whereas n-3 fatty acids are generally present only at trace levels in milk fat but may occur in substantially higher amounts in vegetable oils used as adulterants. Conventional analytical approaches, including gas chromatography and classical volatility indices, are informative but often laborious, destructive, and time-consuming.

Objective: This study aimed to develop a rapid, non-destructive, and mechanism-based NMR screening strategy capable of differentiating butyric moieties (specific to dairy fat) from n-3 fatty acids (characteristic of vegetable oils), despite the overlap of their terminal methyl resonances in one-dimensional 1 H-NMR spectra.

Methods: A two-dimensional COSY (COrrelation SpectroscopY) NMR approach was applied to reference triglycerides, authentic dairy fats, vegetable oils rich in n-3 fatty acids, and binary fat mixtures. Sample classification was based on the presence or absence of diagnostic vicinal H-H correlations, namely the butyrate-specific A–D cross-peak and the n-3-specific A–E cross-peak.

Results: The COSY spectra enabled clear differentiation among dairy fats, n-3-rich non-dairy fats, mixed dairy/non-dairy systems, and saturated non-dairy fats lacking both markers. The proposed spectral criterion resolved the ambiguity associated with the overlapped terminal methyl signal observed in conventional 1 H-NMR and allowed rapid qualitative classification of the analyzed samples in approximately 15 minutes, without derivatization or sample destruction.

Conclusions: The proposed COSY NMR method provides a rapid, selective, and non-invasive tool for dairy fat authentication and for the detection of adulteration with vegetable oils in complex lipid matrices. It is suitable as a first-line screening method and may complement confirmatory chromatographic analyses in routine quality-control workflows.

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Sciforum-185711: Non-Destructive and Reagent-free Monitoring of Vegetable Oil Oxidation Using Dielectric Measurement

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The fatty acid profile of vegetable oils, especially the ratio of saturated to unsaturated fatty acids, plays a decisive role in determining both nutritional value and oxidative stability. In most vegetable oils, the majority of fatty acids are polyunsaturated. While such a composition is favorable from a dietary perspective, it renders the oil highly susceptible to oxidation. Despite the reliability of conventional analytical methods to investigate the vegetable oil quality, they are often time-consuming, require chemical reagents, and are not suitable for real-time process monitoring. Therefore, the development of alternative, rapid, and non-destructive measurement methods – such as dielectric methods- for monitoring the quality and stability of vegetable oils remains a critical challenge.

The dielectric properties of three vegetable oils (sunflower and olive oil) were investigated at the temperature of 45°C at a frequency range of 200–2400 MHz by an open ended dielectric assessment system (Speag DAK3.5 sensor connected to Rohde&Schwarz ZVL3 VNA).

The dielectric constant (ε') of all investigated vegetable oils was found to be consistently below 7.0 in the frequency range of 200–2400 MHz, but a systematic decrease in ε' with increasing frequency was observed. The 40–60% decrease in dielectric constant across the investigated frequency range demonstrating a dispersive behavior. Our results show that detectable changes in dielectric parameters occur already after 6 months of storage. With increasing storage time (up to 24 months), the relationship between ε' and ε'' evolved towards a near-linear correlation. In sunflower and olive oil a direct quantitative relationship between dielectric parameters (measured at the frequency of 400MHz) and peroxide value was found. A strong linear correlation ($R^2 > 0.8$) was determined between dielectric loss factor and peroxide value , which demonstrates that dielectric measurements can act as reliable proxies for chemical oxidation parameters, and enables quantitative prediction of peroxide value at the end of the acceptable shelf-life (10 to 20 meq/kg) of vegetable oils.



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Sciforum-187338: Tailoring of Hydrophobic NADESs Acidity and Viscosity on the Stabilization and HPLC Analysis of *Portulaca oleracea* L. Leaves Labile Bioactives

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Purslane (*Portulaca oleracea* L.) is a rich source of phenolic acids and flavonoids, although several of these compounds are chemically labile during extraction and analysis. Natural deep eutectic solvents (NADESs) represent tunable and more sustainable alternatives to conventional organic solvents; however, the influence of NADESs acidity and viscosity on the selective recovery of purslane phenolics remains insufficiently explored.

This study evaluated the effect of acidic and monoterpenoid-based NADESs on the ultrasound-assisted extraction and HPLC-DAD profiling of phenolic compounds from purslane leaves.

Four NADESs formulations based on menthol, β-citronellol, lactic acid, capric acid, and acetic acid were prepared by heating and stirring. Systems were characterized for pH and viscosity (at 40°C): me/la (pH 1.07; 29.10 mPa·s), me/β-c (pH 3.85; 16 mPa·s), β-c/ca (pH 3.38; 10 mPa·s), and me/aa (pH 1.99; viscosity undetectable). After ultrasound-assisted extraction under standardized conditions, phenolic compounds were quantified by HPLC-DAD and compared with an ethanol extract used as a conventional control.

Chromatographic analysis revealed strong, subclass-specific affinities. Highly acidic, lower-viscosity NADES exhibited superior flavonoid yields: me/aa achieved the highest recovery of rutin (8.28 mg/g) and quercetin (6.12 mg/g), followed by me/la acid (6.30 mg/g rutin; 5.40 mg/g quercetin). In contraste monoterpenoid-based me/β-c NADES demonstrated a distinct selectivity profile, yielding significantly higher concentrations of phenolic acids (coumaric, syringic, caffeic, and gallic). Several compounds detected in NADESs extracts, including rutin, quercetin, caffeic acid, and syringic acid, were not detected in the ethanol extract under the same analytical conditions, suggesting improved recovery and/or protection of labile phenolics in the eutectic matrices.

The findings indicate that NADESs physicochemical properties, particularly acidity and viscosity, strongly influence the selective extraction and analytical detection of phenolic compounds from P. oleracea leaves. Tailored NADESs may therefore serve as sustainable extraction media for food phytochemical analysis, especially when targeting labile phenolic acids and flavonoids.



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Sciforum-192863: Evaluation of Immobilisation Matrices for Phytase: Evaluation of Ionotropically Gelled Matrices

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Phytase immobilisation offers significant potential advantages for enhancing enzyme stability, reusability, and applicability in food and beverage systems. However, the choice of carrier materials and immobilisation strategy critically influences catalytic performance, particularly when substrate interactions or matrix components inhibit activity. Various immobilisation systems for phytase were evaluated with the aim of maintaining catalytic efficiency while minimising adverse interactions with phytic acid. Initial approaches employed chitosan-tripolyphosphate (TPP) and chitosan-iron crosslinked beads. Calcium alginate systems were also investigated as a mild entrapment technique. To overcome observed limitations, κ-carrageenan beads were developed using potassium-ion-induced gelation. Immobilisation yield and efficiency, as well as catalytic activity were assessed across all systems. Chitosan-based systems demonstrated good structural stability but suffered from electrostatic interactions with phytic acid and metal-substrate complexation, negatively affecting enzyme activity. Calcium alginate systems reduced these effects but still exhibited residual Calcium induced phytate complexation, limiting substrate accessibility and decreasing specific activity to 9 – 10 PPU/mg enzyme, compared to 73 PPU/mg for the calcium-free enzyme. In contrast, κ-carrageenan beads showed improved performance. The system achieved an immobilisation efficiency of 42 %, particularly at lower enzyme loading (0.05 mg/mL). Furthermore, κ-carrageenan enabled linear and sustained phosphate release over hydrolysis time without evidence of saturation or substrate-product diffusion limitations. The absence of interfering ions such as calcium and iron contributed to improved catalytic behaviour. Therefore, κ-carrageenan presented as a promising immobilisation matrix for phytase, enabling sustained catalytic activity while avoiding inhibitory interactions observed in other systems. This approach supports efficient phytic acid degradation and has strong potential for application in food and beverage processing.



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Sciforum-193543: Pecan NUT Flour as an Ingredient In Noodles: Impact Of Drying Temperature On Structure And Quality Attribute

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Pecan nut flour, rich in nutrients, is a promising ingredient for value-added foods; however, its incorporation may affect pasta drying behavior and product quality. This study evaluated the effect of hot-air drying temperature on the physicochemical, microstructural, and mechanical properties of pecan flour-enriched noodles. Noodles were produced by replacing 50% of the wheat flour fraction with pecan nut flour and dried under two conditions: D30 (30°C, 40 % RH) and D50 (50°C, 40 % RH). Moisture loss was monitored during drying, and final moisture content, water activity, microstructure, fracture properties, and cooking loss were determined. D30 exhibited a final moisture content of 11.6% and a water activity of 0.514, whereas D50 reached lower values (8.78% and 0.463, respectively), indicating a more intense dehydration process. Surface analysis revealed that D30 retained a more homogeneous and continuous structure, with a uniform distribution of pecan flour particles, whereas D50 displayed a rougher, more heterogeneous surface. These differences were confirmed by optical microscopy, which showed a more cohesive and compact matrix at 30°C, with no evidence of severe structural collapse, whereas samples D50 exhibited discontinuities, localized depressions, and reduced structural continuity associated with shrinkage phenomena and surface rigidification during drying. Mechanical properties reflected these microstructural changes. Noodles D30 showed significantly higher fracture stress values (0.569±0.043 MPa) than D50 (0.384±0.035 MPa), indicating greater mechanical resistance. In contrast, apparent strain did not differ significantly between treatments. Cooking loss was also lower in D30 (10.06±0.24%) than in D50 (11.58±0.03%), suggesting a greater ability to retain solids during cooking. These findings demonstrate that low-temperature drying is a suitable strategy for preserving the structural integrity of noodles containing high levels of pecan nut flour, supporting the valorization of this agro-industrial by-product in the development of nutritionally enriched pasta products thereby improving the technological quality of pecan flour-enriched noodles.



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Sciforum-193821: Influence of Phosphate-Induced pH Modification on Moisture Retention and Yield Characteristics of Porcine Muscle Systems

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Water retention is a critical quality attribute in comminuted meat products, directly affecting product yield, texture, and consumer acceptability. The present study investigated the role of phosphate-based ingredients in modifying the physicochemical properties of porcine muscle systems and their subsequent effects on moisture retention during thermal processing.

Model systems were prepared from fresh pork loin with the incorporation of 20% water and selected functional ingredients. Formulations contained sodium chloride (1.5%) combined with sodium diphosphate, sodium tripolyphosphate, or phosphate mixtures (0.05%). Physicochemical properties were assessed through pH determination, water-binding capacity (WBC), and cooking loss measurements following heat treatment to an internal temperature of 72°C.

Phosphate supplementation significantly altered the reaction environment of the meat matrix. The highest pH value recorded was 6.24, representing a substantial increase compared with untreated samples. This shift away from the isoelectric region of major myofibrillar proteins promoted greater electrostatic repulsion between protein filaments, increasing their ability to immobilize water. Among the tested formulations, systems containing sodium tripolyphosphate in combination with sodium chloride exhibited the most pronounced technological improvements. Water-binding capacity reached 96.47% of total moisture, while cooking losses decreased to 13.19%. These effects are associated with enhanced protein solubilization and structural swelling of the myofibrillar network, facilitating the formation of a stable gel matrix during heating.

The findings demonstrate that phosphate-assisted pH adjustment is an effective strategy for improving moisture retention and processing yield in porcine muscle systems. Sodium tripolyphosphate, particularly when applied together with sodium chloride, showed the greatest potential for enhancing the functional properties of meat emulsions intended for further processing.



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Sciforum-195020: Effects of formulation on the physicochemical properties and acceptability of a strawberry-flavored upcycled coconut skim milk (uCSM)

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Coconut skim milk (CSM), a protein-rich by-product of virgin coconut oil processing, remains largely underutilized despite its nutritional and health functional properties. This study used a two-factor mixture design with 10 experimental runs with the vertices replicated thrice, the center points replicated twice and the axial points with one replicate. Statistical models were generated to predict the effects of formulation parameters (i.e., 83 to 97.6 strawberry syrup and 0.024 to 0.17% stabilizer) on the physico-chemical properties (i.e., color, pH, TSS and viscosity) and consumer acceptability of the resulting upcycled coconut skim milk (uCSM). Acceptability parameters of the samples were evaluated by a total of 60 consumers using a balanced incomplete block design. Verification experiments were conducted to validate the accuracy of the predictive models. Results indicate that the formulation parameters had significant ($p < 0.05$) interaction effects on hue angle, pH, viscosity , color and overall appearance acceptability scores of the uCSM. The hue angles of the strawberry-uCSM blends ranged from 12.49 ± 0.02° to 14.28 ± 0.05°, while the pH values ranged from 5.88 ± 0.03 to 5.99 ± 0.01. Viscosities of the samples ranged from 158.33 ± 14.43 mPa•s to 1016.67 ± 28.87 mPa•s. Color acceptability scores ranged from 4 (dislike moderately) to 9 (like extremely) while overall appearance scores ranged from 1 (dislike extremely) to 9 (like extremely). The actual values of the responses were within the prediction and confidence intervals of the predicted values confirming validity of the generated models. Results of this study support the potential of CSM in the creation of plant-based milk alternatives as a possible upcyling approach to VCO processing wastes.



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Sciforum-195476: Physico-chemical and Functional Properties of Acetylated Cocoyam Starch for use as stabilizer in Tigernut drink.

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This research was aimed at evaluating acetylated cocoyam starch potential as a stabilizer for tiger nut drink. Cocoyam starch extracted from native cocoyam was acetylated using acetic anhydride, and introduced at 0.2g, 0.4g, 0.6g, 0.8g levels, into 100ml tiger nut drinks. The physicochemical, structural and sensory properties were analyzed using standard methods and data was analyzed using Analysis of Variance in a Completely Randomized Design at $p < 0.05$. FTIR analysis showed a distinct carbonyl absorption band at 1740 cm^{-1}, confirming successful acetyl group substitution (acetylation) which significantly ($p < 0.05$) altered the chemical structure of the starch molecules leading to changes in its crystalline and molecular arrangement which affected the starch's molecular interactions and structure hence, a decrease in Amylose content from 22.20 % to 17.00 %, and an increase in amylopectin content and emulsifying capacity from 77.80% to 83.00% and from 16.66% to 21.70%, respectively. Physico-chemical results showed increased viscosity of the drink from 5.5cP to 50.3cP, decreased sedimentation rate from 0.35mL/h to 0.02 mL/h and reduced syneresis from 55.0% to 9.5% with increasing acetylated starch concentration, indicating improved stability. Sample with 0.8 g/100 mL acetylated starch (Sample E) achieved the highest overall acceptability (7.50 ± 1.43) and significantly higher than other samples. The study concludes that acetylation of cocoyam starch enhances its functionality and stability potential in tigernut drink.



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Sciforum-195531: Soluble carbohydrates fingerprinting in commercial bread products using HPLC-RID: a comprehensive assessment of nutritional and technological variability

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The nutritional quality of bread products is closely linked to their carbohydrate composition, as soluble carbohydrates determine both the immediate energy availability and the glycemic characteristics of the food. Quantitative characterization of individual sugars such as glucose, fructose, sucrose and maltose is important for evaluating the nutritional profile of bread and supporting the development of products aligned with speciffic dietary recommendations. The aim of this study was to characterize the soluble carbohydrate profile of a representative selection of bread products and to generate quantitative compositional data relevant to nutritional evaluation, food authentication, product development, quality control and bakery process optimization. Soluble carbohydrates were determined by high-performance liquid chromatography using a Prominence Shimadzu system equipped with a refractive index detector and an EC 250/4 Nucleodur 100–5 NH_2 RP column, under isocratic conditions employing an acetonitrile mobile phase (80:20, v/v) delivered at 1.0 mL min^{-1}. Baseline resolution of all target analytes was achieved within 10 min, enabling rapid and reliable quantification. Marked differences in soluble carbohydrate composition were observed among the investigated bread products, reflecting variations in raw materials, formulation and fermentation technology; sourdough-based products tended to exhibit lower concentrations of reducing sugars, whereas conventionally yeast-fermented breads displayed elevated levels of glucose and maltose, likely resulting from enhanced enzymatic starch degradation during processing. The proposed analytical approach provides a rapid and reliable tool for the characterization of bread products and contributes valuable compositional data for nutritional studies, bakery process optimization and food quality assessment. The composition and concentration of soluble carbohydrates, including glucose, fructose, sucrose and maltose, influence not only the nutritional value of the product but also its sensory properties, shelf life and glycemic response.



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Sciforum-195580: Physicochemical, Bioactive, and Agroclimatic Differentiation of High-Andean Specialty Coffees Oriented toward Traceability and Territorial Valorization

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High-Andean specialty coffees exhibit compositional properties associated with origin, variety, and agroclimatic growing conditions. The objective of this study was to differentiate green coffee varieties from the Cooperativa Agraria Cafetalera Valle de Incahuasi, Peru, through physicochemical properties, bioactive compounds, instrumental color, FTIR, multivariate analysis, and agroclimatic characterization using GIS tools. The varieties known as Geisha Blend, Geisha 90+, Caturra, and SL-09 were evaluated. The results showed significant differences among varieties ($p < 0.05$). Moisture ranged from 9.40 to 11.24%, protein from 11.08 to 12.89%, fat from 6.93 to 8.21%, carbohydrates from 64.58 to 67.39%, and crude fiber from 23.97 to 37.32%. Geisha 90+ showed the highest crude fiber, carbohydrate, total phenolic compound content (33.27 mg GAE/g db), and luminosity (L* = 51.71). In contrast, Caturra stood out for its higher protein, fat, ash, and caffeine content (9.36 mg/g db), as well as its chromatic values a* and b*. FTIR analysis revealed spectral profiles associated with lipid, caffeine, carbonyl, chlorogenic acid, alkaloid, polysaccharide, and trigonelline functional groups, reinforcing the chemical differentiation of the evaluated coffees. PCA explained 84.32% of the total variability, confirming a clear varietal separation. GIS information allowed the delimitation of ten study zones and the generation of maps of location, roads, hydrography, slopes, vegetation cover, and altitude. These results provide technical evidence to strengthen the traceability, authenticity, and territorial valorization of High-Andean specialty coffees.



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Sciforum-195659: Influence of Replacing Raw Cocoa with Cocoa Shell Husk on Chemical Composition, Physicochemical Properties, and Sensory Attributes of Apple-Cocoa Fruit Leathers

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Fruit leathers, also called fruit rolls, are popular healthy snacks amongst children. Apple-cocoa rolls were prepared using apple puree (AP) and either raw cocoa (RC), cocoa husk powder (CW) or a blend of both (2,5% RC and 2,5% of CW). They were prepared by mixing concentrated apple puree with cocoa powder at 5% (w/w) and drying on sheets at 55℃ for 2 h. This strategy aimed to valorise the food industry's by-product and characterise the physicochemical and sensory properties of the obtained leathers. Each formulation was evaluated for its effect on sensory attributes, structure, wetting, mechanical, antioxidant, chemical, and optical properties. The colour and the texture of the developed fruit leathers were affected by the components and the drying process. CW as fine powder showed a good compatibility with the fruit matrix and the RC. The obtained snacks were characterised by dark chololate colour. While the AP samples were significantly lighter. Different microstructure reorganization was observed which was also resulted in surface roughtness. The addition of CW lowered the water vapour sorption rate in prepared snacks. The water contact angle was measured using the sessile drop technique with a goniometer and ranged from 44.43° to 61.56°, indicating the material hydrophilic nature. Additionally, Fourier-transform infrared spectroscopy indicated compatibility of AP, RC and CW. Sensory analysis revealed that fruit leathers with a mix of CW+RC were preferred by panelists for texture. With regard to overall quality, appearance, flavour and chewiness, CW+RC rolls and RC rolls had comparable results. This idea poses a feasible and cost-effective solution to prepare a clean-label product with incorporation of a by-product. However, further studies are recommended, including formulating the snacks with different concentrations of RC and CW, which could enhance the sensory properties.



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Sciforum-196460: Effect of Extrusion Conditions and Retort Processing on the Physicochemical Properties of High-Moisture Meat Analog from Sorghum and Pea Protein Isolate

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The development of high-moisture meat analogues (HMMA) from plant proteins has gained increasing attention due to their ability to mimic the structure and texture of conventional meat. This study investigated the effects of extrusion processing conditions on HMMA formulated from pea protein isolate (PPI) and sorghum flour, followed by evaluation of product stability after retort processing. A full factorial design was employed as a screening approach to evaluate the effects of PPI: sorghum flour ratios (90:10, 80:20, and 70:30), moisture content (65–70%), extrusion temperature (120–130°C), and screw speed (600–850 rpm). Raw materials were characterised for protein content, moisture content, water activity, colour, and functional properties before extrusion. Extrudates were preliminarily screened based on structural integrity, fibre formation, and overall appearance, after which the selected formulation was further characterised using instrumental texture analysis. The 80:20 (PPI: sorghum) formulation extruded at 120°C, 70% moisture, and 600 rpm produced the most desirable meat-like structure, with a protein content of 26.98% (wet basis), hardness of 454.13 g, and cutting firmness of 743.04 g. The selected HMMA was retort processed at 121°C, achieving an F_0 value of 13.84 min while maintaining satisfactory product integrity. The retort-treated HMMA was then seasoned with soy garlic and Korean chilli sauces and evaluated using a 7-point hedonic scale, achieving overall acceptability scores of 5.08 and 5.06, respectively, compared with 6.10 for the commercial HMMA reference. Overall, the study identified suitable extrusion conditions for producing a high-protein, retort-stable HMMA with promising potential for ready-to-eat plant-based meat applications.



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Sciforum-197179: Near-Infrared Spectroscopy and Chemometric Approaches for Discrimination of Brown and Milled Rice Based on Nutritional and Functional Properties

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Introduction

Rice (*Oryza sativa*) is a major staple food worldwide, providing over one-fifth of global caloric intake. Milling brown rice (BR) into white rice (WR) removes the bran layer, reducing nutrients, dietary fiber, minerals, vitamins, and bioactive compounds. As a result, BR retains a superior nutritional profile and potential health benefits compared with refined WR. This study aimed to compare the chemical composition, starch functional properties, and near-infrared (NIR) spectral characteristics of BR and WR, and to develop chemometric models for distinguishing rice samples based on their degree of polishing.

Methods

Brown and milled rice samples were analyzed for chemical composition, starch functional properties, and NIR spectra. Student's t-test ($p < 0.05$) assessed significant differences between groups, while Principal Component Analysis (PCA) identified compositional patterns. Classification models using Partial Least Squares Discriminant Analysis (PLS-DA) and Support Vector Machine (SVM) were developed from NIR data to distinguish rice based on polishing degree.

Results

Significant differences were found between BR and WR in ash, lipid, fiber, and protein contents. BR was richer in these components due to the bran layer, while WR showed higher starch and amylose levels from the endosperm. These differences affected starch thermal behavior, including gelatinization and setback. NIR spectroscopy identified key regions related to moisture, starch, proteins, lipids, and fiber, enabling clear discrimination of the two rice types. PCA showed effective separation, while PLS-DA and SVM models achieved accurate classification based on polishing degree.

Conclusion

The milling process alters rice composition and functionality. NIR combined with chemometric methods (PCA, PLS-DA, SVM) offers a fast, non-destructive, and reliable approach for rice classification, supporting quality control, authenticity testing, and real-time processing decisions.



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Sciforum-197223: *In Vitro* Digestion of *Pleurotus ostreatus* Stem Flour and Extract: Release of Free Sugars and Organic Acids

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Mushroom stems are rich in bioactive macromolecules, although their digestive fate remains poorly understood. To move from waste disposal to systematic valorization, it is essential to understand how different matrices influence metabolite bioaccessibility. This study evaluated the digestive transformation and release kinetics of free sugars and organic acids from *Pleurotus ostreatus* stems (POS) to assess their potential as functional ingredients. POS were processed into two forms: whole flour (POS-F) and an ultrasound-assisted water-soluble extract (POS-E). Both matrices were subjected to the standardized INFOGEST 2.0 *in vitro* digestion model. Oral, gastric, and intestinal phases were monitored kinetically. Following intestinal digestion, dialysis (3.5 kDa) separated the serum-available permeate (P) from the colon-available retentate (R). Free sugars and organic acids were identified and quantified throughout digestion by HPLC-RI/UV. Digestion promoted progressive metabolite release. Trehalose, the major sugar, increased from the oral to intestinal phases in both POS-F (7.96–12.13 mg/100 g) and POS-E (5.11–11.40 mg/100 g). Glucose and sorbitol also accumulated, reaching maximum levels in the intestinal phase. Sucrose was detected only in POS-F and remained stable during digestion (~0.7 mg/100 g in the retentate). Organic acid profiles changed markedly, with succinic and isobutyric acids increasing in the intestinal phase, especially in POS-F (10.81 and 6.45 mg/100 g, respectively). Dialysis revealed high bioaccessibility of lactic acid, reaching 9.58 mg/100 g in the POS-E permeate. In contrast, a substantial fraction of total sugars remained in the retentate (9.66 mg/100 g in POS-F and 5.11 mg/100 g in POS-E), indicating potential colonic delivery.These findings demonstrate that matrix structure governs metabolite release and bioaccessibility during digestion, supporting the use of POS as value-added functional ingredients and providing a basis for targeted food applications.



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Sciforum-197442: Effects of High hydrostatic pressure Treatment on the Flavor Quality of Kiwi Wine Based on Machine Learning and Flavoromics

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To investigate the effect of high hydrostatic pressure (HHP) treatment on the volatile flavor profile of kiwi wine, this study applied HHP at 300, 400, and 500 MPa for 10 and 20 min, with an untreated control, yielding seven treatment groups. Each group comprised three independent samples (n = 3) for machine learning analysis, with five and three technical replicates for GC-MS and E-nose, respectively. A flavoromics approach integrating gas chromatography-mass spectrometry (GC-MS), electronic nose (E-nose), and machine learning was employed; volatile compounds were identified by matching mass spectra against the NIST library, and data were analyzed by one-way ANOVA, principal component analysis (PCA), and multi-class classification models. To prevent data leakage, all preprocessing steps were performed independently within each fold of stratified 3-fold cross-validation repeated 100 times, with one sample per group assigned to the test set and the remaining two to the training set per fold. A total of 40 volatile compounds were identified by GC-MS, among which esters, alcohols, and ketones collectively accounted for over 90% of the total relative content, constituting the principal volatile components of kiwi wine. HHP treatment significantly modulated volatile composition in a pressure- and time-dependent manner: the 300 MPa-20 min treatment increased phenethyl acetate and ethyl laurate while decreasing ethyl decanoate, suggesting a potential shift toward floral and fruity aroma notes based on volatile compound profiles; the 400 MPa-10 min treatment induced a transient accumulation of acetaldehyde that decreased with extended treatment time; whereas the 500 MPa-20 min treatment reduced ester contents and accumulated higher alcohols such as isoamyl alcohol, causing a pronounced deviation from the original volatile profile. E-nose PCA effectively distinguished the control from treatment groups with different pressure-time combinations. Among logistic regression, linear SVM, RBF-SVM, and LDA models, the RBF-SVM model exhibited the best classification performance, achieving accuracies of 0.905 and 0.762 for GC-MS and E-nose data, respectively. These findings contribute to the understanding of HHP-induced flavor changes in kiwi wine and offer preliminary reference data for the optimization of non-thermal processing parameters in fruit wine production.



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Sciforum-197609: Comparative Effects of Pea, Soy, and Wheat Protein Preparations on the Properties of Structured Emulsions

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Structured emulsions are a promising strategy for developing health-oriented fat alternatives in animal-, plant-, and hybrid-based food systems. Oil-in-water (O/W) emulsions are key matrices whose properties depend on the selection of stabilizing agents, including synergistically acting biopolymers. Polysaccharides with thickening or gelling properties, such as guar gum and agar, have considerable potential, especially when combined with plant proteins. Therefore, this study investigated the effects of soy, pea, and wheat protein preparations on guar gum- and agar-structured emulsions.
Structured O/W emulsions (30/70 m/m) were produced by hot homogenization (~80 °C) followed by refrigerated storage (~4 °C). Samples were analyzed after preparation and primary stabilization, and after heat treatment (~100 °C) and secondary stabilization. Color (CIEL*a*b* system, reflectance method), pH (potentiometry), texture (penetration test), mean oil droplet size and polydispersity index (optical microscopy), and oil-holding capacity (centrifugation) were determined. Data were statistically analyzed using ANOVA and Student's t-test.
The use of plant protein preparations, regardless of type, resulted in a significant increase in the L* color parameter and oil-holding capacity, and decreases in pH, mean oil droplet size, and polydispersity index, along with increases in firmness and adhesiveness of the structured emulsions, compared with the control sample. These changes indicate improved system homogeneity and more effective immobilization of the dispersed phase. Emulsions containing soy or wheat protein preparations exhibited the highest firmness in the primary state and the greatest oil-holding capacity in the secondary state, indicating enhanced structural stability. The mechanisms of action differed: soy proteins acted mainly through emulsifying properties, whereas wheat proteins contributed primarily via mechanical entrapment of oil within the gel network. It was found that the type of plant protein preparation significantly affects the properties of structured emulsions. Unlike pea proteins, wheat proteins have the potential to serve as a technological alternative to soy proteins for emulsion structuring.



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Sciforum-197702: What's beyond macro- and micro-nutrients? NMR metabolite profiling of edible insects for a larger view of their features

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Introduction: Edible insects are becoming even more a nutritional source and a valid protein alternative to the conventional ones, with attention being mainly focused on main macro- and micro-nutrients. Anyway, these matrices are also a rich source of other metabolites involved in other properties different from nutritional one, namely biological and organoleptic. In this context, NMR metabolomics is here proposed and innovative approach on edible insects to obtain a more complete view of their chemical profile and properties.

Materials and methods: NMR metabolomics was applied on different edible insect species (*A. domesticus*, *T. molitor*, *L. migratoria*) considered at different conditions (rearing, drying, growth stage) to define their metabolite composition. Mono- and two-dimensional experiments were carried out on both polar and apolar extracts to identify as many metabolites as possible.

Results and discussion: The obtained results allowed to observe a profile characterized by metabolites belonging to different classes (amino acids, sugars, organic acids, nitrogenous compounds, etc.) and involved in nutritional but also organoleptic and biological properties. These data further underline the potential properties and applications of edible insects as alternative food sources. Moreover, it was observed that the metabolite profile is strictly correlated with any production variable applied on the samples, underlining how NMR metabolomics can be a potential tool to monitor production processes or any other variable that can affect edible insect composition and properties.

Conclusion: The value of edible insects as innovative food sources was further valorized in this study, since NMR metabolomics allowed to identify compounds previously never detected in these matrices. The obtained results showed that, together with conventional analyses of macro- and micro-nutrients, metabolite profiling is an added value in defining nutritional and other properties of edible insects.



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Sciforum-197713: Effect of thermal pretreatment on the antioxidant capacity of Cymbopogon flexuosus essential oil when added to sunflower oil

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Essential oils (EOs) are a natural alternative to synthetic antioxidants, but their stability can be affected by various factors. This study determined the changes in the chemical composition and antioxidant capacity (AC) of Cymbopogon flexuosus (lemongrass) EO subjected to accelerated thermal aging. Aliquots of the EO were heated to 60 °C for 60 days, with samples (n = 3) collected on days 0, 15, 30, 45, and 60 (EO0–EO60). Each essential oil was characterized by GC-MS and evaluated using indirect assays (DPPH-FRSA, total phenolic content, TPC), and then incorporated (0.02% w/w) into sunflower oil stored at 60 °C for 28 days (oven test, n=3 per treatment), along with controls with and without BHT, while monitoring the peroxide value (PV), conjugated dienes (CD), volatiles (hexanal, 2,4-decadienal), and the intensity of oxidation and aroma using a trained sensory panel (n=7; OI/EI, 0–150 mm scale). Twenty-four components were identified; alpha- and beta-citral constituted the major fraction (67.5–75.8%). The TPC increased to EO45 (17.15 ± 0.32 μg/mL) and decreased significantly at EO60 (13.75 ± 0.68 μg/mL; Fisher's LSD, $p < 0.05$); DPPH-FRSA increased up to EO30 (30.56 ± 0.32%) with no significant changes thereafter, and showed no correlation with the direct assay (ACP). In the oven test, all essential oils significantly reduced ($p<0.05$) PV, CD, and volatiles compared to the control, which exceeded 30 μg/mL of hexanal and 100 μg/mL of 2,4-decadienal on day 28. BHT and EO0 were the most effective, with no significant differences between them. Among the aged essential oils, EO15 performed best and EO60 worst, with significant differences compared to EO0 and EO15 (Fisher's LSD test, $p < 0.05$), although EO60 remained significantly superior to the control. The control's OI reached ~114 on day 28; BHT, EO0, and EO15 recorded the lowest values. The EI decreased with aging and storage, correlating negatively with the chemical indicators of oxidation. Moderate pretreatments (≤30 days) better preserved the measured CA; prolonged exposure reduced it without eliminating it.



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Sciforum-197801: Red Grape Pomace Flour: Exploring its Physicochemical composition, Antioxidant Characteristics and Technological Performance in Breadmaking

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Red grape pomace (RGP), a winery by-product mainly composed of grape skins and seeds, has traditionally been considered a waste material with limited applications. Nowadays, it is recognized as a valuable source of antioxidant polyphenols with potential health-promoting effects. Therefore, its transformation into flour and physicochemical characterization represent a first step toward its valorization as a food ingredient with potential health-properties. The study evaluated the physicochemical composition and antioxidant properties of RGP flour obtained at different drying temperatures, and its impact on breadmaking performance. RGP was dried at 40 or 60 °C, ground, and sieved to obtain RGP-F40 and RGP-F60 flours. Both flours were characterized for physicochemical composition and antioxidant properties, including total polyphenols (TP), anthocyanins, and *in vitro* antioxidant capacity (AC; FRAP, ABTS, and DPPH assays). The technological performance of RGP flour was evaluated by replacing wheat flour at levels from 0 (control) to 30%. Gluten quality, rheological properties, and breadmaking performance were assessed and compared with control. Both flours showed similar protein contents (10.75%) and energy values (362 kcal/100g). However, RGP-F60 exhibited higher fibre (21.74%), lignin (9.45%), fat (7.27%), ash (10.5%), and moisture contents (7.6%), and lower carbohydrate levels (64%). RGP-F60 also showed greater AC determined by FRAP (214 µmol/g) and ABTS (454 µmol/g), whereas TP (35 mg/g), anthocyanins (3.9 mg/g), and DPPH (4.5 µmol/g) values were not affected by drying temperature. Substitution of wheat flour with RGP-F60 progressively reduced dough quality and breadmaking performance. Dough cohesiveness was lost at substitution levels ≥20%. Acceptable loaf volume and flavour, although with a slightly denser crumb structure, were obtained at 5% substitution, while higher levels impaired dough development and baking performance. Overall, drying RGP at 60 °C enhanced its fibre content and AC without affecting TP and anthocyanin contents. This flour could be successfully incorporated at 5% into bread formulations, providing an opportunity to develop value-added food products while contributing to the valorization of winery by-products.



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Sciforum-197810: Comparison of the Chemical Composition of Different Gluten-Free Brewer's Spent Grain Batches for Potential Applications in the Food Industry and Biorefineries

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Brewer's spent grain (BSG) is the main by-product generated during brewing. Information on the chemical composition of gluten-free BSG remains scarce. This study compared two millet-based gluten-free BSG batches and values reported in the literature to determine compositional differences affecting interchangeability and valorization potential. Samples were characterized using standardized (NREL-AOAC-AOCS) methods. Data were analyzed by ANOVA and Tukey's test ($p < 0.05$). Results are reported on a dry basis, except moisture content.

Significant differences ($p < 0.05$) were observed between batches for all parameters evaluated, except total solids content (p=0.16). For the 2022 batch, moisture, fat, protein, ash, fat acidity (expressed as linoleic acid equivalents), and extractives contents were 58.00 ± 0.54 % ; 3.19 ± 0.28 %; 12.67 ± 0.27 %; 4.53 ± 0.02 %; 14.00 ± 2.11 % and 16.37 %, respectively. The corresponding values for the 2025 batch were 71.00 ± 0.71 %; 6.35 ± 0.05 %; 18.41 ± 0.11 %; 6.78 ± 0.40 %; 4.20 ± 0.55 % and 23.64 %, respectively. The lignocellulosic fraction of both batches consisted of cellulose (35.79 ± 0.07 % – 53.60 ± 1.43 %), hemicellulose (10.55 ± 0.17 % – 6.10 ± 0.03 %) and lignin (12.30 ± 0.30 % – 7.03 ± 0.04 %).

Differences in chemical composition were observed between the 2022 stored batch and the recently produced 2025 batch. Although the causes were not investigated, they may be associated with prolonged storage and batch-to-batch process variations. Comparison with conventional BSG and other lignocellulosic biomasses showed no consistent pattern, with some compositional parameters being comparable and others differing. These findings highlight the need for standardized characterization of gluten-free BSG to generate comparable datasets and support its valorization in food and biorefinery applications.



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Sciforum-197866: Dielectric characterization of foods in solid and semi-solid state

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Dielectric properties of food (dielectric constant, ε', and loss factor, ε") determine how electromagnetic energy is absorbed and dissipated, and are influenced by frequency, temperature, moisture, composition and structure. Their characterization is crucial for microwave/radio-frequency drying, cooking, thawing and pasteurization equipment design, and for online quality control.

Unlike most previous studies, which report single-frequency data, this work introduces a low-cost, non-destructive, broadband (100 MHz-4 GHz) measurement system, based on a Keysight FieldFox vector network analyzer and an open-ended coaxial probe with custom MATLAB calibration, validated against nine independent literature sources (2-6% relative error for water, apple cortex/puree and sucrose solutions; 10-14% for potato).

Sucrose solutions (0–60% w/w) served both as dielectric reference standards for calibration/validation and as a controlled water-sugar matrix, since water and soluble sugars dominate the dielectric response of fruit tissue at these frequencies. Potato, banana and apple (slices and puree) were then measured, as a first approximation, to evaluate how closely these foods behave as a simple water-sugar mixture, over the analyzed frequencies.

For the sucrose–water system, second-order polynomial models were developed by multiple regression to describe the dependence of dielectric constant and loss factor on frequency and sucrose concentration. The resulting correlations showed a very good fit to the experimental data, with R^2 = 0.9923 and 0.9290 for ε' and ε", respectively; concentration affected the dielectric constant more than frequency, since sucrose replaces polar water molecules with larger, less polar sugar molecules that also restrict remaining water's mobility.

The resulting sucrose-based correlations were further used as a first approximation to estimate the dielectric properties of the fruit and potato matrices using representative total soluble solids (°Brix) values reported in the literature. This water-sugar model reasonably reproduced homogeneous, low-ionic samples (e.g., apple purée), but underestimated banana and potato loss factor and overestimated intact-tissue dielectric constant (apple cortex), reflecting their starch/ionic content and structural/moisture heterogeneity. This first approximation provides a basis for further models incorporating additional compositional variables that should provide important information about cultivar, ripeness and tissue structure.



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Sciforum-197880: Sustainable Processing of Citrus By-Products: Influence of Drying on Bioactive Compound Recovery

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Citrus processing generates substantial quantities of by-products, including peels and pulp residues, which represent valuable sources of bioactive compounds. The efficient recovery and characterization of these compounds are essential for the development of value-added ingredients and sustainable food applications. This study investigates the influence of different drying and extraction approaches on the recovery of bioactive compounds from grapefruit, orange, and lemon by-products. Citrus materials were subjected to conventional hot-air drying and freeze-drying, followed by ultrasound-assisted extraction (UAE) by use of 70% ethanol. The obtained extracts were characterized by determining colour parameters and ferulic acid (FA) content. Ferulic acid is a powerful antioxidant because it neutralizes the damage caused. In addition, near-infrared spectroscopy (NIR) was applied as a rapid and non-destructive analytical tool for the characterization of dried citrus materials and the evaluation of potential relationships between spectral features and bioactive compound content. The study aims to identify the processing conditions that maximize the recovery of FA while providing insights into the applicability of NIR spectroscopy for rapid assessment of citrus by-products using AI tools. The results may contribute to the development of efficient analytical approaches for the characterization and utilization of citrus-derived functional ingredients (re)used in the food and pharmaceutical industry.



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Sciforum-197882: Effect of hydrothermal–microwave pretreatment on tocopherol retention and acidity evolution in canola oil during storage

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Processing conditions applied before canola oil extraction may influence tocopherol content and the oil´s acidity during storage. In this context, this work evaluated the effect of combined hydrothermal–microwave (HTMW) pretreatment on tocopherol content and acidity evolution in mechanically pressed canola oil under different storage conditions.

Untreated and hydrothermal–microwave (HTMW) pretreated canola seeds were mechanically pressed, and the resulting oils were stored for 108 days under different temperature and light conditions (8 or 37 °C, and with or without light exposure). Tocopherol content was determined by HPLC, while acidity was expressed as a percentage of oleic acid. All determinations were performed in duplicate (n = 2). Data were analysed using ANOVA followed by Tukey's Test ($p < 0.05$).

The HTMW treatment resulted in higher initial tocopherol levels in the extracted oil (1061 µg/g) than those measured in oil obtained from untreated seeds (956 µg/g). Tocopherol concentrations remained unchanged throughout storage in oils kept at 8 °C, regardless of seed pretreatment. Similarly, no significant losses were detected in oil obtained from untreated seeds and stored at 37 °C under light-protected conditions. In contrast, total tocopherols declined significantly in oils from HTMW-treated seeds stored at 37 °C, both with and without light, as well as in oil from untreated seeds stored at 37 °C with light exposure. Despite these reductions, oils produced from HTMW-treated seeds retained higher tocopherol concentrations than their corresponding untreated counterparts after 108 days of storage.

Regarding changes in acidity, free fatty acids gradually increased after 14 days of storage onward. In contrast, oils obtained from HTMW-treated canola seeds generally showed higher acidity values throughout storage.

These results show that the hydrothermal–microwave treatment increased the oil's initial tocopherol content and contributed to higher levels of these antioxidants throughout storage, whereas temperature and light exposure increased tocopherol losses during storage.



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Sciforum-197922: Response Surface Optimization of Digital Image Colorimetry for Total Acidity Determination in Alcohol Vinegar

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Alcohol vinegars are used in food preparation and as ingredients in the food industry. Therefore, their acidity must be controlled to ensure product quality. Digital image colorimetry (DIC) has gained attention due to its low-cost instrumentation, rapid analysis, and agreement with Green Analytical Chemistry. However, its application to determination of acidity in alcohol vinegar has not yet been reported. To develop a DIC-based methodology, image acquisition and color development conditions were optimized, since the alcohol vinegar samples are colorless and its composition consists exclusively of acetic acid at a minimum concentration of 4% (w/v), in accordance with Brazilian legislation, and shall not exceed 1% (v/v) residual ethanol derived from the alcoholic fermentation involved in vinegar production. A Box–Behnken design was employed to evaluate the effects of three factors on RGB channel: distance between the smartphone camera and the vial containing 3 mL of comercial alcohol vinegar sample (10, 15, and 20 cm), brightness level of LED in the mini-studio (10, 50, and 90%), and the volume of 0.01% (w/v) Bogen indicator (100, 300, and 500 μL). Using the G-channel as response, a quadratic model was fitted to the experimental data, resulting in an adjusted R^2 of 99.85%. All evaluated factors, as well as the interactions between indicator volume and brightness level and between camera distance and brightness level, were significant at the 95% confidence level. The optimal conditions were determined using contour plots and the desirability function, resulting indicator volumes between 400 and 500 μL, camera distances between 10 and 15 cm, and a 10% brightness level. Results obtained under these conditions showed good agreement with the model predictions, confirming the suitability of the optimized acquisition parameters, demonstrating that DIC is a viable approach for determining acidity in alcohol vinegar without significant waste and use of corrosive reagents.



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Sciforum-198056: Impact of Mild Oven Drying on Colour Preservation and Phenolic Extractability of *Mentha spicata* L. from the Saloia Region

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Mentha spicata L. is an aromatic herb valued for its sensory characteristics and phenolic compounds associated with antioxidant activity. Drying is widely used to preserve aromatic herbs by reducing moisture and microbial growth, extending shelf life, and facilitating storage and transport. However, drying conditions may affect visual quality and bioactive compound extractability. This study evaluated the effect of mild oven drying on the colour, total phenolic content, and antioxidant activity of *M. spicata* cultivated in the Saloia Region of Sintra, Portugal.

Fresh mint and samples oven-dried at 30 °C for 24 h were analysed. Colour was assessed using the CIE L*ab** system. Aqueous extracts were analysed for total phenolic content and antioxidant activity using FRAP, DPPH, and ABTS assays. Results for fresh mint were converted to a dry matter basis, and all phenolic and antioxidant results were expressed per gram of sample dry weight. Data were analysed using an independent-samples *t*-test, with significance set at $p < 0.05$.

Mild oven drying did not significantly affect L*, a*, or b*, indicating preservation of mint colour. Dried mint showed significantly higher total phenolic content and FRAP values than fresh mint, with increases of approximately 46% and 172%, respectively, on a dry-weight basis. No significant differences were observed for DPPH or ABTS.

To the best of our knowledge, no previous studies have simultaneously assessed the effects of mild oven drying at 30 °C on instrumental colour, phenolic content, and antioxidant activity of *M. spicata* from the Saloia Region of Sintra. Overall, drying at 30 °C for 24 h preserved visual quality while enhancing phenolic extractability and ferric reducing antioxidant power. These findings support mild drying as a preservation strategy for producing dried mint with retained colour and enhanced functional potential, while maintaining a low processing temperature that may be particularly relevant for small-scale producers and commercial processors of high-quality aromatic herbs.



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Sciforum-198083: Influence of Processing Operations on the Functional and Rheological Properties of Legume Flours

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The growing demand for sustainable alternative protein sources has increased interest in legume flours as functional ingredients for innovative food applications. Their technological performance depends not only on botanical origin and composition, but also on processing conditions, such as soaking, cooking, milling, drying, and particle size reduction. This study evaluated the functional and rheological behaviour of chickpea, grass pea, and lupin flours subjected to different processing conditions, aiming to identify their potential applications in food matrices.

Grass pea, chickpea, and lupin flour samples were obtained using different processing operations, including direct milling, soaking, cooking, drying, and sieving. Functional properties were assessed through moisture content, water, oil, and milk absorption capacity, swelling power, foaming and emulsifying properties, and gelation capacity. For rheological analysis, all flours were sieved to 250 µm to minimize particle size effects. Gel systems at 6% (w/v) were prepared and analysed using rotational rheometry at 20 ± 1 °C. Stress sweep tests were performed to define the linear viscoelastic region, followed by frequency sweep tests. Storage modulus (G′) and loss modulus (G″) were evaluated at 1 Hz. Data were analysed by ANOVA followed by Tukey's test at $p < 0.05$.

Lupin flour showed significantly higher water and milk absorption capacity, swelling power, and moisture content, indicating high hydration potential. Grass pea flour exhibited the highest foaming capacity, above 90%, suggesting suitability for aerated products. Soaking improved chickpea emulsifying properties by approximately 25% compared with the untreated sample. Rheological results showed that directly milled chickpea presented higher structural rigidity, whereas commercial chickpea flour showed lower G′ values and greater susceptibility to deformation.

Legume flours presented distinct functional and rheological profiles strongly influenced by processing conditions and particle size. These results support their targeted use in bakery, emulsion-based, aerated, dough-based, and fluid food products.



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Sciforum-198166: Effect of Metal Ion Complexation on the Stability and Antioxidant Properties of Anthocyanins

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Introduction: Anthocyanins are natural plant pigments with antioxidant properties, whose stability and antioxidant activity may be altered by interactions with metal ions. The aim of this study was to evaluate the effect of the formation of anthocyanin complexes with metal ions, with particular emphasis on Fe^{2+}, Fe^{3+} and Cu^{2+} ions, on their spectral properties, antioxidant activity, and reactivity in model oxidative systems.

Methods: The formation of anthocyanin–metal complexes was analyzed using UV–Vis spectroscopy. The model compounds were kuromanin chloride and cyanidin chloride, and the studies focused, in particular, on complexes with Fe^{3+}, Fe^{2+} and Cu^{2+} ions.

Results and Discussion: The absorption spectra showed changes in the spectral properties of anthocyanins in the presence of iron and copper ions, indicating their interaction with the anthocyanin chromophore. Antioxidant properties of anthocyanins and their metal complexes evaluated by reduction of the $ABTS^{\bullet}$ and $DPPH^{\bullet}$ radicals and ORAC assay which measures the protection of fluorescein against AAPH-induced oxidation. The formation of complexes did not result in a uniform increase or decrease in antioxidant activity relative to free anthocyanins. Instead, the observed effects depended on the metal ion and the mechanism of the assay used. Anthocyanin complexes with Fe and Cu ions may exhibit pseudoenzymatic SOD-like and catalase-like activity or limit the involvement of metals in pro-oxidative reactions.

Conclusions: The results obtained indicate that the complexation of Fe^{2+}, Fe^{3+} and Cu^{2+} ions has an effect on the spectral, antioxidant, and redox properties of anthocyanins, and the varied nature of the observed changes suggests that further research into the mechanism of these interactions is warranted.

This study was performed within the project “Modification of anthocyanins/anthocyanidins as new markers of food oxidation” (application number 2023/51/B/NZ9/02490) financed by the National Science Center (NCN), Poland, within the “OPUS 26” program.



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Sciforum-198167: Chemometric Mapping of Phenolic Diversity in Lamiaceae Extracts Highlights Solvent-Dependent Patterns

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Introduction: Deep eutectic solvents (DES) and natural deep eutectic solvents (NADES) have emerged as sustainable alternatives to conventional organic solvents for the extraction of phenolic compounds from aromatic plants. Multivariate chemometric tools provide a powerful means of evaluating complex extraction datasets and identifying patterns associated with phenolic selectivity across different solvent systems.

Methods: Multivariate chemometric analysis was applied to evaluate the relationships among phenolic compound profiles of ten Lamiaceae species extracted with five solvent systems — two hydrophobic DES, two NADES, and 70% ethanol — yielding a dataset of 50 samples and 12 quantified phenolic compounds. Prior to analysis, data were standardized by z-score normalization. Principal Component Analysis (PCA), Hierarchical Cluster Analysis (HCA), and heatmap visualization were performed to assess sample grouping and identify key discriminating variables.

Results and Discussion: PCA revealed that the first two principal components accounted for 41.8% and 23.7% of total variance, respectively, with a cumulative explained variance of 65.5%. The score plot highlighted sample grouping that was more closely associated with extraction solvent than with botanical origin. The menthol/methyl salicylate DES formed a well-separated cluster associated with high rosmarinic acid, chlorogenic acid, and quercetin loadings, while NADES and ethanol extracts showed partial overlap, which may reflect similarities in their polarity ranges. HCA similarly showed two primary clusters broadly corresponding to hydrophobic DES and hydrophilic extraction systems. Loadings analysis identified rosmarinic acid, chlorogenic acid, and quercetin as principal discriminating variables.

Conclusions: These results highlight solvent-dependent patterns in the phenolic profiles of Lamiaceae extracts and demonstrate the utility of chemometric tools in characterizing phenolic fingerprints and support rational solvent selection for targeted extraction from complex plant matrices.

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Sciforum-198251: Natural Deep Eutectic Solvents for Enhanced Extraction of Chicoric Acid from Chicory (*Cichorium intybus* L.) Herb

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Introduction: Chicory (*Cichorium intybus* L.) is a rich source of bioactive phenolic compounds, among which chicoric acid, is recognized for its pronounced antioxidant, anti-inflammatory, and metabolic regulatory properties. Natural deep eutectic solvents (NADES) represent a sustainable and non-toxic alternative to conventional organic solvents for the extraction of such bioactive compounds from plant matrices.

Methods: Ten NADES formulations based on choline chloride, glycerol, urea, glucose, erythritol, lactic acid, malic acid, and citric acid were prepared and applied for ultrasound-assisted extraction of chicoric acid from chicory herb. Water and ethanol were used as conventional reference solvents. Quantification was performed by HPLC-DAD.

Results and Discussion: Chicoric acid content in herb extracts ranged from 0.54 ± 0.05 to 3.31 ± 0.26 mg/g dry weight. The highest yield was obtained with the urea/glucose NADES (3.31 ± 0.26 mg/g), followed by glycerol/malic acid (2.70 ± 0.24 mg/g) and glycerol/citric acid (2.62 ± 0.15 mg/g). NADES formulations significantly outperformed water and ethanol ($p < 0.05$), with the lowest yields observed for aqueous infusion (0.54 ± 0.05 mg/g) and water extraction (0.55 ± 0.04 mg/g). The glycerol/urea system failed to yield detectable chicoric acid, likely due to excessive solvent viscosity limiting analyte diffusion. NADES containing organic acids provided significantly higher chicoric acid content compared to acid-free formulations ($p < 0.01$), consistent with enhanced hydrogen-bonding interactions with the polar hydroxyl and carboxyl groups of chicoric acid.

Conclusions: NADES formulations, particularly those combining urea or organic acids with sugars or polyols, represent efficient and environmentally friendly alternatives to conventional solvents for chicoric acid extraction from chicory herb, supporting their potential application in sustainable food and nutraceutical processing.

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Sciforum-198255: Anthocyanin fluorescence for monitoring oxidation of the chokeberry fruit during drying and storage of fruit lyophilizates

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Introduction. Chokeberry *Aronia melanocarpa* fruit, rich in anthocyanins, can be subject to drying or lyophilization for domestic or industrial applications; these processes may involve oxidation of the fruit. The appearance of the „oxidation band" in the fluorescence spectrum of anthocyanins is an index of oxidative deterioration of anthocyanins and can be a useful index of food freshness. The study was aimed at determining whether the measurement of fluorescence of whole or pulverized chokeberry fruit or fruit extracts can provide information on the extent of anthocyanin oxidation during prolonged drying, and storage of chokeberry fruit lyophilizates.

Methods: The fruits were dried at 60 °C for up to 240 h. The fruit lyophilizates were stored at 4, 22 and 37 °C with air access. Antioxidant activity was assayed by ABTS• decolorization and FRAP assays. The phenolic content with the Folin-Ciocalteu reagent. Fluorescence was measured in a Spark Tecan multiplate reader.

Results and Discussion. Drying of chokeberry fruits was accompanied by a decrease in the anthocyanin content, much higher than the general flavonoid content, and a decrease in the antioxidant capacity of the extracts. A progressive increase in the intensity of the "oxidation band" of anthocyanins, centred at 520-530 nm for the excitation wavelength of 460 nm accompanied the drying process. The intensity of the "oxidation band" also increased during storage of fruit lyophilizates at 22 and 37°C.

Conclusions: The increase in the fluorescence intensity at the "oxidation band" was a regular function of the time of fruit drying and the time of lyophilizate storage and can be a facile index of food and lyophilizate oxidation.

This study was performed within the project "Modification of anthocyanins/anthocyanidins as new markers of food oxidation" (application number 2023/51/B/NZ9/02490) financed by the National Science Center (NCN), Poland, within the "OPUS 26" program.



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Sciforum-198256: Food Processing as a Strategy for Low-FODMAP Functional Ingredient Development: A Systematic Literature Review of Mediterranean Plant Foods

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Introduction: The low-FODMAP (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) diet is an evidence-supported strategy for irritable bowel syndrome management, but its restrictiveness may compromise nutritional adequacy, dietary variety, and adherence. Processing strategies that reduce fermentable carbohydrates in culturally relevant plant foods may support low-FODMAP functional ingredient development within Mediterranean dietary patterns.

Methods: This systematic literature review investigates how domestic and industrial processing affect FODMAP composition in selected Mediterranean plant matrices: garlic, onion, bell pepper, tomato, and apple. Searches were conducted in Web of Science, Scopus, PubMed and Google Scholar up to 15 May 2026 using terms related to FODMAP classes, carbohydrate fractions, food processing and target matrices. Eligible studies reported quantitative or semi-quantitative data for raw and/or processed edible samples and provided interpretable information on processing conditions and analytical methodology.

Results and Discussion: Thirty-five studies met the inclusion criteria. Water-based processes, including boiling, steaming and canning, generally reduced FODMAP content, supporting the role of mass-transfer mechanisms such as diffusion and leaching. However, these approaches may compromise texture, sensory quality, and compositional integrity, particularly when prolonged heating or liquid discard is required. Thermal processing and fermentation showed mixed effects depending on matrix composition, processing conditions, microbial or enzymatic activity, and FODMAP class. Drying reduced some FODMAP fractions while increasing others, suggesting combined effects of carbohydrate transformation and water-loss concentration. Overall, processing-induced changes were matrix-specific and method-dependent.

Conclusions: Water-based processing demonstrates FODMAP-reduction potential, but its impact on texture and food quality limits its applicability as a universal strategy. Future low-FODMAP product development should prioritize alternative or combined technologies that selectively reduce FODMAPs while preserving the nutritional, functional, and sensory properties of Mediterranean plant foods.

Acknowledgments

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Sciforum-198258: Improvement of Paraguayan cane fermentation through nitrogen supplementation: effects on ethanol yield and aromatic profile.

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Paraguayan cane spirit is a distilled beverage of high cultural and economic relevance in Paraguay. Its fermentation depends on the availability of nitrogen, an essential nutrient for the metabolic activity of the yeast Saccharomyces cerevisiae. This study evaluated the effect of urea and ammonium sulfate supplementation on fermentation time, ethanol yield, and the aromatic profile of the distillate. Yeast assimilable nitrogen (YAN) of the sugarcane juice was determined using the Sörensen method and adjusted to 150 and 175 ppm. Five treatments were analyzed in triplicate: M1 (urea, 150 ppm YAN), M2 (urea, 175 ppm YAN), M3 (ammonium sulfate, 150 ppm YAN), M4 (ammonium sulfate, 175 ppm YAN), and a control P (56 ppm YAN). Following distillation, ethanol yield was quantified as % v/v, and the aromatic profile was analyzed by gas chromatography with flame ionization detection (GC-FID). Treatments M1 and M4 significantly improved fermentation kinetics ($p < 0.05$), reducing the fermentation time from 72 h in the control to 56 h (M1) and 59 h (M4), with ethanol yield increases of 12.4% and 15.1%, respectively. In contrast, M2 and M3 showed increases of less than 6%, without statistical significance ($p > 0.05$). All treatments maintained the concentrations of esters and higher alcohols within the accepted parameters for sugarcane distillates. In conclusion, supplementation with urea at 150 ppm (M1) or ammonium sulfate at 175 ppm (M4) represents an effective strategy to optimize fermentation and maximize ethanol production in Paraguayan cane spirit, without compromising its aromatic quality. However, the use of urea requires caution due to its association with ethyl carbamate formation.



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Sciforum-198356: Upcycling *Agaricus bisporus* Stems: Ultrasound-Assisted and NADES for Protein Extraction

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The global production of *Agaricus bisporus* generates substantial quantities of stems, representing up to 20% of total biomass and typically managed through low-value applications such as composting or incineration. However, these by-products are rich in valuable biomolecules, particularly proteins. This study evaluates innovative and sustainable extraction technologies to recover proteins from mushroom stems for incorporation as functional food ingredients.

Seven extraction protocols were comparatively assessed: conventional alkaline solubilization (pH 12) with agitation, ultrasound-assisted extraction (UAE) using bath and probe systems, water-based UAE without pH adjustment, and green solvent extraction using two deep eutectic solvents (DES): choline chloride:lactic acid (1:2) and choline chloride:glycerol (1:2). For alkaline methods, proteins were solubilized at pH 12 and precipitated at pH 4 (isoelectric point) using acetic acid (1M). For the NADES approach, extraction was performed at 50 °C for 1 h in a 75% DES aqueous solution, followed by ethanol precipitation (1:4). All concentrates were characterized for protein recovery yield (%) and water retention capacity (WRC).

Results demonstrated that DES extraction with choline chloride:lactic acid achieved the highest protein recovery (33.45%), followed by alkaline extraction combined with UAE probe (29.94%), which outperformed UAE bath treatment by 11.70%. Choline chloride:glycerol DES also showed competitive performance (23.69%). Water-based UAE without pH adjustment yielded significantly lower recovery (8.85%), highlighting the critical role of pH-induced solubilization. Notably, UAE-derived concentrates exhibited superior WRC (2.60 g/g) compared to choline chloride:lactic acid NADES extracts (0 g/g), suggesting that ultrasound-induced cavitation preserves protein structural features associated with hydration capacity, a key attribute for food texture applications.

This work identifies NADES and UAE as the most effective strategies for recovering functional protein concentrates from *A. bisporus* stem by-products: NADES maximizes extraction yield, while UAE produces concentrates with superior water retention capacity, broadening applicability across food formulation needs and providing a viable upcycling pathway for the mushroom supply chain.

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Sciforum-198362: Oil yield, fatty acid profile, and nutraceutical potential of *Nigella damascena* seeds under varying pedoclimatic conditions

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Background: *Nigella damascena*, an annual species of the Ranunculaceae family, is increasingly considered a promising source of specialty vegetable oil and bioactive lipids for functional food applications. Seed and oil yields, together with the fatty acid profile (FAP) and nutraceutical quality of the oil, can vary substantially in response to pedoclimatic conditions across growing seasons.

Objective: This study aims to quantify seed and oil yield of *Nigella damascena* over multiple years, to characterize the FAP and nutraceutical indices of its seed oil, and to evaluate how pedoclimatic conditions influence plant development and oil production.

Methods: *Nigella damascena* was cultivated at INCDA Fundulea between 2018-2025. Seed lipid content (32.39-39.27 g oil/100 g dry seeds) and seed yield were determined and combined to obtain oil yield per hectare (237.28-351.86 kg/ha). FAP was established by GC-MS, and standard nutraceutical indices were calculated. A multiple linear regression model used monthly Selyaninov hydrothermal coefficients to assess the impact of temperature-precipitation patterns on oil yield.

Results: FAP was dominated by unsaturated fatty acids, mainly linoleic and oleic acids, with saturated palmitic and stearic acids contributing the remainder, yielding PUFA/SFA ratios >1 and acceptable atherogenic and thrombogenic indices, confirming a high proportion of unsaturated lipids. Oil yield varied considerably among years, from 237.28 kg/ha (2024) to 351.86 kg/ha (2019). The regression model indicated that Selyaninov coefficients for March, May and June had statistically significant effects ($p<0.05$) on oil yield, with March exerting a negative influence and May-June a positive one.

Conclusions: The study demonstrates that both the quantitative performance and nutraceutical quality of *Nigella damascena* seed oil depend strongly on pedoclimatic variability during the growing season. These findings support the potential of *Nigella damascena* as a functional oilseed crop and highlight the value of hydrothermal indices as tools for predicting oil yield under changing climatic conditions.



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Sciforum-198392: Oxidative Changes in Canola Oil during Storage as Affected by Hydrothermal–Microwave Pretreatment

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Canola oil, rich in unsaturated fatty acids, is susceptible to oxidation during storage. While hydrothermal–microwave (HTMW) pretreatment of seeds improves initial oxidative stability1, information on its effect during storage remains scarce. This study evaluated the effect of HTMW pretreatment on the oxidative parameters of canola oil under different storage conditions. Canola seeds were steam-treated (autoclave VZ, 130°C, 5 min) and microwave-dried (BGH QuickChef 36960, 2450 MHz, 5 min, 100% power)1. Oils from untreated (UT) and HTMW-pretreated seeds were mechanically pressed at 50 °C (Susweetlife X8S, China) and stored for 108 days at 8 or 37°C, with or without light exposure. Oxidation was monitored via peroxide value (PV), p-anisidine value (AnV) and Rancimat induction time.Initially, PV and AnV were undetected in all samples. HTMW oils exhibited longer induction times than UT controls (14.2 and 7.9, respectively). Among HTMW oils stored at 37 °C for 48 days, light-exposed oils reached higher peroxide values (9.65 meq O2/kg oil), while samples in darkness showed no peroxide detection. Overall, storage temperature and light exposure negatively affected oxidative stability. Oils from pretreated seeds maintained higher induction times throughout the study; after 108 days at 37 °C in darkness, HTMW oil retained an induction time of 11.05 h compared to 4.26 h for UT oil. Furthermore, in samples kept in darkness at 37 °C, the PV decrease after 28 days (from 5.8 to 0 for HTMW, and 7.25 to 5.3 meq O2/kg for UT) coincided with rising AnV (undetected at 28 days, rising to 2.14 and 2.27 for HTMW and UT, respectively, at day 48).These results indicate that hydrothermal–microwave pretreatment improves the oxidative stability of canola oil, although storage conditions, particularly light exposure, strongly influence the formation of primary oxidation products.



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Sciforum-198404: Characterization of Indian Himalayan region Sea Buckthorn (*Hippophae rhamnoides* L.) to explore its nutritional, biochemical, thermal and structural attributes

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Sea buckthorn (SBT) (Hippophae rhamnoides L.) is a versatile shrub rich in bioactive compounds, and has wide applications in the food and pharmaceutical industries. This study characterizes the nutritional, biochemical, thermal, and structural properties of Indian Himalayan SBT roots, stems, leaves, and berries using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, FT-IR, XRD, SEM - EDX, DSC, TGA, and 1H - NMR. Berries had the highest fat content (21.10 ± 1.39%) and antioxidant activity (94.63% DPPH inhibition), while stems showed the highest protein (22.28 ± 0.70%). DSC analysis showed multiple exothermic and endothermic peaks varying by plant part, reflecting differences in chemical composition and thermal transitions. TGA revealed staged mass losses due to moisture, polysaccharide decomposition, and lignin degradation, with roots retaining the highest residual mass (~20%). XRD indicated greater crystallinity in roots and stems versus amorphous leaves and berries. NMR identified diverse metabolites, especially sugars and bioactives in berries. Elemental analysis confirmed a predominantly organic composition with variable mineral content. These results provide a comprehensive scientific dataset and a foundation for future investigations into the sustainable valorisation of SBT plant resources. Future studies should evaluate the bioavailability, biological activity, processing stability, and application potential of the identified bioactive compounds.



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Sciforum-198430: Fish Oil Microencapsulation on Volatile Compound Profiles and Physicochemical Properties of Dark Chocolate

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The incorporation of omega-3 polyunsaturated fatty acids into confectionery products is constrained by their susceptibility to oxidative degradation and the presence of off-flavor compounds. This study aimed to evaluate the effect of fish oil (cod liver) microencapsulation, using whey protein isolate (WPI) and maltodextrin (MD) as wall materials, on the volatile compound profile and physicochemical properties of dark chocolate. Three formulations were prepared: (1) a plain chocolate control, (2) chocolate fortified with free fish oil, and (3) chocolate fortified with microencapsulated fish oil, each providing an equivalent fish oil concentration of 8.33 g/100 g. Physicochemical characterization included moisture content, water activity, color (CIELab), and viscosity of chocolate samples, as well as complete characterization of the microcapsule powder (encapsulation efficiency and peroxide value). Volatiles were analyzed by headspace solid-phase microextraction coupled to gas chromatography–mass spectrometry (HS-SPME–GC–MS). Results showed that encapsulation efficiency was 76.19%, with a surface oil fraction of 5.48%, and a peroxide value of 2.93 meq O_2/kg. Incorporation of the microcapsules significantly increased chocolate moisture content (from 4.16 to 16.05%) and melt viscosity (from 3,621.5 to 6,040.5 mPa·s), while free fish oil reduced the viscosity of the chocolate (2,031.5 mPa·s). GC-MS analysis identified a cluster of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) oxidation markers, including decanal, undecanal, 2-pentylfuran, two lactone species, and thiophene-2-decyl, that were present in the free fish oil chocolate but absent or substantially reduced in the microencapsulated formulation. Nonanal, a secondary lipid oxidation aldehyde, was reduced by approximately 37.5% in the microencapsulated treatment. Taken together, the data provide evidence that WPI-MD microencapsulation attenuates the release of characteristic fish-oil oxidation volatiles in dark chocolate, while simultaneously introducing physicochemical challenges, particularly elevated moisture and viscosity, that would require formulation optimization prior to commercialization.



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Sciforum-198453: Exploring the Antioxidant Capacity of Lupin Flour as a Sustainable Functional Ingredient

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Introduction: As the global food system transitions toward sustainable and low-impact plant-based resources, legumes are being re-evaluated as high-performance functional ingredients. This study explores the antioxidant potential of lupin (*Lupinus* spp.) flour, a promising clean-label ingredient with potential interest for the development of alternative food matrices [1,2].

Methods: The free radical scavenging activity of lupin extracts was evaluated utilising an adapted DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay [3] under various solid-to-solvent ratios and ethanol concentrations (25%, 50%, 80%, and 100% v/v), alongside an aqueous extraction (H_2O), all maintained at room temperature for 5 h under constant agitation.

Results: The antioxidant activity, expressed as Trolox Equivalent Antioxidant Capacity (TEAC), demonstrated distinct variation across the alcoholic extracts. The highest antioxidant capacity was achieved with the EtOH 80% 1:100 condition (87 mg Trolox/100 g DW), followed by EtOH 80% 1:50 (61 mg Trolox/100 g DW), while the lowest among quantifiable matrices were observed in EtOH 80% 1:20 (35 mg Trolox/100 g DW).

Conclusion: This study successfully optimises key extraction variables, demonstrating that the solid-to-solvent ratio and ethanol concentration directly influence the quantifiable antioxidant capacity of lupin flour. These baseline parameters provide crucial data for the standardised characterisation of lupin bioactive compounds, supporting its potential future exploration as a functional ingredient.

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Sciforum-198520: Development and Characterization of an innovative Artisanal Cider Production Using alternative ingredients

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The development of new craft cider ou Artisanal cider recipes that incorporate alternative ingredients requires precise control of fermentation parameters to ensure product quality, process efficiency, and consistency across batches. This study evaluated the influence of the initial total soluble solids (TSS) content, density, and fermentation time on fermentation kinetics, alcohol production, and the final characteristics of an artisanal cider formulated from a blend of fruit juices.

The fermentation consisted of 3 L of substrate prepared from 2.25 L of natural apple juice and a supplementary mixture containing apple juice, grape juice, coconut water, and spirulina. To optimize the content of fermentable sugars, the initial TSS was adjusted from 11.5 to 13 °Brix by adding sucrose, resulting in an initial density of 1.052 g/mL. The mixture was inoculated with rehydrated active dry yeast and fermented under anaerobic conditions at 18 - 19 °C. After primary fermentation, the cider underwent racking, aging, and bottle conditioning with the addition of sugar (9 g/L)

Monitoring of the fermentation revealed stable and efficient sugar conversion throughout the entire process. The specific gravity decreased progressively from 1.052 to 1.030 g/mL, which corresponded to an alcohol content of 5% (v/v). The final product had a density of 1.000 g/mL, 5 °Brix, and an alcohol content of approximately 6% (v/v). The overall process yielded 2 L of clarified cider.

The results demonstrate that systematic monitoring of °Brix and density is a robust tool for controlling fermentation kinetics, allowing for the optimization of alcohol yield and ensuring the reproducibility and consistency of the process in artisanal cider production. Furthermore, the findings support the successful incorporation of alternative ingredients into cider formulations without compromising fermentation performance.



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Sciforum-198537: Genotype × Environment Interactions Govern the Biochemical Composition and FTIR Spectral Fingerprint of Fig (Ficus carica L.) Seed Oil

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Background/Objectives: Fig (Ficus carica L.) seed oil is an emerging by-product with promising nutraceutical properties, yet the influence of genotype × environment (G × E) interactions on its biochemical composition remains poorly understood. This study aimed to evaluate compositional variability among fig genotypes, identify metabolic trade-offs affecting oil quality, and assess the potential of FTIR-ATR spectroscopy as a rapid tool for varietal authentication and discrimination.

Methods: Thirty-seven fig genotypes cultivated in Morocco were investigated over two consecutive harvest years (2023–2024). Oil yield, total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activities (DPPH and ABTS assays) were determined using conventional analytical methods. FTIR-ATR spectroscopy was employed to characterize spectral fingerprints, while analysis of variance (ANOVA) and principal component analysis (PCA) were used to evaluate the effects of genotype, year, and G × E interactions.

Results: Significant variability was observed among genotypes and between years for all measured traits ($p < 0.001$). TPC ranged from 16.5 to 115.1 mg GAE/100 g oil and decreased by approximately 36% from 2023 to 2024, while TFC followed a similar trend. In contrast, DPPH radical-scavenging activity increased by 34% in 2024, whereas ABTS activity declined by 18.6%. Mean oil yield decreased from 26.7% to 21.2% between years and showed a significant negative correlation with phenolic accumulation ($r = -0.49$, $p < 0.001$), suggesting a trade-off between lipid biosynthesis and secondary metabolism. FTIR-ATR analysis revealed diagnostic spectral markers, with significant G × E effects detected across key absorption bands. PCA explained 75.4–84.5% of the total variance and successfully discriminated both harvest years and genotypes. ‘Dottato Perguerolles’, ‘VCR 276/49’, and ‘Ferqouch Jmel’ emerged as the most stable and promising cultivars.

Conclusions: Fig seed oil composition is strongly influenced by both genetic background and environmental conditions. The integration of biochemical analyses with FTIR-ATR spectroscopy provides an efficient approach for cultivar discrimination and supports the selection of stable, high-value genotypes for nutraceutical applications.



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Sciforum-198570: Cryogenic Pre-treatment of Grape must before winemaking: Effect on must and wine physico-chemical and sensory profiles

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Sauvignon blanc and Chenin blanc are key South African white wine cultivars whose varietal aroma profiles are strongly influenced by methoxypyrazines and volatile thiols. Efforts to enhance these compounds through viticultural and oenological interventions have produced inconsistent results, prompting interest in cryogenic pre-fermentative treatments as a potential strategy for improving aroma expression. This study examined the effects of cryogenic freezing (–20 °C and –4 °C) applied at four production stages—whole grapes (WG), macerated grapes (MG), turbid must (TM), and clear juice (CJ)—either immediately (T0) or after four months of storage (T4). A standard white winemaking protocol was followed, with untreated (unfrozen) wines serving as controls. Musts and wines were evaluated for physicochemical composition, volatile thiols, methoxypyrazines, and sensory attributes. Cryogenic treatments had minimal impact on must composition aside from increased pH and reduced total acidity. Vintage-related differences were evident in yeast assimilable nitrogen. In Sauvignon blanc, 3-SHA exceeded its aroma threshold and typical concentration range, whereas 3-SH and 4-MSP remained within or below expected levels. Chenin blanc showed elevated 3-SHA but generally lower 3-SH. Most cryogenic treatments increased methoxypyrazine concentrations above perception thresholds in Sauvignon blanc. Aroma composition was strongly influenced by region and vintage, particularly in T4 Sauvignon blanc wines from WG and MG treated at –4 °C. Sensory evaluation showed that WG and MG treatments produced wines with enhanced tropical and thiol-driven aromas, increased body, and higher overall quality. Overall, the production stage had the largest effect, while temperature and storage duration played smaller roles. Applying cryogenic treatments to WG or MG at –4 °C, particularly at T0, appears to be an energy-efficient, cost-effective approach for enhancing desirable aroma attributes.



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Sciforum-198619: Glucose Reduction in NFC Apple Juice by Immobilized Glucose Oxidase/Catalase: Quality and Safety Assessment

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Increasing consumer awareness of the adverse health effects of excessive sugar intake increase the interest in technologies for the reduction of sugar levels in fruit-based products. Apple juice, although perceived as a natural and healthy product, is characterised by a relatively high naturally occurring carbohydrates. The use of immobilised glucose oxidase and catalase represents a promising biotechnological strategy for selective glucose reduction, offering biocatalyst reuse and easy separation from the final product.

The aim of the study was to reduce the glucose concentration in NFC apple juice through the use of glucose oxidase and catalase immobilized in a gel matrix. The scope of the work included an assessment of the effectiveness of the immobilized enzymes in reducing the glucose concentration in apple juice and process assessment. Glucose oxidase (*Aspergillus niger*) and catalase (from bovine liver) were immobilized using 3% sodium alginate and 0.2 M $CaCl_2$. During the experiments, immobilized enzymes were added to juice samples, and were incubated for 6 hours in a water bath at 35°C, with additional oxygenation of the juice. In the next stage, selected samples were subjected to physicochemical analyses to determine the effect of the process on juice quality, including sugar profile and selected food safety-related parameters.

As a result of the process applied, a significant reduction in glucose concentration was observed. Enzymatic treatment led to an increase in parameters such as formol number or gluconic acid concentration.

Overall, this preliminary quality and safety assessment study demonstrates the potential of glucose oxidase/catalase immobilized in alginate beads for glucose reduction in NFC apple juice and provides a basis for further evaluation of its effects on physicochemical quality and safety-related indicators.



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Sciforum-198622: Application of lactic acid-based natural deep eutectic solvents for the extraction of phenolic compounds from winter savory

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Satureja montana L. (Lamiaceae), known as winter savory, is an aromatic plant native to the Balkan Peninsula, valued for its use as a culinary spice. A diverse range of secondary metabolites, including phenolic compounds, contributes to the reported antioxidant, antidiabetic, anti-inflammatory, analgesic, and antimicrobial potential of this plant. Natural deep eutectic solvents (NADES) are systems designed according to the principles of green chemistry, with demonstrated high efficiency in the extraction of phenolics. The use of NADES, particularly those based on food-grade components, offers a sustainable and potentially food-compatible extraction approach for recovering bioactive compounds. Therefore, the aim of this study was to evaluate the applicability of lactic acid-based NADES in microwave-assisted extraction (MAE) of *S. montana* herb, with a focus on their efficiency in extracting selected phenolic compounds compared with water and ethanol.

Two NADES systems were prepared by heating and stirring, using food compatible components - lactic acid as the hydrogen bond donor and glucose or glycerol as hydrogen bond acceptors. In addition to NADES, water and 70% ethanol were used as extraction solvents. MAE was carried out in three 5-second cycles, at a microwave power of 180 W. The chemical profile of the extracts was assessed by High-Performance Liquid Chromatography (HPLC).

Rosmarinic acid, trans-cinnamic acid, rutin, quercetin, and naringenin were identified and quantified by HPLC. Extracts obtained using lactic acid:glucose system contained higher levels of rutin, quercetin, naringenin, and trans-cinnamic acid than those obtained with other solvents. Ethanol was more effective for rosmarinic acid extraction, while water was the least efficient solvent.

The obtained NADES-based extracts could be further explored as potential nutraceuticals, pending additional evaluation of their biological activity and safety.

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Sciforum-198623: High-Temperature Ohmic Heating as a Strategy to Improve Resistant Starch Type 5 Formation in Corn Starches with Different Amylose Contents

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Resistant starch type 5 (RS5), formed through amylose–lipid complexation, has attracted considerable interest as a functional food ingredient due to its low digestibility, thermal stability, and potential to reduce the glycemic response of starch-based foods. However, the mechanisms governing RS5 formation remain poorly understood, and conventional processing methods often result in limited yields. While most studies have focused on temperatures near 100 °C, recent evidence suggests that temperatures above 140 °C may be necessary to disrupt amylose double-helical structures and enhance lipid complexation. This study evaluated the effect of high-temperature ohmic heating (OH) on the structural characteristics and digestibility of starch–lipid complexes prepared from corn starches with different amylose contents. Native starches were treated by OH at 150 °C for 30 min prior to complexation with stearic acid (10%, w/w). Structural and morphological changes were analyzed by X-ray diffraction (XRD), differential scanning calorimetry (DSC), vibrational spectroscopy, scanning electron microscopy (SEM), and confocal laser scanning microscopy (CLSM). OH treatment reduced the ordered amylose double-helical organization and promoted conformations favorable for lipid inclusion. Although high-amylose starches retained crystalline regions, reflecting greater thermal stability, starches containing 30% and 70% amylose exhibited the characteristic V-type diffraction pattern associated with RS5. DSC thermograms showed endothermic transitions near 110 °C, supporting RS5 formation, while spectroscopic analyses indicated that complexation occurred through physical rather than covalent interactions. OH treatment increased resistant starch content, with the highest complexation index (~80%) observed in the 70% amylose starch. SEM and CLSM observations further confirmed enhanced incorporation and distribution of stearic acid within the starch matrix after OH treatment. These findings demonstrate that high-temperature OH promotes the disruption of amylose double-helical structures, increasing their availability for lipid complexation and enhancing RS5 formation. Consequently, OH represents a promising strategy for improving RS5 production and developing starch-based functional ingredients with enhanced nutritional properties.



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Sciforum-198638: Metabolic Changes during Coffee Cherry Ripening and Their Implications for Coffee Processing

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The biochemical composition of coffee cherries at harvest strongly influences the quality of the raw material entering postharvest processing. However, in many coffee-producing regions, including Loja (Ecuador), pre-ripe, ripe, and over-ripe cherries are commonly harvested together without selective sorting, resulting in heterogeneous material for fermentation, drying, roasting, and beverage production. This study evaluated the physicochemical and metabolic changes occurring in the pulp, pericarp, and seed of *Coffea arabica* L. var. *Typica* across three ripening stages to investigate their potential implications for coffee processing.

Ripening induced a marked metabolic reorganization between fruit tissues. In the pulp and pericarp, total soluble solids, glucose, and fructose increased progressively, indicating a greater availability of fermentable carbohydrates during the initial stages of processing. Conversely, the seed followed a different metabolic trajectory, characterized by decreasing glucose and quinic acid concentrations together with increasing neochlorogenic acid, caffeine, total phenolics, and antioxidant activity. These changes suggest a progressive transition from primary to secondary metabolism as ripening advances. In addition, potassium, calcium, and iron decreased significantly in the pericarp, indicating coordinated physiological changes accompanying fruit maturation.

Collectively, these metabolic shifts modify the biochemical composition of the cherries entering postharvest processing. The differential distribution of carbohydrates, organic acids, minerals, and bioactive compounds among ripening stages is expected to influence the availability of fermentation substrates and the pool of chemical precursors involved in subsequent roasting reactions. Consequently, processing cherries with heterogeneous ripening stages may contribute to greater variability in the chemical composition of the processed beans and, ultimately, in coffee quality. These findings highlight the importance of selective harvesting or ripeness-based sorting as practical strategies to improve the biochemical uniformity of the raw material and enhance the consistency of coffee processing and final beverage quality.



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Sciforum-198679: Characterizing and Optimizing Milk Thistle Pomace Oil and Bioactives Extracted by Ultrasound-Assisted Extraction

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Milk thistle (*Silybum marianum L. Gaertn.*) is a medicinal plant from the Asteraceae family renowned for its therapeutic and industrial potential. Its seeds contain highly valuable bioactive compounds, including the silymarin complex, unsaturated fatty acids, vitamin E, and diverse phenolics, which contribute significantly to the prevention of cardiovascular diseases. This study implemented a sequential, two-step ultrasound-assisted extraction (UAE) strategy optimized via a Box-Behnken design (BBD). In the first stage, lipophilic fractions were isolated using n-hexane to optimize oil yield. The optimized oil was evaluated for fatty acid profile via gas chromatography (GC), regiospecific distribution, and thermal oxidative properties via Pressure Differential Scanning Calorimetry (PDSC). Quality parameters were further assessed through acid and peroxide value testing. In the second stage, the resulting defatted pomace matrix was utilized to optimize the extraction of polar bioactive compounds (phenols, polyphenols, and flavonoids) using ethanol under UAE.

Analytical results for the optimized oil showed that linoleic acid (C18:2) and oleic acid (C18:1) were the predominant unsaturated fatty acids, complemented by saturated palmitic (C16:0) and stearic (C18:0) acids. Regiospecific analysis indicated that unsaturated fatty acids were preferentially located at the internal (*sn*-2) position, whereas saturated fatty acids occupied the external (*sn*-1,3) positions. The oil exhibited an oxidation induction time of 7.88 minutes via PDSC. While the acid value remained safely within the permissible range, a slightly elevated peroxide value was observed. This behavior is attributed to acoustic cavitation-induced micro-environments, where localized radical formation promotes early-stage primary oxidation on highly sensitive polyunsaturated chains. The subsequent secondary extraction yielded a considerable total phenolic and flavonoid content from the defatted matrix.

In conclusion, the optimized sequential UAE method serves as an efficient, green, non-thermal approach to successfully fractionate milk thistle pomace, preserving key structural oil characteristics while concurrently liberating premium bioactive components for health and nutrition applications.



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Sciforum-198719: Tree Age Effects on Chemical Composition of cv. Verdeal Transmontana Olive Oil: Young vs Centenarian Trees

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Introduction: Olive oil composition is influenced by multiple factors, including cultivar, climatic conditions, agronomic practices, and fruit maturation stage. Although olive trees undergo significant physiological and metabolic changes throughout their long lifespan, the influence of tree age on olive oil quality remains relatively unexplored. This study aimed to evaluate the influence of olive tree age on the chemical composition and bioactive properties of olive oils from the Portuguese cv. Verdeal Transmontana.

Material and methods: Olive oils were obtained from three age groups of olive trees: young (≤25 years), middle-aged (≤50 years), and centenarian (≥100 years), all grown under the same agronomic and environmental conditions in Mirandela (northern Portugal). Sampling was carried out over four consecutive crop years (2022-2025). The olive oils were analyzed for physicochemical quality parameters, antioxidant activity, oxidative stability, fatty acid composition, tocopherol profile, and hydroxytyrosol and tyrosol derivatives.

Results: All samples complied with the legal standards for extra virgin olive oil. Although significant differences were found among tree age groups, the crop year exerted a stronger overall influence on most parameters. Olive oils from centenarian trees exhibited higher oleic acid content (80.0 %) and lower polyunsaturated fatty acids (3.1 %). These olive oils exhibited higher total phenolic compounds, including hydroxytyrosol derived, contributing to enhanced oxidative stability and bioactivity. In contrast, olive oils from younger trees showed higher polyunsaturated fatty acids (5.5 %) and tocopherol content (459 mg/kg). Principal Component Analysis (PCA) enabled clear separation of samples, primarily driven by antioxidant activity, oxidative stability, tocopherols, and phenolic compounds. Linear Discriminant Analysis (LDA) further confirmed the discriminatory power of tree age on olive oil composition.

Conclusion: Olive tree age influenced the composition of cv.Verdeal Transmontana olive oils, but interannual variability had a greater overall impact, highlighting the predominant role of environmental conditions in olive oil quality.



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Sciforum-201479: Near-Infrared Spectroscopy and Chemometric Approaches for Discrimination of Brown and Milled Rice Based on Nutritional and Functional Properties

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Abstract

Introduction

Rice (*Oryza sativa*) is a major staple food worldwide, providing over one-fifth of global caloric intake. Milling brown rice (BR) into white rice (WR) removes the bran layer, reducing nutrients, dietary fiber, minerals, vitamins, and bioactive compounds. As a result, BR retains a superior nutritional profile and potential health benefits compared with refined WR. This study aimed to compare the chemical composition, starch functional properties, and near-infrared (NIR) spectral characteristics of BR and WR, and to develop chemometric models for distinguishing rice samples based on their degree of polishing.

Methods

Brown and milled rice samples were analyzed for chemical composition, starch functional properties, and NIR spectra. Student's t-test ($p < 0.05$) assessed significant differences between groups, while Principal Component Analysis (PCA) identified compositional patterns. Classification models using Partial Least Squares Discriminant Analysis (PLS-DA) and Support Vector Machine (SVM) were developed from NIR data to distinguish rice based on polishing degree.

Results

Significant differences were found between BR and WR in ash, lipid, fiber, and protein contents. BR was richer in these components due to the bran layer, while WR showed higher starch and amylose levels from the endosperm. These differences affected starch thermal behavior, including gelatinization and setback. NIR spectroscopy identified key regions related to moisture, starch, proteins, lipids, and fiber, enabling clear discrimination of the two rice types. PCA showed effective separation, while PLS-DA and SVM models achieved accurate classification based on polishing degree.

Conclusion

The milling process alters rice composition and functionality. NIR combined with chemometric methods (PCA, PLS-DA, SVM) offers a fast, non-destructive, and reliable approach for rice classification, supporting quality control, authenticity testing, and real-time processing decisions.



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Sciforum-201560: Effect of Hyperbaric Micro-Oxygenation on the Chromatic Evolution of Tempranillo Red Wine

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Introduction: Color is one of the most important quality attributes of red wines, as it is closely related to phenolic extraction, anthocyanin stability, oxidation reactions, and consumer perception. Oxygen management during vinification plays a decisive role in the formation and stabilization of red wine pigments. In this context, hyperbaric micro-oxygenation may represent an innovative non-thermal strategy to improve oxygen dissolution and promote controlled reactions involved in color development. This study evaluated the effect of hyperbaric micro-oxygenation on the chromatic characteristics and total phenolic content of red wine produced from *Vitis vinifera* L. cv. Tempranillo.

Methods: Tempranillo grapes were vinified under controlled conditions. Wines subjected to hyperbaric micro-oxygenation were compared with untreated control wines produced under conventional conditions. Color evolution was assessed using CIELAB coordinates, including lightness (L*), red-green coordinate (a*), yellow-blue coordinate (b*), chroma (C*), hue angle (hab), and total color difference (ΔE). In addition, the total phenolic content was determined to evaluate the effect of the treatment on the extraction and preservation of phenolic compounds. These parameters were used to determine the impact of the treatment on color intensity, red tonalities, chromatic stability, and phenolic composition during the winemaking process.

Results: Hyperbaric micro-oxygenation promoted a differentiated chromatic evolution compared with the control treatment. Treated wines showed a more intense red color, higher chroma values, and greater total color differences, indicating a more pronounced visual evolution of the wine matrix. In addition, treated wines exhibited a slightly higher total phenolic content than the control. The increase in redness, color saturation, and phenolic content suggests that the treatment may favor anthocyanin extraction, reduce phenolic oxidation, promote pigment stabilization, and enhance the formation of more stable phenolic complexes under controlled oxygen availability.

Conclusions: Hyperbaric micro-oxygenation may be considered a promising technological tool to modulate and improve the chromatic quality of Tempranillo red wines. Its application could contribute to enhancing color intensity and stability while promoting a slight increase in total phenolic content, supporting its potential use in innovative red winemaking strategies.



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Sciforum-201872: Comparative evaluation of quality characteristics and mineral profile of three avocado (*Persea americana* L.) culivars commercialized in Portugal: Fuerte, Hass and Ryan

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Avocado (*Persea americana* L.) is a nutritious tropical fruit from the Lauraceae family, widely appreciated for its taste, texture and nutritional value. Moreover, the quality of the fruits is influenced by different factors, namely cultivar and mineral traits. As such, the aim of this study was to compare the quality characteristics and mineral composition of three avocado cultivars (Fuerte, Hass and Ryan) commercially available in Portugal. The fruit samples were assessed for height, diameter, weight, firmness, total soluble solids content (TSS), dry matter and colorimetric parameters (CIE L^*, a^* and b^*) of both the inner and outer fruit tissues. Additionally, the concentration of phosphorus (P), sulfur (S), potassium (K), calcium (Ca), manganese (Mn), iron (Fe), copper (Cu), zinc (Zn) and lead (Pb) were determined in the peel, pulp and in the mixture of peel and pulp. The results showed clear differences among cultivars in the parameters analyzed ($p < 0.05$), confirming the distinct quality profiles of the three cultivars. For instance, Hass cultivar presented the highest TSS content (17°Brix), while Fuerte showed the greatest firmness. Moreover, mineral content differed among fruits tissues, with the peel and pulp showing different accumulation patterns for macro and micro elements. Pb was detected in all samples, with higher concentrations in the peel than in the pulp, varying between 26.33 and 49.67 mg/kg, and 7.33 and 12.4 mg/kg, respectively. Overall, the findings contribute to a better understanding of the compositional variability of avocado fruits marketed in Portugal, and highlight the importance of evaluating potential contamination by heavy metals such as Pb, which may pose food safety and public health concerns.



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Sciforum-202167: Bean Pre-treatment Shapes the Techno-functional and Rheological-Pasting Behaviour of Wheat-Bean Flour Systems

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Introduction: Legume flours can improve the nutritional and functional value of cereal products, but their incorporation into wheat matrices depends on particle size, hydration and interfacial properties, and rheological-pasting behaviour. This study compared wheat flour, flours prepared from boiled and soaked beans, and wheat-bean blends as model systems for fermented bakery applications.

Methods: Samples were characterized for particle size distribution, CIE L*a*b* colour, techno-functional properties, foaming and emulsifying behaviour, oscillatory rheology, and pasting characteristics using a Rapid Visco Analyser.

Results and Discussion: The studied systems differed clearly in particle size distribution. Soaked-bean flour contained the highest coarse fraction, with 38.31% retained on the 0.500 mm sieve, whereas boiled-bean flour was mainly retained on the 0.355 mm sieve and wheat flour on the 0.250 mm sieve. Bean pre-treatment also affected colour: the wheat-boiled bean blend showed the highest lightness, while the wheat-soaked bean blend was the darkest and shifted towards positive a* values. The incorporation of bean flour modified functional behaviour, particularly interfacial properties. Bean flours and blends showed higher emulsifying activity than wheat flour, with values of approximately 14.2-15.8 compared with 4.18 for wheat flour. Oscillatory rheology indicated a stronger elastic response in soaked-bean systems than in boiled-bean systems. This tendency was consistent with the pasting profiles. Boiled-bean flour showed the lowest final viscosity, 632.75 mPa·s, while wheat flour and the wheat-soaked bean blend maintained much higher values, 2388.75 and 2282.50 mPa·s, respectively.

Conclusions: Bean pre-treatment strongly shaped the functional and rheological-pasting behaviour of wheat-bean flour systems. Soaked-bean flour promoted stronger structure formation and maintained paste-building capacity in blends, whereas boiled-bean flour markedly reduced final viscosity. These differences show that wheat-bean systems can be tailored by selecting the bean-flour variant according to the desired colour, interfacial functionality and viscosity profile.



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Sciforum-202212: Thermomechanical Properties of Durum Wheat Semolina Blends Enriched with Pumpkin Flesh and Peel Flour Evaluated by Mixolab

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The incorporation of vegetable by-products into cereal products represents an effective strategy for improving nutritional quality while supporting sustainable food production. Pumpkin flesh and peel are recognised as valuable sources of dietary fibre and naturally occurring carotenoids and phenolic compounds, making them promising ingredients for cereal-based products. However, their influence on dough processing behaviour remains insufficiently understood. Therefore, this study evaluated the effects of pumpkin flesh flour (10, 25 and 50%) and pumpkin peel flour (10, 20 and 30%) on the thermomechanical properties of durum wheat semolina blends using the Mixolab system, which simultaneously measures dough behaviour during mixing and controlled heating and cooling, providing information on protein weakening, starch gelatinization, cooking stability, and starch retrogradation.Progressive substitution with pumpkin flesh flour significantly increased water absorption from 57.3% in the control to 72.2% at 50% substitution, while dough development time increased from 3.27 to 7.75 min. Increasing flesh flour levels reduced starch gelatinization (C3), cooking stability (C4), and starch retrogradation (C5). At 50% substitution, C3 decreased from 1.864 to 1.271 Nm, C4 from 1.631 to 0.916 Nm, and C5 from 2.355 to 1.035 Nm.Pumpkin peel flour produced an even greater increase in water absorption (63.2–77.0%) and prolonged dough development time (8.30–9.75 min). It also reduced C3 (1.589–1.472 Nm), C4 (1.131–0.845 Nm), and C5 (1.598–1.055 Nm), indicating reduced starch paste stability and lower retrogradation during cooling. In both formulations, C2 values remained relatively stable, suggesting that the observed changes resulted primarily from fibre–starch interactions rather than protein weakening.These findings demonstrate that pumpkin flesh and peel flours substantially modify the thermomechanical behaviour of semolina doughs by increasing water absorption and reducing starch gelatinization and retrogradation. Pumpkin peel, as an underutilized processing by-product, shows particular potential as a sustainable functional ingredient for high-fibre cereal products.



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Sciforum-202258: Characteristics of Latvian Red Wines Produced from Local Grape Varieties

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Grape variety, fermentation conditions, and winemaking practices determine wine quality and its characteristics. Although wine production in Latvia has traditionally relied on berries and fruits, local climatic conditions also support the cultivation of grape varieties suitable for producing high-quality wines, thereby contributing to the development of the domestic wine industry.

This study aimed to evaluate the physicochemical properties of Latvian-produced red wines. The volatile compound profile, phenolic content, antioxidant activity, and physicochemical characteristics of red wines produced primarily from the grape varieties *Zilga*, *Valiant*, and their blends were analysed. Physicochemical, spectrophotometric, and statistical methods were used to characterise wines from different Latvian wineries.

Statistically significant differences between the samples were determined using one-way analysis of variance (ANOVA) followed by Tukey's test, with $p \leq 0.05$ considered statistically significant. Hierarchical analysis and a heatmap were used to analyse the volatile compound data. Volatile aroma compounds were analysed by headspace solid-phase microextraction (HS-SPME) using a CAR/PDMS fibre, followed by GC–MS analysis (PerkinElmer Clarus 500) on a capillary column.

The results revealed considerable variability among the analysed wines. Alcohol content ranged from 8.97% to 15.11% (v/v). Lactic acid concentrations ranged from 0 to 3.85 g/L, with *Zilga* wines mostly at 0.5 to 1 g/L, indicating differences in malolactic fermentation intensity; while volatile acidity ranged from 0.22 to 0.67 g/L. Based on residual sugar content, 65% of the wines were classified as dry, 24% as semi-sweet, and 11% as sweet wines.

Volatile compound analysis revealed significant differences among samples. Total phenolic content ranged from 278 to 1,533 mg GAE/L, with higher amounts in *Zilga* wines. Antioxidant activity measured by DPPH ranged from 17.37 to 50.27 mmol TE/L and by ABTS from 86.4 to 923 mmol TE/L.

The findings demonstrate that Latvian-produced red wines possess diverse physicochemical and bioactive characteristics. The results provide a foundation for further studies on Latvian red wines.



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Sciforum-203230: Development and Nutritional Characterization of Multispecies Seaweed Chips from Philippine Seaweeds

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Seaweeds are valuable marine resources with potential for utilization in value-added food products. This study explored the development and proximate composition of multispecies seaweed chips formulated from *Caulerpa* and *Eucheuma* species available in the Philippines. Three formulations with *Caulerpa*:*Eucheuma* ratios of 75:25, 50:50, and 25:75 were developed and evaluated during the product development process. The 50:50 formulation was selected for proximate characterization based on its overall product acceptability. Proximate composition was determined using applicable methods of the Association of Official Analytical Chemists (AOAC). The selected formulation contained 12.01% moisture, 12.51% ash, 2.58% crude protein, 2.34% crude fiber, 3.81% crude fat, and 66.75% carbohydrate. These results provide baseline information on the proximate composition of a chip product formulated by combining *Caulerpa* and *Eucheuma*. The findings support the feasibility of developing multispecies seaweed chips using locally available Philippine seaweeds and provide a basis for further formulation and process optimization. The study does not establish specific health or nutritional benefits beyond the proximate composition determined. Future studies should investigate storage stability, detailed nutritional and functional properties, and appropriately designed and ethically approved consumer or sensory evaluations. Overall, the study provides preliminary compositional information that may support further development of seaweed-based snack products.



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Sciforum-203295: Stabilizer-dependent physical stability of vitamin-fortified coconut milk alternatives

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Plant-based coconut beverages are oil-in-water emulsions in which lipid-phase separation may reduce visual quality, shelf-life stability, and consumer acceptance. The incorporation of functional ingredients, including vitamin premixes, may additionally affect interactions between fat droplets, hydrocolloids, and the aqueous phase. Therefore, the selection of an appropriate stabilizing system is essential for maintaining the physical stability of fortified coconut milk alternatives.

The aim of this preliminary study was to evaluate the physical stability of vitamin-fortified coconut beverage formulations stabilized with selected food-grade hydrocolloid systems: gellan gum, xanthan/locust bean gum blend, and a commercial emulsifier/stabilizer blend composed of mono- and diglycerides of fatty acids, carrageenan, and guar gum (Recodan CM). Non-fortified coconut beverage variants stabilized with gellan gum or xanthan/locust bean gum were used as reference samples. Stability was assessed using analytical photocentrifugation with a LUMiSizer dispersion analyzer at 870 nm over approximately 3000 s. The instability index was used as the main parameter describing the tendency toward sedimentation and lipid-phase separation.

The stability of vitamin-fortified coconut beverages depended on the stabilizing system. Fortified samples containing gellan gum showed instability index values ranging from 0.183 to 0.372, while formulations with the commercial emulsifier/stabilizer blend showed intermediate values of 0.379-0.414. In contrast, vitamin-fortified samples stabilized with the xanthan/locust bean gum blend showed the highest instability index values, ranging from 0.564 to 0.600, indicating a greater tendency toward phase separation under accelerated test conditions. The non-fortified reference variants showed instability index values of 0.295–0.307. Compared with the respective non-fortified controls, vitamin fortification markedly increased instability in the xanthan/locust bean gum system (0.564–0.600 vs. 0.305), whereas the gellan gum system showed a variable response, with fortified samples ranging from 0.183 to 0.372 compared with 0.295-0.307 for the non-fortified reference samples.

The results indicate that vitamin fortification affected the physical stability of coconut milk alternatives in a stabilizer-dependent manner, with a clear destabilizing effect in the xanthan/locust bean gum system but no consistent unidirectional effect in the gellan gum system. Formulations containing gellan gum or the mono- and diglyceride/carrageenan/guar gum stabilizing system showed lower instability than those stabilized with xanthan/locust bean gum.



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Sciforum-203310: Physicochemical properties of stored *Ga* and *Fante* Kenkey *Aflata*-mix from maize-sweet potato composite dough

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Kenkey, a staple maize dough dumpling widely consumed in Ghana, exists primarily in two forms: *Ga* kenkey and *Fante* kenkey. Traditionally, production relies on fermented maize dough, part of which is partially cooked into *aflata* and mixed with uncooked dough to form the *aflata*-mix. The integrity of this *aflata*-mix is critical to the quality of the final product. Recently, there has been growing interest in incorporating doughs from other crops, such as sweet potato, into composite formulations. In such cases, some practitioners suggest preparing *aflata* before fermentation, though no empirical evidence has validated this approach. This study aimed to evaluate the physicochemical stability of maize–sweet potato (70:30) composite dough in kenkey production, specifically testing whether *aflata* preparation prior to fermentation influences product quality during storage. The design involved two fermentation times (0, 2 days), two kenkeys (*Ga* and *Fante*) *aflata* and *aflata*-mixes stored for ten different times (0, 2, 7, 14, 21, 28, 35, 42, 47 and 56 days) under ambient conditions and analyzed for physicochemical properties (pH, titratable acidity, total soluble solids and syneresis). The pH was within the acidic region (3.5 – 5.5) for the samples. Titratable acidity increased as storage time increased for all the samples (0.5 – 7%). Soluble solids did not follow a specific trend but the values were higher for the unfermented dough *aflata* and *aflata*-mixes than for the fermented products. For both kenkey ingredients, *aflata* maintained perfect structural integrity for the first 28 days and showed comparable syneresis. This study provides the first empirical evidence on the impact of fermentation timing in composite dough kenkey ingredients. These findings highlight the potential of composite kenkey formulations to enhance product diversification for consumers as well as the nutritional benefits from sweet potato inclusion, and improve self-life management in traditional foods.



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Sciforum-209580: Effect of Wet Ageing on the Proximal Composition and Mineral Profile of Meat from Adult Serpentina Goats

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Goat meat from adult animals is frequently undervalued because of its lower tenderness and more intense flavor. Wet ageing may represent a suitable technological strategy for increasing the value of this product, particularly in autochthonous breeds such as Serpentina, which are important for the preservation of local genetic resources and the sustainability of rural food systems. This study evaluated the effect of 14 days of wet ageing on the proximal composition and mineral profile of meat from adult Serpentina goats. Four female goats, aged 8 – 12 years and with an average carcass weight of 20.6 ± 1.7 kg (mean ± SD), were slaughtered in a commercial slaughterhouse. On the third day *post-mortem*, the left *Longissimus thoracis et lumborum* muscle was vacuum-packaged and stored at 2 ± 2 °C for 14 days. **A portion from the right *Longissimus thoracis et lumborum* muscle collected on third day *post-mortem* was used as the non-aged reference.** Non-aged and wet-aged meat samples were analyzed for moisture, protein, total lipids, ash and mineral composition. Wet ageing significantly reduced moisture content, from 77.9 to 76.5 % ($P = 0.01$), and decreased Fe, Cu and B concentrations from 3.6 to 2.6, 0.20 to 0.13 and 0.65 to 0.34 mg/100 g, respectively ($P < 0.05$). Protein, ash and the remaining minerals were not significantly affected by the ageing process. Although total lipid content increased numerically from 1.3 to 2.9 g/100 g, this difference was not significant ($P = 0.17$) and may be **associated with natural intramuscular variance. The reduction in Fe, Cu and B is likely due to loss exudate that accumulates inside the vacuum packaging during storage**. Overall, 14 days of ageing modified moistures and selected mineral contents while exerting a limited effect on the proximal composition of goat meat, **however, further studies evaluating texture and sensory properties are needed to fully confirm its effectiveness.**



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Session D. Food Microbiology & Biotechnologies

Sciforum-181916: A Comparative Analysis of Turbidity and Impedance Measurements for Rapid Quantification of *Bacillus cereus* in Milk Across Diverse Temperatures and Salt Concentrations

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Quickly quantifying *Bacillus cereus* in milk is crucial for controlling spoilage and toxin-related food safety risks in refrigerated and temperature-abused dairy products. This study evaluated a turbidimetric microplate reader (Bioscreen Co Pro™) versus an impedance-based microbiological analyzer (BacTrac 4300) for rapidly estimating *B. cereus* levels in skim milk incubated at four temperatures (10, 20, 30, or 37 °C) and four sodium chloride concentrations (0.11, 0.8, 1.5, or 3.0% w/v NaCl). Samples were taken at 24 and 72 h. The instruments produced optical density ($OD_{600\ nm}$) and impedance (M-value change) time curves, which were fitted to the Baranyi and Roberts model to accurately determine detection times (DTs). These DTs were then correlated with plate counts to generate calibration equations. Both methods demonstrated strong linear relationships between DT and initial inoculum (log_{10} CFU/mL), as well as between predicted and actual bacterial counts across all temperature-salinity-time conditions (R-squared of 0.82 for turbidity and 0.90 for impedance). Impedance predictions aligned more closely with plate counts, particularly at 20-37 °C and 72 h, while turbidimetric estimates tended to underestimate actual concentrations but still effectively reflected environmental influences on *B. cereus* growth. Impedance primarily detects metabolically active cells, making it a better indicator of cells relevant to spoilage and toxin production. In contrast, turbidimetry captures signals from viable cells, dead biomass, debris, and spores. Overall, both rapid DT-based techniques provide valuable quantification of *B. cereus* in milk, but impedance microbiology offers greater accuracy and quicker results for urgent food safety decisions, whereas turbidimetry remains a practical, high-throughput alternative when slight underestimation is acceptable.



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Sciforum-186035: Combined *Lacticaseibacillus rhamnosus*-Derived Lysate and *Cannabis* spp. Extracts Enhance Epithelial Restitution in a Caco-2 Wound Healing Model

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Intestinal epithelial integrity underpins gastrointestinal homeostasis, and its disruption is associated with dysbiosis, inflammation, and impaired barrier function. Postbiotic fractions derived from probiotic bacteria and plant bioactive compounds are increasingly investigated as candidates for functional food strategies aimed at promoting mucosal repair - yet their combined effects remain largely unexplored.

We examined how a protein-enriched lysate/supernatant from *Lacticaseibacillus rhamnosus* DSM 20711, alone and together with ethanolic *Cannabis* spp. extracts influence re-epithelialization in a standardised Caco-2 wound-healing model. Confluent monolayers were grown using Ibidi culture inserts; after insert removal, cells were exposed to *Cannabis* extracts (3.25, 7.5, or 15 µg/mL) with or without *L. rhamnosus* lysate/supernatant (6.25%). Gap closure was tracked over 92 h by time-lapse confocal imaging (Echo microscope, 37 °C, 5% CO_2, 8 h intervals), and residual wound area was quantified in Image-Pro v11.

Combined treatments enhanced wound closure compared with both the untreated control and either component applied alone. The response was non-linear: the two lower extract concentrations (3.25 and 7.5 µg/mL) elicited the most pronounced pro-migratory effect, reducing the remaining wound area by up to 50% relative to controls within the 48–64 h window, whereas the highest concentration was markedly less active.

Taken together, these data point to a potentially beneficial interaction between *Cannabis* spp. bioactives and *L. rhamnosus*-derived postbiotics in supporting epithelial barrier restoration, with implications for both functional food development and microbiome-targeted therapeutic strategies.

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Sciforum-190652: In Silico Assessment of Thymol as a Natural Plant-derived Antibacterial Candidate against *Pseudomonas aeruginosa*

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Introduction: *Pseudomonas aeruginosa* is a Gram-negative opportunistic pathogen of relevance to food microbiology, biofilm formation, and antibiotic resistance. The inclusion of carbapenem-resistant *P. aeruginosa* among high-priority pathogens in the 2024 World Health Organisation Bacterial Priority Pathogens List highlights the need for new antibacterial candidates. This study aims to evaluate thymol against *P. aeruginosa* using an integrated in silico bioinformatics and cheminformatics approach.

Methods: The in silico workflow first evaluated thymol for physicochemical properties, predicted pharmacokinetic characteristics, and drug-likeness using the Swiss Absorption, Distribution, Metabolism and Excretion web tool (SwissADME). Literature-relevant *P. aeruginosa* protein targets with resolved structures were selected from the Research Collaboratory for Structural Bioinformatics Protein Data Bank (RCSB PDB), after which potential binding pockets were identified using the Computed Atlas of Surface Topography of Proteins (CASTp). Docking calculations were performed in triplicate using AutoDock Vina. Binding orientations and interaction patterns were then analysed using the Python Molecular Graphics System (PyMOL), University of California, San Francisco Chimera (UCSF Chimera), and BIOVIA Discovery Studio Visualiser.

Results: Thymol showed a favourable in silico profile, with predicted pharmacokinetic and drug-like properties consistent with Lipinski's Rule of Five. Triplicate molecular docking indicated plausible interactions with the selected *P. aeruginosa* targets, supporting the prioritisation of thymol for further experimental investigation. These findings are consistent with existing in vitro evidence reporting antibacterial and anti-biofilm activity of thymol against *P. aeruginosa*, as well as the activity of thymol-rich essential oils against antibiotic-resistant *P. aeruginosa* isolates.

Conclusions: This study suggests plausible molecular interactions between thymol and selected *P. aeruginosa* targets. These findings should be validated experimentally, starting with in vitro antibacterial and antibiofilm assays that include antibiotic-resistant isolates, followed by mechanistic studies and in vivo assessments to evaluate safety and efficacy.



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Sciforum-192101: Development of type II sourdoughs using *Lactiplantibacillus plantarum* CIDCA 8327 in gluten-free matrices

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Sourdough fermentation is a well-established biotechnological strategy for improving the technological and nutritional properties of bakery products. The use of selected lactic-acid bacteria (LAB) as starter cultures in type II sourdoughs represents a tool for gluten-free product development. This study aimed to characterize type II sourdoughs using *Lactiplantibacillus plantarum* CIDCA8327 as a starter culture in two gluten-free matrices: chia expeller (CE) and a blend of chia expeller with buckwheat flour (1:1, CE:BF), with dough yields of 400 and 300, respectively. Bacterial suspensions were prepared from MRS cultures (37 °C, 24 h), centrifuged, and resuspended to achieve an inoculum of 7 log CFU/g. Fermentation was conducted at 30 °C for 24 h. Sourdoughs were characterized for LAB counts (MRS agar), yeast and mold counts (Sabourade agar), pH, titratable acidity (% lactic acid), free amino acid content (ninhydrin method), and antioxidant activity (DPPH radical inhibition assay). After fermentation, LAB counts increased significantly, reaching 9.60±0.06 log CFU/g in CE and 9.01±0.02 log CFU/g in CE:BF, while mold and yeast found were $<$4 log CFU/g in both samples. The pH decreased from 6.1 to 4.40 in CE and from 6.2 to 3.66 in CE:BF, while titratable acidity increased to 1.04 and 1.84% lactic acid in CE and CE:BF, respectively. Free amino acid content increased significantly in CE (from 21.8 to 42.4 mg glycine/100g), indicating active proteolytic activity, while the CE:BF matrix showed high baseline amino acid levels (47.5 mg/100g) with no significant further increase post-fermentation. Antioxidant activity improved markedly in both matrices, with DPPH inhibition increasing from 12.4 to 37.4% and from 26.3 to 56.5% in CE and CE:BF, respectively. These results demonstrate that *L. plantarum* CIDCA8327 effectively ferments gluten-free substrates based on chia and buckwheat, producing type II sourdoughs with enhanced proteolysis, and improved antioxidant capacity, supporting its potential for their use in functional breadmaking.



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Sciforum-194322: Bioprocessing of Olive Mill Wastewater Sludge-Derived Subcritical Water Extracts (SWE) by Lactic Acid Bacteria

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Olive mill wastewater (OMW) and the sludge accumulated in evaporation ponds represent major environmental challenges in Mediterranean olive oil-producing areas because of their high organic load, phytotoxicity and complex composition. Despite their potential as sources of phenolics and fermentable substrates, lactic fermentation of phenolic-rich aqueous extracts obtained from OMW sludge through subcritical water extraction (SWE) remains scarcely investigated. This study evaluated their suitability as fermentation substrates. The selected extract combined the highest phenolic enrichment, representing a high-value but potentially inhibitory matrix, with the greatest reducing sugar content as an endogenous carbon source. Preliminary assays with *Lactiplantibacillus plantarum* under non-limiting carbon conditions identified a 75% (v/v) extract dilution as the best compromise between microbial compatibility and phenolic retention. Enzymatic conditioning with pectinase, xylanase and cellulase mobilised endogenous carbohydrates, reaching approximately 50 g glucose equivalents/L without external glucose supplementation. Fermentations at 37 °C for 180 h with *L. plantarum* and a wheat-associated *Pediococcus pentosaceus* strain showed rapid acidification, reaching final pH values of approximately 4.0 and 3.75, respectively, sustained viability at 10^8 - 10^9 CFU/mL and partial utilisation of reducing sugars during the first 24 h. Total phenolic content remained stable at approximately 2.5 mg GAE/mL, while strain-dependent functional and physicochemical changes, including matrix clarification with *P. pentosaceus*, were observed. These findings support an integrated extraction-conditioning-fermentation strategy to convert OMW sludge into phenolic-rich, fermentable matrices for the sustainable development of value-added bioproducts.

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Sciforum-195704: Solid-State Fermentation for Upcycling Agro-Industrial Side Streams into Value-Added Biomass within Circular Food and Bio-Based Systems

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The increasing availability of agro-industrial side streams has intensified the search for sustainable biotechnological approaches capable of generating added value while reducing waste. Solid-state fermentation (SSF) is recognized as an efficient microbial process for upgrading agricultural residues into valuable products using limited water and energy resources. Within the Pomacle–Bazancourt biorefinery ecosystem in France, large quantities of agricultural by-products are generated and represent promising feedstocks for bio-based applications. Rapeseed cake, hemp oil cake, wheat and alfalfa by-products, and sugar beet pulp were investigated as substrates for SSF. Selected microbial strains were evaluated in combination with physical and chemical pretreatments. Fermentation trials were initially conducted in Erlenmeyer flasks and subsequently transferred to packed-bed bioreactors. Microbial growth, heat production, and mass transfer phenomena were monitored throughout the process. In parallel, Digital Twin simulations were used to support process optimization and evaluate scale-up potential. The investigated side streams supported efficient microbial growth and bioconversion. SSF enabled the generation of value-added products, including bioactive compounds, vitamins, enzymes, natural pigments, flavoring agents, and biomaterials. These products demonstrated potential relevance for several industrial sectors, including food, feed, cosmetic, and textile applications. Process optimization focused on improving productivity while maintaining technical and industrial feasibility. A complementary market-oriented analysis was also performed to assess valorization opportunities. The findings demonstrate the potential of SSF as a sustainable biomass-upgrading strategy for transforming agro-industrial side streams into value-added products. By supporting resource efficiency and biomass valorization, SSF contributes to the development of circular bio-based value chains and offers a sustainable pathway for future food and bio-based production systems.



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Sciforum-195896: Sustainable Valorization of Berry Seed By-Products: Effects of Blackcurrant and Raspberry Seed Oils on Sessile-Cell Metabolism in Bacterial Biofilms of Food and Public Health Relevance

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The recovery of value-added compounds from agro-industrial by-products represents a sustainable strategy for developing novel functional ingredients. Berry seed oils, often discarded during fruit processing, are rich in bioactive lipids and may represent promising natural antibiofilm agents for controlling biofilm-forming bacteria relevant to food safety and public health. This study comparatively investigated the fatty acid composition of blackcurrant (*Ribes nigrum*) and raspberry (*Rubus idaeus*) seed oils and evaluated their effects on the metabolic activity of sessile cells in immature and mature bacterial biofilms. Fatty acid profiles were determined by GC–MS, while the metabolic activity of sessile cells was evaluated by the MTT reduction assay against immature (MTT0) and mature (MTT24) biofilms formed by *Acinetobacter baumannii*, *Escherichia coli*, *Klebsiella pneumoniae*, *Listeria monocytogenes*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*. Oils were tested at 5 and 10 μL/mL. Blackcurrant seed oil contained high proportions of α-linolenic (21.37%), linoleic (46.45%), and oleic acids (16.44%), whereas raspberry seed oil was enriched in linoleic (59.72%) and oleic acids (22.86%) and lacked detectable α-linolenic acid. Despite these compositional differences, both oils reduced the metabolic activity of sessile cells, particularly at 10 μL/mL. In immature biofilms, blackcurrant seed oil showed the greatest reduction in sessile-cell metabolic activity against *L. monocytogenes* (58.00%), *S. aureus* (58.52%), and *P. aeruginosa* (57.50%), whereas raspberry seed oil was more effective against *E. coli* (42.34%) and *K. pneumoniae* (43.13%). In mature biofilms, raspberry seed oil reduced sessile-cell metabolic activity by up to 54.46% against *L. monocytogenes*, whereas blackcurrant seed oil achieved reductions of 46.69% against *K. pneumoniae* and 37.41% against *A. baumannii*. These findings support the sustainable valorization of berry-processing by-products and identify berry seed oils as promising natural antibiofilm agents for food biopreservation strategies aimed at reducing biofilm-associated microbial persistence.



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Sciforum-195986: A Proof-of-Concept ImageJ/Fiji Workflow for Single-Cell Analysis of Lipid Accumulation in Oleaginous Yeasts

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Sustainable bioprocess development would benefit from accessible and reproducible approaches for assessing microbial lipid accumulation across strains and cultivation conditions. Oleaginous yeasts are promising producers of single-cell oil (SCO), but conventional lipid quantification methods are often time-consuming, destructive, or poorly suited to capturing single-cell heterogeneity. Image-based analysis may therefore provide a useful complementary approach for early-stage screening, particularly when intracellular lipid distribution and cell-to-cell variability are relevant.

Here, we present a proof-of-concept ImageJ/Fiji workflow for semi-automated single-cell analysis of intracellular lipid accumulation in oleaginous yeasts. The workflow was developed using representative unpublished fluorescence microscopy images from preliminary lipid-staining experiments. Yeast cells are stained with a lipid-selective fluorophore, such as Nile Red, and imaged under controlled fluorescence microscopy settings. Images are analyzed in Fiji/ImageJ using a macro-assisted batch workflow. Cell regions are segmented from the bright-field or brightness channel, while lipid-rich structures are detected from the green fluorescence channel after background correction, White Top Hat enhancement, automatic thresholding, and particle analysis. Segmentation overlays are used for visual quality control.

The workflow is designed to extract descriptors such as lipid-droplet number per cell, droplet area fraction, integrated fluorescence intensity, and distribution-based measures of population heterogeneity. Quality-control steps, including overlay inspection and illumination assessment, are included to support consistent analysis and reduce manual interpretation.

This concept is intended as a preliminary image-analysis approach for comparing lipid accumulation patterns under different experimental conditions, including carbon source, C/N ratio, cultivation time, and stress induction. Future work will focus on validating ImageJ/Fiji-derived parameters against reference lipid measurements, including gravimetric lipid content and fatty-acid profiling, to assess their suitability for screening and comparative phenotyping.

Overall, the proposed workflow may support image-based phenotyping of lipid accumulation in oleaginous yeasts and early-stage comparison of microbial candidates for SCO-oriented bioprocess development.



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Sciforum-196087: Identification by MALDI-TOF MS and probiotic characterization of *Enterococcus faecium* strains isolated from equine milk

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Developing innovative functional foods requires selecting robust, biologically active probiotic microorganisms capable of tolerating processing conditions and gastrointestinal transit. Non-bovine milk serves as a unique repository of underexplored lactic acid bacteria (LAB) with promising health-promoting properties.

This study aimed to isolate, identify, and evaluate LAB strains from raw Algerian equine milk for their technological, safety, and probiotic characteristics.

Nine isolates were screened for environmental adaptability under technological stresses (2–6.5% NaCl, 10–63.5°C, pH 9.8) and subjected to a rigorous *in vitro* simulated gastrointestinal transit model, including sequential exposure to salivary α-amylase, gastric fluid (pH 2), intestinal fluid (0.05 g/L bile salts, 0.1 g/L lysozyme), and pancreatic enzymes. DPPH radical scavenging capacity, and antagonistic action against five foodborne pathogens, using agar well diffusion method, were also quantified. High-throughput proteomic profiling via MALDI-TOF MS ensured accurate taxonomic classification.

Nine isolates showed strong physiological tolerance, growing in up to 6.5% NaCl and surviving alkaline conditions (pH 9.8). Strains S5 and S8 exhibited high survival rates (>70%) under simulated gastric conditions (pH 2.0, 120 min), exceeding the survival of the reference probiotic strain Bb12. Both strains maintained viability under simulated intestinal conditions containing lysozyme (0.1 g/L) and bile salts (0.05%). MALDI-TOF MS identified S5 and S8 as *Enterococcus faecium* with high-confidence identification scores of 2.40 and 2.36, respectively. Strain S8 showed antimicrobial activity against *Staphylococcus aureus* (15.33 mm) and *Bacillus cereus* (16.33 mm) and demonstrated antioxidant activity of 67.74 ± 1.0%, comparable to the reference strain Bb12 (63.84%).

These findings indicate that equine-milk-derived *E. faecium* S5 and S8 exhibit promising technological and bioactive properties. However, given the opportunistic nature of this species and the potential risk of antibiotic resistance gene transfer, extensive safety profiling, including virulence gene screening and in vivo validation is mandatory before considering these strains for functional food applications.



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Sciforum-196111: Hurdle technologies for the preservation of nixtamalized tortillas: application of sous vide processing and refrigerated storage

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The short shelf life of nixtamalized tortillas, caused by textural changes and microbial spoilage, represents a critical challenge for their industrial commercialization. This study was the first to evaluate the effect of *sous vide* treatment as a novel alternative for extending shelf life without chemical preservatives. All tortilla formulations, including control, were supplemented with 0.4% carboxymethyl cellulose (CMC) and vacuum-sealed in polyamide films. Tortillas were thermally processed in a circulating water bath at 65 °C for 30 min, then stored at 25 °C and 4 °C. Control samples (vacuum-sealed without thermal treatment) exhibited rapid proliferation of lactic acid bacteria and coliforms, losing flexibility and reaching critical rollability limits (>3) after only 5 days of storage. In contrast, the *sous vide* treatment significantly reduced the initial vegetative microbial load. At 25 °C, treated tortillas remained stable for two months before rejection due to visible fungal growth. The combination of *sous vide* processing and refrigerated storage at 4 °C proved to be the most effective strategy, controlling microbial metabolic activity, maintaining moisture content above 42%, delaying increases in cutting force and textural tension, and preserving adequate rollability (<3) for up to 4 months. These results demonstrate that *sous vide* and refrigeration are a promising preservative-free strategy for extending the shelf life of nixtamalized tortillas, and this approach may promote the development of clean-label products.



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Sciforum-196627: Response Surface Optimization of Goat Milk Kefir Fermentation for Improved Physicochemical and Microbiological Quality

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Introduction: Goat milk kefir is gaining increasing attention as a functional fermented dairy product because of its digestibility, nutritional value, and potential probiotic properties. However, its quality is strongly influenced by fermentation conditions, including grain-to-milk ratio, temperature, and fermentation time. This study aimed to optimize goat milk kefir production using a Box–Behnken design combined with response surface methodology to establish a reproducible protocol with targeted physicochemical and microbiological characteristics.

Methods: A three-factor, three-level Box–Behnken design comprising 14 experimental runs, including center points, was applied. The independent variables were grain-to-milk ratio, fermentation temperature, and fermentation time. The evaluated responses included pH, titratable acidity, syneresis, total solids, proteolytic activity, lactic acid bacteria, yeasts and molds, and total aerobic mesophilic count. Data were analyzed by ANOVA and fitted to second-order polynomial models to determine the effects of fermentation parameters and identify optimal processing conditions.

Results: All three factors significantly affected kefir quality. The experimental ranges were pH 4.0–4.9, titratable acidity 60–115 °D, syneresis 22–40%, total solids 11.3–13.4%, proteolytic activity 0.38–0.95 mg Gly/mL, and lactic acid bacteria 6.9–9.1 log CFU/mL. Increasing grain-to-milk ratio and temperature accelerated acidification and microbial growth, whereas longer fermentation enhanced proteolysis. The optimized region achieved LAB counts above 9.0 log CFU/mL, titratable acidity above 110 °D, and syneresis below 30%.

Conclusions: The optimized conditions, namely 1.5% kefir grains, 30 °C, and 22 h, provide a reproducible protocol for producing goat milk kefir with strong probiotic potential and controlled technological quality. These conditions may support future shelf-life and pathogen-control studies.



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Sciforum-196641: Screening Safe and Functional Lactic Acid Bacteria from Argan Press Cake for Food Biopreservation Applications.

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Introduction: Argan press cake, a nutrient-rich by-product of argan oil extraction, remains underexploited despite its potential as a reservoir of functional microorganisms. Its microbial diversity may provide lactic acid bacteria with applications in food safety, fermentation, and biopreservation. This study aimed to isolate lactic acid bacteria from argan press cake and evaluate their antimicrobial activity, safety attributes, and technological properties.

Methods: 480 bacterial isolates were recovered from 10 argan press cake samples. Antagonistic activity was screened by double-layer and agar well diffusion against *Listeria monocytogenes* CECT 4032, *Staphylococcus aureus* CECT 976, and *Salmonella* spp. CECT 704. Inhibition zones and active isolates were recorded. Assays used anaerobic conditions and buffered MRS and GM17 (pH 6.5) to minimize the contribution of hydrogen peroxide and organic acids to the observed antimicrobial activity. Safety assessment comprised hemolytic, DNase, and gelatinase activities, together with antimicrobial susceptibility determined by the disk diffusion method. Technological characterization covered amylolytic, lipolytic, citrate-utilizing, proteolytic, and diacetyl-producing activities. Isolates were presumptively identified using API 20 STREP.

Results: Among the 480 isolates, 28 showed activity against *L. monocytogenes* (12–20 mm), while 6 were active against *S. aureus* (15–17 mm); no activity was observed against *Salmonella* spp. All selected isolates were Gram-positive, catalase-negative, non-hemolytic, and negative for DNase and gelatinase. Most isolates were susceptible to the tested antibiotics; resistance was mainly observed against kanamycin (9/28), one isolate was resistant to vancomycin, and 18/28 showed intermediate susceptibility to gentamicin. Most isolates showed proteolytic and diacetyl-producing activities, whereas amylolytic, lipolytic, and citrate-utilizing activities were absent. Seven isolates were presumptively identified as *Lactococcus lactis*.

Conclusion: Argan press cake represents a valuable source of lactic acid bacteria with favorable preliminary safety and technological characteristics. The selected isolates may be promising candidates for further investigation as natural biopreservatives or starter cultures in food fermentation systems, pending additional strain-level characterization and validation in food matrices.



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Sciforum-197042: Carvacrol and organic acids marination in chicken fillets. An antimicrobial and antioxidant approach

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Introduction: Bioactive compounds and organic acids are being applied for a wide range of foods against different types of food-borne pathogens. In the present study, carvacrol (1000mg/L) was applied in wine-based marinades, alone or in combination with tartaric acid, malic acid, ascorbic acid, citric acid and acetic acid (0.5% & 1% w/v), in chicken fillets and their antimicrobial activity, antioxidant capacity and pH were estimated during refrigerated storage.

Methods: Likewise, their antimicrobial activity was recorded versus *Enterobacteriaceae*, Total Mesophilic Bacteria*, Staphylococcus* spp. ,Yeasts/moulds & Lactic Acid Bacteria (LAB) . Meat samples were keptunder refrigerated storage (4^{o}C)during the total experimental time which reached 11 days . Samples were taken for analyses during 1st-3rd-5th-7th-9th & 11th day, for decimal dilutions after overnight incubation at 37^{o}C. The Total Phenolic Content (TPC) and the antioxidant activity of the applied marinades were determined with the use of Folin- Ciocalteau method and ABTS & DPPH radical scavenging activity methods, respectively. As control, meat samples mariated only with wine and salt were used.

Results: The results of the present study demonstrated that the application of wine-based marinades containing organic acids significantly affected the physicochemical properties and microbiological stability of chicken meat during refrigerated storage.

Among the microbial groups examined, the strongest inhibitory effect was observed for *Enterobacteriaceae* and total viable counts, where marinated samples showed reductions of up to 2 log CFU/g compared with the control during intermediate storage days. Similar trends were also observed for *Staphylococcus* spp., lactic acid bacteria, and yeast/mold populations, although the magnitude of inhibition varied among microbial groups.

The pH results showed that marinated samples maintained lower pH values (3,76-5,3) compared with the control samples (4,2-5,5). Furthermore, in terms of antioxidant properties, the results of the DPPH(327-393 μg Trolox/mL) , ABTS (655-720 μg Trolox/mL) and total phenolic content assays (0,7-1,2 mg GA/mL) demonstrated that the marinades exhibited higher anti-oxidative values in comparison with their respective controls.

Conclusions: These findings highlight the potential of such marinades as a natural preservation strategy for improving the safety, quality, and shelf life of poultry products.



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Sciforum-197073: Modelling the Combined Effects of PH and Temperature on Biofilm Formation Dynamics of A Multidrug Resistance Strain of *Staphylococcus Aureus*

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Staphylococcus aureus is a resilient pathogen capable of forming biofilms that promote survival in food processing environments. Understanding how environmental factors such as pH and temperature interact over time is essential for developing effective control strategies.

This study evaluated the biofilm-forming capacity of a multidrug-resistant (penicillin, cefoxitin, erythromycin, trimethoprim) S. aureus strain isolated from Portuguese traditional sausages, grown in glucose tryptic soy broth under optimal and suboptimal conditions. Under a full factorial design, biofilm formation in microplates was assessed at pH levels (4.5, 5.5, 6.5), temperatures (15°C, 25°C, 35°C), and incubation times (3 h, 24 h, 48 h), with optimal conditions (pH 7, 35°C) used as a baseline to calculate biofilm inhibition (%).

Biofilm biomass was quantified using crystal-violet staining and optical density at 570 nm, with the aim of developing mixed-effects models to describe biofilm accumulation and inhibition under stress conditions. Random effects accounted for clustering within microplate wells, and model goodness-of-fit was evaluated. The logit biofilm model indicated that production increased significantly with temperature ($p < 0.001$), pH ($p < 0.001$), and time ($p < 0.001$), with positive interactions among these factors. A negative quadratic effect of time ($p < 0.001$) revealed a deceleration phase, leading to a plateau influenced by temperature and pH. Mean inhibition ranged from 50 to 98%, demonstrating reduced control efficacy as conditions approached the neutral-thermal optimum. Inhibition (%) increased quadratically over time under adverse conditions. However, unlike the biofilm model, the interaction between pH and time was not significant for inhibition (%). Both models showed that within-well variance represented approximately 26% of total variability, while the highest between-well variability occurred under the least favorable conditions (pH 4.5, 15°C).

The developed mathematical models, currently based on in-vitro screening provide a robust framework for predicting S. aureus biofilm behavior under fluctuating environmental conditions, supporting improved control strategies in food safety and clinical contexts.



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Sciforum-197102: Impact of *Lachancea thermotolerans* inoculation on microbial diversity during Spanish-style green table olive fermentations

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Table olives are among the most widely consumed fermented vegetable products worldwide, with production largely concentrated in Mediterranean countries such as Spain, Italy, and Greece. Despite their economic importance, the industry continues to face technological challenges, particularly the poor initial survival and implantation of commercial starter cultures. This limitation has driven increasing interest in the exploration of alternative microorganisms with enhanced adaptability and biotechnological potential.

In this study, the effect of selected *Lachancea thermotolerans* strains was evaluated in Spanish-style green table olive fermentations, followed by sequential inoculation with *Lactiplantibacillus plantarum*. Fermentation dynamics were monitored through physicochemical and microbiological analyses. In addition, a metagenomic approach was applied to characterize microbial community evolution and to assess the possible impact of *L. thermotolerans* inoculation. Sensory evaluation of the final products was also performed.

Metagenomic results revealed a remarkable and sustained persistence of *L. thermotolerans* throughout the fermentation process, with detectable abundance maintained for over 90 days. Furthermore, fermentations inoculated with the *L. thermotolerans*– *L. plantarum* consortium showed accelerated acidification kinetics, promoting the rapid establishment and dominance of lactic acid bacteria, while improving organoleptic profiles and sensory scores compared to controls.

Overall, the studied *L. thermotolerans* strains demonstrate significant potential as robust starter cultures for table olive fermentation, particularly due to their exceptional persistence as evidenced by metagenomic analysis. These findings support their application as a strategy to improve fermentation reliability and product quality. Further studies at industrial scale are warranted to confirm their performance under commercial conditions.

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Sciforum-197197: Tracking one year of homemade kombucha backslopping: microbial succession, chemical transformations and bioactivity in green and black tea fermentations

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Kombucha is a fermented tea beverage commonly produced at household level through backslopping and valued for its potential functional properties. However, information on the long-term effects of repeated backslopping on microbial ecology, biochemical composition, and product safety remains limited.

This study evaluated the impact of twelve consecutive backslopping cycles, performed under controlled homemade conditions, on green and black kombucha. Physicochemical parameters, bioactive compounds, antioxidant activity, and microbial community dynamics were assessed through chemical analyses, antioxidant assays, and metabarcoding. Partial least squares (PLS) modelling was applied to identify the variables most affected by repeated fermentation cycles.

Throughout all fermentation cycles, both green and black kombucha maintained acetic acid and ethanol concentrations within recommended safety limits, confirming the safety of prolonged homemade backslopping. Repeated fermentations promoted microbial activity, as indicated by enhanced sugar consumption and lower gluconic acid production, without causing critical pH variations or excessive ethanol accumulation. Although phenolic profiles changed over time, antioxidant activity remained stable, suggesting a compensatory contribution of fermentation-derived microbial metabolites. Metabarcoding coupled with PLS analysis revealed progressive shifts within acetic acid bacteria populations, characterized by a decline in *Acetobacter* ASVs and the concomitant enrichment of *Komagataeibacter* ASVs across fermentation cycles.

Long-term backslopping significantly influences kombucha microbial succession and biochemical characteristics while preserving product safety and antioxidant potential. These findings provide new insights into the stability of homemade kombucha ecosystems and support the optimization of backslopping practices to maintain beverage functionality and quality.



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Sciforum-197256: Heat-stable antifungal activity of a wild *Bacillus* sp. against food-spoilage moulds: a promising approach for clean-label food preservation

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Introduction: Fungal spoilage causes food quality deterioration and shelf-life loss, while consumers increasingly favour clean-label alternatives to synthetic preservatives. *Bacillus* species produce diverse antimicrobial metabolites and may represent promising candidates for food bioprotection. This study evaluated the antifungal activity of a wild *Bacillus* sp. isolate against common food-spoilage moulds and examined how cultivation conditions, cellular fraction and processing-related treatments influence this activity.

Methods: *Bacillus* sp. was tested against *Aspergillus niger*, *Penicillium nalgiovense* and *Fusarium oxysporum* using mycelial spread-zone assays on PDA at early and late incubation time points, MIC assays with lyophilised fermentation broth, and food-model trials on refrigerated strawberries and yoghurt. *Bacillus* sp. MIC values were compared with those of *Janthinobacterium lividum* and *Pseudomonas* sp. Static versus shaken cultivation and cell-free supernatant versus cell biomass were compared. The active biomass was then subjected to pasteurisation, autoclaving, ultrasonication and enzymatic hydrolysis with pepsin and trypsin. Activity was expressed as inhibition relative to untreated controls.

Results: *Bacillus* sp. inhibited all tested moulds and exhibited the lowest MIC values among the three isolates (≤0.5–1%). In refrigerated strawberries and yoghurt, it prevented visible mould development for up to five weeks. Activity was primarily associated with the cell biomass rather than the supernatant and was largely retained after pasteurisation, autoclaving and ultrasonication. In contrast, proteolytic treatment reduced activity, suggesting that proteinaceous compounds may contribute to the antifungal effect. Static cultivation generally produced stronger inhibition than shaken cultivation.

Conclusions: This wild *Bacillus* sp. combined broad-spectrum antifungal activity with food-model efficacy and resistance to processing-related treatments, supporting its potential as a clean-label bioprotective candidate against food-spoilage moulds. Further studies should identify the active compound(s) and evaluate their safety and applicability in food systems.



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Sciforum-197532: Production and Evaluation of a Novel GABA-Producing Plant Yogurt and its Functional Benefits

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Depression and anxiety are prevalent mental health disorders, and growing evidence implicates the gut–brain axis in the regulation of neurophysiological processes. Psychobiotics, defined as probiotics with potential effects on the gut–brain axis, have consequently gained attention as candidate functional food components. However, the application of human breast milk-derived psychobiotic strains in the development of GABA-enriched fermented foods remains largely unexplored. Gamma-aminobutyric acid (GABA), the principal inhibitory neurotransmitter in the mammalian central nervous system, is a bioactive metabolite produced by certain microorganisms during fermentation. In this study, the previously characterized GABA-producing strain *Enterococcus faecalis* RIT BM_{S15-3}, isolated from human breast milk, was employed as a starter culture for the development of GABA-enriched almond yogurt. Fermentation conditions were systematically optimized by evaluating L-monosodium glutamate (L-MSG) concentration, fermentation temperature, and fermentation time to maximize microbial GABA production. The optimized formulation was subsequently characterized for GABA stability, antioxidant activity, water-holding capacity, viscosity, and sensory properties. Fermentation with *E. faecalis* RIT BM_{S15-3} enhanced GABA production in the almond-based matrix, and the optimized yogurt retained detectable GABA levels and viable bacterial counts during storage. The fermented product also demonstrated measurable antioxidant activity and acceptable sensory characteristics. Overall, the findings demonstrate the feasibility of utilizing a human breast milk-derived GABA-producing bacterial strain for the development of a plant-based fermented food with enhanced bioactive value. Further in vivo and clinical investigations are warranted to determine whether consumption of the GABA-enriched product translates into measurable neurophysiological or mental health benefits.



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Sciforum-197608: Decoding the Volatile Fingerprint of Fermented Underutilized Fruits and Citrus: A Multivariate Approach to Functional Beverage Design

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The growing demand for functional beverages has driven the search for novel substrates rich in bioactive compounds and unique sensory profiles. This study explores the valorization of underutilized fruit and citrus biodiversity through controlled fermentation using selected *Saccharomyces cerevisiae* starter strains of oenological origin (respectively denoted NU32 and NC103). The primary objective of this invstigation was the evaluation of the interplay between distinct fruits and citrus genotypes and microbial metabolisms shape the final product. A comprehensive analysis of the volatile organic compounds (VOCs) profile using gas chromatography-mass spectrometry (GC-MS), combined with multivariate analysis, made it possible to identify the main volatile compounds responsible for the sensory characteristics and to assess the influence of individual variables and their interactions on the volatile profile of the beverages produced. This interaction had a statistically significant impact on the final aroma profiles, revealing significant changes between the different chemical classes and defining tailored aroma profiles. In detail, among minor fruit varieties examined, the Principal Component Analysis (PCA) coupled with the Cluster Heatmap showed that fruit matrix emerged as the dominant driver of volatile composition. On the other hand, the yeast-strain effects, although secondary, proved detectable and relevant in selected combinations, highlighting a fine-tuning role of microbial biodiversity. Interestingly, among citrus species studied, the Bergamotto (Citrus × bergamia (Risso)) juice emerged as the most aromatic substrate, systematically exhibiting the highest concentrations of terpenes, particularly when fermented with the NC103 strain. In conclusion, the recovery and characterization of autochthonous, neglected biodiversity, combined with tailored fermentation biotechnologies, represent a powerful strategy. This approach not only prevents genetic erosion but it actively drives the design of innovative, customized functional beverages with optimized, distinctive volatile fingerprints and elevated consumer appeal.



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Sciforum-197655: A First Approach to combine AI and Predictive Microbiology

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Introduction: This study analyses the application of predictive microbiology as a strategic tool for risk assessment and the optimization of food shelf-life, focusing on a first approach for the development of a unified third-level predictive model capable of estimating the behaviour of *Listeria monocytogenes* based on multiple environmental and technological variables.

Methods: The methodology initially involved a simulation phase conducted using two reference software programs, FSSP and PMP, based on a multivariate experimental design (DoE). Variables such as temperature, pH, NaCl concentration, nitrite, lactic acid, and initial microbial load were analyzed. The data obtained were then processed using the Gompertz equation to extract kinetic parameters, mainly t_{100}, which represent the time required for a 100-fold increase in the microbial population.

Results: Multivariate statistical analysis, conducted through Pareto chats and response surfaces, highlighted that temperature and pH are the primary determinants of growth rate, while nitrite exerts the most significant inhibitory effect. In the final phase, the integration of data through computational algorithms and the support of generative artificial intelligence allowed for the comparison of various regression models.

Conclusion: The non-linear logistic model was selected as the most effective due to its robustness and biological consistency, proving superior to purely mathematical models like Random Forest in its ability to avoid unrealistic extrapolations. The results confirm that an integrated approach combining predictive software and advanced statistics serves as a fundamental support for designing HACCP self-control systems and for the proactive management of food safety within the Industry 4.0 framework.



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Sciforum-197679: Disruption of Candida tropicalis biofilms on stainless steel by essential oil emulsions

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Microbial biofilms are reservoirs of spoilage microorganisms highly resistant to conventional sanitation procedures. This study evaluated essential oil emulsions (EOE) as disruption agents against Candida tropicalis biofilms on stainless steel (SS) surfaces, using a strain isolated from an apple juice industry. Emulsions of oregano (OE), cinnamon leaf (CLE), peppermint (PME), and white thyme (WTE) essential oils were prepared with Tween 80 as an emulsifier, using a high-speed homogenizer. Disruption capability was assessed at the minimal inhibitory concentration (MIC: WTE, CLE, OE: 500 ppm and PME: 1000 ppm), half the MIC (½MIC), and twice the MIC (2MIC), determined in a previous study. Biofilms were developed on SS coupons for 24h at 25°C using an inoculum of 1×10^6 CFU/mL and apple juice as a nutrient medium, yielding a control of 6.8 logCFU/cm^2 viable cells. After treatment, coupons were rinsed with peptone water and sonicated at 40kHz for 2min to detach cells. Viable cells were enumerated on Sabouraud Dextrose Agar and the percentage reduction (%Reduction) was determined. Statistical analysis was performed using ANOVA followed by Tukey's test. At ½MIC, reductions were limited: 13.2 ± 0.2% (WTE), 4.1 ± 0.3% (CLE), and negligible reductions for OE and PME. At MIC, reductions reached 29.3 ± 5.1% (WTE), 11.0 ± 1.1% (PME), 10.0 ± 2.2% (OE), and 2.4 ± 0.2% (CLE). At 2MIC, the highest reductions were recorded: 53.9 ± 2.1% (OE), 42.4 ± 1.8% (WTE), 34.8 ± 2.1% (PME), and 12.5 ± 1.3% (CLE). All EOE exhibited concentration-dependent activity, with OE and WTE showing the greatest efficacy at 2MIC. No complete biofilm eradication was achieved, reflecting the resistance of biofilms. These findings support OE and WTE as candidates for biofilm control.



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Sciforum-197798: Glutamate and pH affect GABA production and acid stress tolerance in *Levilactobacillus brevis* LB12

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Introduction

Levilactobacillus brevis is recognized as the most efficient lactic acid bacteria (LAB) species for the production of gamma-aminobutyric acid acid (GABA) because it possesses a complete *gad* operon (*gadR*, *gadB*, *gadC*, and *gadA*). We investigated the effects of glutamate availability and pH conditions on GABA production, *gad* gene regulation, and acid stress tolerance in *Lvb. brevis* LB12, which are critical factors for developing robust and competitive starter cultures.

Methods

Lvb. brevis LB12 batch cultivations were carried out in bioreactors under either controlled pH (6.5, to maximize biomass) or uncontrolled pH (to activate the GABA system), with or without glutamate (Glu) supplementation. Acidification adaptation phases (down to pH 4.5) were applied to evaluate the role of low pH on the GABA pathway. Transcriptional regulation of gad operon was analysed via RT-qPCR, and cell survival under acid stress was evaluated.

Results and Discussion

Glu supplementation and GAD activation significantly improved survival under acid stress, with high GABA-producing cells showing enhanced resistance. This confirms that GABA biosynthesis acts as a robust acid-response mechanism where glutamate decarboxylation consumes intracellular protons to ensure pH homeostasis and acid protection. Gene expression analysis confirmed that the *gad* operon genes were strongly upregulated by glutamate and low pH. Conversely, *gadA* expression was less affected, indicating distinct regulatory patterns between the two decarboxylase isoforms and identifying *gadR* as the key driver of operon activation.

Conclusions

GABA biosynthesis is a central component of the acid-adaptation strategy of *Lvb. brevis* LB12. Optimizing bioreactor parameters to trigger this pathway offers a scalable strategy to improve starter culture robustness during industrial food processing.



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Sciforum-197832: The Effect of Mono- and Co-Culture Fermentation on the Physicochemical Properties of Beetroot Juice

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The purpose of the study was to evaluate the effect of guided microbial fermentation on the physicochemical and microbiological characteristics of beetroot juice (pasteurised at 100 °C for 20 min/h). Beetroot juice was selected as the fermentation substrate due to its high content of betalains and other bioactive compounds, which are known for their nutritional and antioxidant properties. The strains selected for fermentation were *Propionibacterium freudenreichii* (PAB), due to its ability to synthesise vitamin B12 and produce propionic acid, and *Lactiplantibacillus plantarum* (LAB) to promote the growth of PAB. Fermentation was conducted using PAB in monoculture and in coculture with LAB for 72 h, with sampling every 24 h; a control sample, juice without inoculation with PAB or LAB, was also prepared. Changes in pH, titratable acidity, extract content, betalain concentration, bacterial counts, vitamin B12 production, and organic acid profiles were monitored.

The fermentation strategy significantly affected acidification kinetics, microbial growth, metabolite production, and the stability of selected quality attributes. After 72 h, the co-culture exhibited stronger acidification, with pH decreasing to 3.47 and titratable acidity increasing to 2.62 g/L, compared with pH 4.18 and 1.41 g/L in the PAB monoculture. An initial increase in betalain content, particularly betacyanin, was observed after 24 h of fermentation, followed by no significant changes thereafter. In contrast, the monoculture promoted higher vitamin B12 accumulation (65μg/L) and a higher propionic-to-acetic acid ratio. The increase in vitamin B12 concentration confirmed that beetroot juice provided suitable conditions for cobalamin biosynthesis by PAB. Although LAB was expected to support propionic fermentation through metabolite production, rapid acidification in the co-culture may have limited PAB adaptation and metabolic activity. Co-cultivation altered the fermentation course and modified the physicochemical and microbiological characteristics of the fermented juice. These findings improve understanding of interactions between propionic acid bacteria and lactic acid bacteria in fermented vegetable matrices, indicating the potential for effective vitamin B12 fortification under PAB monoculture conditions. Results support the development of novel fermented beetroot-based beverages with enhanced functional properties.



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Sciforum-197902: Development and Validation of a TaqMan Real-Time PCR Assay for Species-Level Authentication of *Locusta migratoria* in Commercial Food and Feed Matrices

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Locusta migratoria (Orthoptera: Acrididae) is one the insect species authorised in the European Union for food and feed applications, including as a novel food under Regulation (EU) 2021/1975, and as a processed animal protein (PAP) for aquaculture, poultry, and pig feed under Regulations (EU) 2021/1372 and 2021/1925. Given its nutritional value and growing relevance in the edible insect and feed sectors, reliable species-level authentication tools are needed to ensure correct labelling and regulatory compliance.

In this work, a species-specific TaqMan real-time PCR assay targeting the mitochondrial cytochrome *c* oxidase subunit I (COI) gene of *L. migratoria* (GenBank: KM384849.1) was developed and validated for its detection and quantification in complex food and feed matrices. Specific primers and TaqMan probe were designed, and DNA was extracted using the NucleoSpin® Food Kit. Although *in silico* analysis revealed no cross-reactivity, non-specific amplification was observed for *Oxya yezoensis* during cross-reactivity testing. To address this challenge, three Locked Nucleic Acid (LNA) modifications were incorporated into the forward primer, successfully eliminating this cross-reactivity. Specificity was confirmed against 86 non-target matrices, including 49 insect species, 13 seafood species, 10 cereals/seeds/legumes, 8 spices/herbs, and 6 fruits/vegetables matrices, with no false-positive amplification. The LOD was 0.0001 ng of *L. migratoria* genomic DNA. A calibration curve constructed from binary mixtures of *L. migratoria* flour in wheat flour at 50%, 30%, 20%, 15%, 10% and 5% w/w yielded a PCR efficiency of 96.11%, R^2 of 0.998, and LOQ of 1% (w/w). Method trueness, evaluated at four concentration levels, 25%, 7.5% 2.5% and 1% (w/w), yielded percentage errors ranging from -26.22 to 10.78% and coefficients of variation below 0.54%.

The validated assay was applied to 47 commercial insect-labelled products, confirming *L. migratoria* DNA in four products, declaring this species and detecting it in four unlabelled products ($33.83 < Cq < 38.15$), indicating potential cross-contamination or mislabelling. Overall, this assay provides a sensitive and specific tool for *L. migratoria* authentication in food and feed products



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Sciforum-198032: Probiotic-derived extracellular vesicles: Emerging natural inhibitors of foodborne pathogens and biofilms

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Foodborne pathogens, *Staphylococcus aureus, Escherichia coli, Salmonella* and *Listeria monocytogenes* pose significant health risks to human health and food safety worldwide. Recently, extracellular vesicles (EVs) derived from probiotic lactic acid bacteria (LAB) have emerged as promising natural antimicrobial agents. The aim of this study was to isolate EVs from *Lactiplantibacillus plantarum* and *Lacticaseibacillus rhamnosus* during stationary growth phase using size-exclusion chromatography (SEC) and to characterize them using transmission electron microscopy (TEM) and nanoparticle tracking analysis (NTA). Furthermore, the antimicrobial activity was accessed using planktonic cell viability assays and antibiofilm activity was evaluated by using crystal violet staining assay. The isolated EVs exhibited spherical shaped morphology, with particle concentrations ranging from 6.7×10^9 to 3.0×10^8 particles/mL and their peak sizes between 90 - 280 nm. EVs significantly inhibited the planktonic cell growth all four tested pathogens in a dose dependent manner. However, a reduction of *Salmonella* planktonic cells was observed only at 15 µg/mL (***$P < 0.001$ and ****$P < 0.0001$) for EVs derived from both *L. plantarum* and *L. rhamnosus*. Biofilm formation by foodborne pathogens was significantly reduced at all tested concentrations relative to the control for both LAB strains (**$p < 0.01$). However *L. plantarum* EVs were the most effective, at reducing *Salmonella* biofilms by 86% at 5 µg/mL (*$P < 0.05$). In conclusion, probiotic-derived EVs exhibited significant antimicrobial and antibiofilm activities, highlighting their potential for application in food safety and infection prevention strategies.



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Sciforum-198115: Fruit peel powders as functional ingredients to improve antioxidant- properties of Kombucha-like beverages

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Introduction

Kombucha is a fermented tea beverage produced by a Symbiotic Culture of Bacteria and Yeasts (SCOBY), with potential benefits for human health. In this study, we used fruit wastes to produce a kombucha-like beverage with improved antioxidant properties.

Methodology

Orange peel powder (OPP) and pomegranate peel powder (PPP) were used as supplements (1% OPP, 1% PPP, or 0.5% OPP + 0.5% PPP) for the kombucha production (traditional 7-day fermentation with SCOBY). Unsupplemented beverage (black tea) was used as control. Microbial population, antioxidant properties (DPPH, ABTS, FRAP assays), sugar metabolites production (^{1}H-NMR) and phenolic profile (UHPLC) were analysed.

Results

Supplementation with PPP and OPP had a positive effect on the SCOBY population. PPP significantly ($p < 0.05$) increased the content of phenolic compounds (e.g., gallic acid, hesperidin, epicatechin) and the antioxidant capability, while the addition of OPP increased ($p < 0.05$) the concentration of citric acid and flavonoids. UHPLC analysis of the samples shows the presence of ellagic acid, ellagitannins, and flavonoids in the PPP-fortified kombucha. The content of caffeine was reduced in supplemented kombucha.

Conclusions

This study demonstrated that pomegranate- or orange-peel powders affected the functional properties of Kombucha-like beverages and highlighted the potential use of fruit-processing by-products as sustainable strategy to valorise food waste and support circular economy approaches in the beverage industry.



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Sciforum-198311: Bio-Prospecting and Probiotic Characterization of Lactic Acid Bacteria Isolated from Milk and *Dahi* of Indigenous *Badri* and *Malnad Gidda* Cattle of India

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The exploration of indigenous dairy ecosystems offers significant opportunities for the discovery of novel lactic acid bacteria (LAB) with probiotic and techno-functional properties suitable for functional foods and fermented dairy products. This study aimed to isolate, characterize, and evaluate LAB from milk and *dahi* obtained from two indigenous Indian cattle breeds, *Badri* cattle of the Himalayan region and *Malnad Gidda* cattle of the Western Ghats. A total of 107 samples, comprising 95 milk and 12 *dahi* samples, were collected, including 80 samples from *Badri* cattle and 27 samples from *Malnad Gidda* cattle. From these samples, 203 bacterial isolates were recovered, of which 65 were identified as presumptive LAB based on morphological and biochemical characteristics.

Thirty representative LAB isolates were initially screened for starter culture potential through assessment of milk coagulation, pH reduction, and acid production. Five promising isolates, namely M2-VMRS (*Lactiplantibacillus plantarum* AR195), C1-VMRS (*Lactiplantibacillus plantarum* F14A), C2MRS-37-3 (*Limosilactobacillus fermentum* B-1840), AMRS-37 (*Pediococcus acidilactici*), and FLA30-4 (*Enterococcus italicus*), were selected for detailed probiotic evaluation alongside reference strains *Lacticaseibacillus rhamnosus* GG and *Lactiplantibacillus plantarum* Lp91, following ICMR–DBT guidelines. Among the isolates, M2-VMRS exhibited excellent survival under simulated gastrointestinal conditions, with gastric acid tolerance of 97.5 ± 0.30% and bile tolerance of 64.90 ± 0.30%. It also demonstrated strong co-aggregation with antimicrobial-resistant pathogens, including ESBL-producing *Escherichia coli* (55.19 ± 0.35%) and vancomycin-resistant enterococci (50.79 ± 0.23%), along with notable antimicrobial activity. C2MRS-37-3 showed superior bile tolerance (98.39 ± 0.19%), high acid tolerance (87.13 ± 0.37%), and auto-aggregation activity (53.70 ± 0.40%), while AMRS-37 exhibited cell surface hydrophobicity ranging from 39.20 ± 0.29% to 47.96 ± 0.46%.

The findings demonstrate that indigenous cattle-derived dairy products as valuable reservoirs of probiotic LAB, with *Lactiplantibacillus plantarum* AR195 and *Limosilactobacillus fermentum* B-1840 emerging as promising candidates for probiotic and functional starter culture applications.



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Sciforum-198538: Shelf life extension of Ready-to-Eat glasswort through natural antimicrobials and Modified Atmosphere Packaging

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Introduction

Salicornia spp. are halophytic plants of considerable interest for the food sector, valued for their rich phytochemical profile and their capacity to grow on marginal, salt-impacted soils where conventional crops cannot thrive. Despite this potential, their transformation into ready-to-eat (RTE) vegetable products remains underexplored. This study aimed to develop and evaluate a novel RTE product based on glasswort harvested in the Apulia region (Southern Italy), integrating nutritional analysis, natural preservation technologies, and consumer perception.

Methods

Fresh glasswort samples were characterized for their phenolic and flavonoid content. The effect of blanching on bioactive compounds, oxalate levels, and mineral bioavailability was assessed. For preservation, two natural antimicrobials (thyme essential oil T and grapefruit seed extract GFSE) were tested under ordinary and modified atmosphere packaging (MAP). A microbiological challenge test using *Pseudomonas fluorescens* and *Enterobacter agglomerans* was performed at 4°C and 15°C over 90 days. Consumer acceptance was evaluated through a survey of 129 participants.

Results

Fresh samples contained 2648 mg GAE 100 g^{-1} dw of total phenols and 413 mg QE 100 g^{-1} dw of total flavonoids. Blanching reduced total phenols and flavonoids by approximately 40% and 26%, respectively, while retaining significant bioactive levels. Oxalate content decreased by ~53% following blanching, while calcium concentration increased, suggesting enhanced mineral bioavailability. GFSE exhibited stronger antimicrobial activity than thyme essential oil; the MAP + GFSE combination was the most effective, keeping bacterial loads below 5 log CFU g^{-1} throughout 90 days at 4°C. Both antimicrobials reduced yellowing during storage. Consumer evaluation revealed that 82.2% of respondents expressed willingness to try the product.

Conclusions

The developed RTE glasswort product demonstrates strong nutritional value and promising shelf life under optimized preservation conditions, particularly MAP combined with GFSE. High consumer interest in its nutritional attributes supports the commercial viability of glasswort-based products, positioning them as a sustainable and marketable innovation in the functional food sector.



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Sciforum-198586: Impact of nitrite reduction in cooked turkey ham: preliminary studies on safety issues

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Sodium nitrite is a preservative widely used in the meat industry to ensure product quality and safety by inhibiting the growth of pathogenic microorganisms and preventing spoilage. Cooked turkey ham commonly contains nitrite; however concerns regarding its potential health effects have prompted regulatory changes in Europe, reducing the maximum permitted level from 150 mg/kg to 80 mg/kg (expressed in nitrite ions, corresponding to 119 mg/kg of sodium nitrite) in meat products. This study aimed to evaluate the impact of nitrite reduction on the microbiological safety and organoleptic characteristics of cooked turkey ham.

Total viable counts (TVC), lactic acid bacteria (LAB), *Enterobacteriaceae*, *Escherichia coli*, and *Staphylococcus aureus* as well as pathogenic bacteria, including *Listeria monocytogenes*, *Salmonella* spp., and sulphite-reducing *Clostridium* spores, were determined according to ISO standards in cooked turkey ham produced with different nitrite concentrations throughout its shelf life. Physico-chemical analysis, including colour, water activity (a_w) and pH were evaluated at 0, 17, and 35 days of storage. Challenge testing was performed with both *L. monocytogenes* and *C. sporogenes* (as a surrogate for *C. botulinum*), during 35 and 264 days, respectively, under refrigerated storage (4 °C) and abuse storage temperature (8 °C).

Microbiological analyses demonstrated that the reduced-nitrite product showed trends in TVC and LAB growth similar to those of the standard product, with counts remaining below 1.0 x 10^7 CFU/g throughout 28 days of storage at 4 °C and no detection of pathogenic bacteria, in line with microbiological safety criteria. Overall, no significant differences were observed in physico-chemical properties during the shelf life of the product. Challenge testing results indicate that the reduced-nitrite formulation limited the growth of *L. monocytogenes* remaining below the 0.5 log CFU/g threshold at 4 °C but showing an increase above this threshold at 8 °C, and prevented vegetative outgrowth of *C. sporogenes* under the tested conditions.

These findings suggest that nitrite reduction does not adversely affect the safety or quality of cooked turkey ham under the conditions studied. Nevertheless, additional research is required to further confirm the long-term safety of reduced-nitrite formulations.



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Sciforum-198590: From Fruit Waste to Functional Ingredients: Probiotic Growth Promoting and Bioactive Potential of Rejected Plum and Orange Pulp

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The increasing volumes of fruit by-products resulting from aesthetic nonconformity and processing losses have prompted the development of sustainable strategies for the valorisation of food waste. The present study assessed the probiotic growth promoting potential and bioactive properties of pulp obtained from rejected plums and oranges as potential functional ingredients. Both pulps were incorporated into culture media at concentrations of 2% and 6% (w/v) and tested for their capacity to support the growth and metabolic activity of five probiotic strains, including four lactic acid bacteria (Lacticaseibacillus rhamnosus GG and R11, Lactiplantibacillus plantarum299v, Levilactobacillus brevis D-24) and the next-generation probiotic Akkermansia muciniphila DSM 22959. The assessment of potential growth promoting activity was conducted through the measurement of culturable cell counts, pH, sugar consumption, and organic acid production. The Folin-Ciocalteu assay (for total phenolic content, TPC), the ABTS and DPPH assays (for antioxidant capacity), and the α-glucosidase inhibition assay (for antidiabetic activity) were performed to test for additional bioactive potential. The pulps of both fruits supported probiotic growth and metabolic activity, as evidenced by increased cell counts ($>10^8$ CFU/g), medium acidification, and organic acid production (mainly lactic acid). The TPC of plum pulp was found to be 3.94 ± 0.29 mg GAE/$g_{dry\ matter}$, with antioxidant activities measuring 24.08 ± 3.52 (ABTS) and 22.52 ± 2.71 (DPPH) µmol TE/$g_{dry\ matter}$. In the case of orange pulp, the TPC was 3.69 ± 0.21 mg GAE/$g_{dry\ matter}$, with antioxidant activities measuring 15.36 ± 1.49 (ABTS) and 11.28 ± 1.24 (DPPH) µmol TE/$g_{dry\ matter}$. Furthermore, both pulps demonstrated notable α-glucosidase inhibitory activity, with values exceeding 97%. These findings demonstrate that pulps from discarded plum and orange possess relevant probiotic growth promoting potential and bioactive properties, thus supporting their use as sustainable functional ingredients. Furthermore, they reinforce strategies aimed at reducing food waste through valorisation of agro-industrial by-products.



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Sciforum-198699: Exploring Plant Matrices as Sources of Bioprotective Lactic Acid Bacteria for Food Applications

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Introduction: Lactic acid bacteria (LAB) are promising natural biopreservatives due to their antimicrobial activity and the recognized safety status of many species. Fermented vegetables remain underexplored as sources of strains with potential use as bioprotective cultures. This study aimed to isolate and characterize antagonistic LAB from fermented plant matrices based on antimicrobial activity, safety, and technological properties.

Methods: LAB were isolated from fermented tomato, pepper, beetroot, and okra. A total of 672 isolates were recovered: 48 from each tomato, pepper, and beetroot sample and 528 from okra. Antimicrobial activity was initially screened using the double-layer method against *Listeria monocytogenes* CECT4032, *Staphylococcus aureus* CECT976, and *Salmonella enterica* CECT704, and confirmed using the agar well diffusion method. For this assay, unneutralized cell-free supernatants from the LAB were tested using Mueller–Hinton Agar and buffered semi-solid Tryptic Soy Broth. Selected isolates were characterized by Gram staining and catalase testing. Safety was assessed by hemolysis, DNase, and gelatinase assays, while technological properties included proteolytic, lipolytic, and citrate-utilizing activities. Promising isolates were presumptively identified using API 20 STREP.

Results: Among the 672 LAB isolates screened, only 12 (1.8%) exhibited reproducible antimicrobial activity. Eight tomato-derived isolates inhibited *L. monocytogenes*, one inhibited both *L. monocytogenes* and *S. aureus*, and three okra-derived isolates inhibited *L. monocytogenes*. No active isolates were recovered from pepper or beetroot. All selected isolates were Gram-positive, catalase-negative, non-hemolytic, and negative for DNase and gelatinase activities. All showed proteolytic activity but lacked lipolytic and citrate-utilizing activities. Four isolates were selected and presumptively identified as three *Lactococcus lactis* isolates and one *Enterococcus faecalis* isolate.

Conclusion: LAB from fermented tomato and okra showed promising antimicrobial, safety, and technological characteristics, supporting their potential as bioprotective cultures. However, molecular identification and validation in food systems are required to confirm their stability and efficacy under processing and storage conditions.



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Sciforum-198708: Exploring the use of *Aspergillus oryzae* for the development of innovative fish-based sausages

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Introduction: Consumer interest in fermented foods and sustainable protein sources has increased considerably in recent years, driving the development of novel food products. Although fermented meat sausages are widely consumed, fermented fish-based alternatives remain scarce. This study explored the use of *Aspergillus oryzae* during the production of an innovative Portuguese-style fish-based sausage and evaluated its microbiological, physicochemical, and nutritional characteristics.

Methods: Fish-based sausages were produced using yellowfin tuna (*Thunnus albacares*) and surface-inoculated with *A. oryzae*. After fermentation and dehydration until approximately 40% weight loss, physicochemical parameters (pH and water activity), proximate composition, and microbiological analyses were determined according to standardized methods at different processing stages.

Results: Nutritionally, the product was characterized by a high protein content (30.5 g/100 g) and a fat content below 0.5 g/100 g, meeting the criteria for the "high protein" and "fat-free" nutrition claims defined by European legislation (Regulation (EC) No. 1924/2006). Physicochemical analysis showed a pH of 6.24 and an a_w of 0.926, indicating the need for refrigerated storage. Mesophilic aerobic counts increased by 2.4 log CFU/g after fermentation and remained stable thereafter. Mould counts increased by 4.3 log CFU/g in the final product, which may be associated with the inoculation of the product. Lactic acid bacteria increased by 3.8 log CFU/g, while yeast counts decreased throughout processing. *Enterobacteriaceae* levels remained stable from the beginning, and *Listeria monocytogenes*, *Clostridium* spp., and *Bacillus cereus* remained below the detection limit ($<$50 CFU/g).

Conclusions: The results demonstrate the feasibility of using *A. oryzae* during the production of an innovative fish-based sausage. The developed product exhibited a satisfactory microbiological profile and a favorable nutritional composition, meeting the criteria for the European "high protein" and "fat-free" nutrition claims, thereby supporting its potential as an innovative and sustainable alternative to conventional fermented sausages.



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Sciforum-198715: "Adaptive Responses of *Listeria monocytogenes* during Long-Term Frozen Storage of Cheese: Survival and Biofilm Recovery".

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Introduction: *Listeria monocytogenes* causes case fatality rates of ≈30% in vulnerable population and is a psychrotrophic foodborne pathogen capable of surviving under freezing conditions. Although frozen storage is commonly used to preserve dairy products, the persistence of viable cells and their ability to recover stress-adaptive traits remain important food safety concerns. Therefore, this study aimed to evaluate the survival and biofilm-forming ability of *L. monocytogenes* during long-term frozen storage of cheese.

Methods: A strain of *L. monocytogenes* derived from artisan cheese (Lm7) was inoculated into semi-cured pasteurized cheese cubes (1g) at approximately 10^8 CFU/g and stored at -20°C for 180 days. Survival was determined by plate counts on Oxford agar, while biofilm formation was assessed using the crystal violet microplate assay (OD595). Data were analyzed by ANOVA and Tukey's test ($p < 0.05$).

Results and Discussion: Freezing caused a rapid decline in bacterial counts, reaching a 98.5% reduction after 7 days. However, viable cells remained detectable throughout storage. A transient increase in counts was observed on day 30 (1.62×10^5 CFU/mL), followed by a progressive decline until day 150, when reductions of approximately 99.99% were recorded. Despite this decrease, viable populations persisted at day 180. Biofilm formation was weak during the first week, absent on day 30, and recovered at the end of storage. These findings suggest that surviving cells may retain adaptive mechanisms that facilitate persistence under prolonged cold stress.

Conclusions: Long-term frozen storage substantially reduced *L. monocytogenes* populations in cheese but did not eradicate the pathogen. The recovery of biofilm-forming ability after prolonged freezing highlights the importance of maintaining preventive control measures throughout the dairy cold chain.



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Sciforum-198750: Traditional Fermented Foods from Southern Brazil as a Source of Bacteriocinogenic Lactic Acid Bacteria against *Listeria monocytogenes*

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Background: Traditional fermented foods are recognized as valuable reservoirs of lactic acid bacteria (LAB) with potential applications in food biopreservation. The aim of this study was to screen LAB isolates from artisanal food matrices produced in southern Brazil for bacteriocin-producing LAB active against *Listeria monocytogenes*.

Methods: A total of 200 LAB isolates obtained from traditional fermented foods produced in Santa Catarina, Southern Brazil—including colonial salami-type dry-fermented sausages, sheep's milk cheese, cow's milk cheese, and sourdough—were screened for antimicrobial activity against *L. monocytogenes* using the spot-on-lawn method. Cell-free supernatants from active isolates were subsequently evaluated for anti-Listeria activity. Active cell-free supernatants were neutralized with 0.1 M NaOH and digested with proteinase K to distinguish bacteriocin-mediated inhibition from the effects of organic acids and other metabolites. Selected isolates were further characterized by hemolytic profile, activity against other foodborne pathogens, growth under varying oxygen conditions, and MALDI-TOF MS identification.

Results: Among the 200 isolates, two Gram-positive, catalase-negative LAB isolates (1.0%) demonstrated notable inhibitory activity against *L. monocytogenes*. This inhibitory effect persisted following pH neutralization but was completely abolished after proteinase K treatment, confirming the proteinaceous nature of the antimicrobial compounds and suggesting the production of bacteriocin-like inhibitory substances. Both isolates were γ-haemolytic. MALDI-TOF MS identified the strains as *Pediococcus acidilactici* and *Enterococcus mundtii*. *E. mundtii* exhibited enhanced growth under aerobic conditions, whereas *P. acidilactici* showed better growth under microaerophilic conditions. Evaluation of the antimicrobial spectrum revealed no inhibitory activity against *Escherichia coli*, *Pseudomonas aeruginosa*, or *Staphylococcus aureus*, indicating a narrow antimicrobial spectrum primarily directed against *L. monocytogenes*.

Conclusions: Traditional fermented foods are a valuable source of bacteriocinogenic lactic acid bacteria. The *P. acidilactici* and *E. mundtii* isolates identified in this study exhibited promising anti-Listeria activity, suggesting their potential application as natural biopreservative cultures in food systems. Further studies will evaluate their safety and characterize the antimicrobial compounds.



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Sciforum-200406: Comparative Biomaterial Analysis of Cellulose Produced by Caffeinated and Decaffeinated Kombucha Symbiotic Cultures of Bacteria and Yeast (SCOBY)

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Bacterial cellulose produced by kombucha symbiotic cultures of bacteria and yeast (SCOBY) is an emerging biomaterial with potential applications in food packaging and biomedical engineering. For example, recent studies have investigated integration of SCOBY-produced cellulose into tissue grafts. Meanwhile, given regulations on restaurants, grocers and the gradual phasing out of plastic in areas such as California, finding biodegradable materials with sufficient tensile strength is not optional. Replacing plastic with unsuitable materials may lead to food waste if the contents are not genuinely contained by the vessel, or do not serve their intended function. This pilot study investigated how caffeinated and decaffeinated black tea influence fermentation, cellulose production, and properties. We hypothesized differences in tea composition would alter microbial activity and cellulose biosynthesis, resulting in differences in pellicle growth, structure, and mechanical performance. Identical fermentation systems were established under controlled conditions, and pH, pellicle thickness, biomass, moisture content, tensile strength, water rehydration, putative Gram staining, and scanning electron microscopy (SEM) were used to characterize the resulting bacterial cellulose.

The decaffeinated treatment exhibited greater fermentation activity, producing a larger decrease in pH and thicker cellulose pellicles at 1.4mm compared with 0.8mm in the caffeinated treatment. The decaffeinated cellulose demonstrated greater tensile strength (9,032 psi; 4,608 psi) and lower moisture content (95.6% versus 97.5%), indicating a denser cellulose network. Rehydration experiments showed lower water uptake in decaffeinated pellicles (275%) than caffeinated pellicles (325%). SEM analysis at 3500× magnification revealed more compact, less porous cellulose architecture in the decaffeinated treatment, while caffeinated samples exhibited greater porosity and less organized fiber structure. Gram staining identified mixed communities that included putative Gram-negative bacteria, consistent with acetic acid bacteria, together with yeast populations identified by morphology.

These findings demonstrate that tea composition influences bacterial cellulose production and biomaterial properties. Decaffeinated tea promoted stronger, thicker, and more structurally organized cellulose, supporting its potential as a renewable biomaterial for sustainable food-related and biodegradable applications. Further studies must confirm these results with bacterial and fungal identification that relies on morphology as well as additional evidence such as sequencing data. Replication must be implemented to allow for statistical analysis.



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Sciforum-200471: Interplay of vertical inheritance and horizontal gene transfer shapes biogenic amine biosynthesis in lactic acid bacteria: Implications for food safety

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Introduction

Biogenic amines (BAs) produced by lactic acid bacteria (LAB) are important determinants of food quality and safety due to their potential adverse effects on human health. While the BA production in LAB has been extensively reported, the evolutionary mechanisms responsible for the origin, maintenance, and dissemination of BA biosynthesis genes remain poorly understood. This study aimed to elucidate the relative contributions of vertical inheritance and horizontal gene transfer (HGT) to the evolution of BA-producing traits in LAB.

Methods

A comparative genomic analysis was performed on 4,880 publicly available LAB genomes. Key BA biosynthesis genes, including ornithine decarboxylase (*odc*), tyrosine decarboxylase (*tdc*), histidine decarboxylase (*hdc*), arginine decarboxylase (*adc*), and agmatinase, were identified and analyzed. Phylogenomic reconstruction, ancestral state reconstruction, gene synteny analysis, nucleotide composition profiling, codon usage analysis, and mobile genetic element screening were employed to investigate gene evolutionary histories and mechanisms of acquisition.

Results

BA biosynthesis genes followed diverse evolutionary trajectories involving ancestral gains and extensive HGT, particularly for *odc* and *tdc* genes across LAB lineages. Phylogenetic incongruence, conserved syntenic arrangements, and compositional analyses supported multiple independent acquisition events. The *adc* and agmatinase genes frequently occurred as a conserved genetic unit, suggesting coordinated acquisition and maintenance. Codon usage patterns indicated translational adaptation following gene acquisition, while insertion sequences and composite transposons were commonly associated with BA loci, highlighting their potential role in gene mobilization.

Conclusions

The evolution of BA biosynthesis genes in LAB is driven by a dynamic interplay between vertical inheritance and HGT. Stable retention following acquisition and the involvement of mobile genetic elements have facilitated the persistence of BA-producing traits across LAB lineages. These findings offer novel insights into the evolutionary mechanisms underlying BA production and support genomic approaches for improving the safety assessment of food-associated and probiotic LAB strains.



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Sciforum-200499: Natural Bioactives Against *Staphylococcus aureus*: Disrupting Biofilm Formation and Virulence to Combat Food Contamination

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Introduction: *Staphylococcus aureus*, including methicillin-resistant strains (MRSA), is a major foodborne pathogen that colonizes food-contact surfaces through robust biofilm formation and produces enterotoxins implicated in staphylococcal food poisoning. In the era of smart food microbiology, harnessing natural bioactives as biotechnological tools to disrupt pathogen virulence offers a sustainable and health-aligned alternative to conventional antimicrobials.

Methods: The antibacterial and antivirulence potential of selected natural bioactives and sanitizers was systematically evaluated against *S. aureus* and MRSA. MICs were established by microbroth dilution. Biofilm inhibition and eradication were quantified via crystal violet staining, viable cell enumeration, and scanning electron microscopy. The carotenoid pigment staphyloxanthin, a key virulence determinant, was assessed by methanol extraction. Antibiotic-potentiating activity was evaluated through checkerboard synergy assays. Molecular docking against 15 virulence-associated protein targets was conducted using AutoDock Vina.

Results and Discussion: Benzalkonium chloride and retinol demonstrated potent antibacterial activity (MIC 2–256 µg/mL). Epigallocatechin gallate suppressed biofilm formation by 81.53% and staphyloxanthin production by 68.26%; retinol eradicated established biofilms by 79.18%. Combinations with oxacillin, rifampicin, tetracycline, and ciprofloxacin yielded synergistic or additive outcomes. Docking analyses predicted favorable binding affinities across biofilm- and pigment-regulatory proteins, supporting a multitarget biotechnological mechanism.

Conclusions: Natural bioactives with established safety profiles demonstrate strong biotechnological potential as antivirulence agents against *S. aureus* in food microbiology settings. Their integration into emerging food microbiological control strategies merits further validation under realistic food-matrix and processing conditions.



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Sciforum-200786: Multi-omics profiling of palmitoleic acid-associated changes in *Zygosaccharomyces rouxii*

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High-salt fermentation creates a unique ecological niche where salt-tolerant yeasts must sustain cellular activity under severe osmotic pressure. Here, we focused on *Zygosaccharomyces rouxii*, a representative yeast in soy sauce fermentation, and investigated the molecular effects of exogenous palmitoleic acid (C16:1) supplementation under 120 g/L NaCl stress. Using integrated transcriptomic, DIA-based proteomic, and untargeted metabolomic datasets, we obtained a pathway-level view of C16:1-associated responses. The treatment (1.0 mM C16:1 in ethanol, 24 h, with equal ethanol added to the control) was performed with three biological replicates per group. Applying stringent criteria ($|\log_2 FC| \geq 1.5$, adjusted *p* < 0.05), we identified 142 up- and 87 down-regulated genes, 65 up- and 43 down-regulated proteins, and 38 up- and 29 down-regulated metabolites in the treatment versus control (NaCl only). Joint pathway enrichment (KEGG and Reactome, hypergeometric test) revealed that C16:1 supplementation consistently upregulated branched-chain amino acid degradation while downregulating several fatty acid β-oxidation enzymes, alongside altered levels of redox-related metabolites (e.g., decreased oxidized glutathione). These changes suggest that C16:1 may alleviate oxidative burden and modulate membrane fluidity-related gene expression, which are relevant to yeast performance in high-salt environments. Importantly, because fermentation performance (e.g., growth rate or ethanol tolerance) was not directly measured, these interpretations remain hypotheses that require functional validation through targeted gene deletions and actual soy sauce moromi trials. This study thus provides a comprehensive multi-omics resource for understanding how a defined nutritional factor influences molecular adjustments in *Z. rouxii* under severe salt stress, and offers a foundation for future mechanistic and applied studies on salt-tolerant yeasts in fermented food production.



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Sciforum-201151: Antibacterial and Antibiofilm Activity of Lactic Acid Bacteria Against Major Foodborne Pathogens: Potential for Natural Biocontrol

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Introduction: *Listeria monocytogenes*, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), and *Salmonella* Typhimurium are frequent causes of foodborne illness. Lactic acid bacteria (LAB) offer a natural route to their control through antibacterial and antibiofilm metabolites. Two strains were tested here: *Pediococcus acidilactici* JCM 8797 (KCTC 15064) and *Lactiplantibacillus paraplantarum* DSM 10667 (KCTC 5045).

Methods: Cell-free supernatants (CFS) were collected from 24 h MRS cultures by centrifugation and 0.22 µm filtration, then mixed into pathogen growth medium at 50, 25, 12.5 and 6.25% (v/v), and growth was recorded spectrophotometrically. Assays were referenced to untreated pathogen cultures. No parallel control substituted an equal volume of sterile uninoculated MRS broth, so the share of the effect attributable to reduced nutrient availability was not measured. Clearing zones were measured on pathogen-seeded agar. Biofilm inhibition was tested against *S. aureus*, the strongest biofilm producer among the four, using a crystal violet assay. Cell morphology was checked by microscopy.

Results and Discussion: Both strains inhibited all four pathogens. CFS of KCTC 15064 inhibited *L. monocytogenes* at 50% and *S. aureus*, MRSA, and *S.* Typhimurium at 25%; KCTC 5045 inhibited *S. aureus* and *L. monocytogenes* at 50% and MRSA and *S.* Typhimurium at 25%. Clearing zones for KCTC 15064 measured 1.3 cm (*S. aureus*) and 1.5 cm (*L. monocytogenes*), against 1.3 cm and 2.0 cm for KCTC 5045. *S. aureus* biofilm biomass dropped 55.52% at 6.25% CFS of KCTC 15064 and 48.62% at 12.5% CFS of KCTC 5045. Both values include whatever contribution medium substitution made at those dilutions. Microscopy showed heavier cell wall damage in Gram-positive cells.

Conclusions: Antibacterial activity covered all four pathogens and was stronger against Gram-positive targets, and *S. aureus* biofilm biomass fell at low CFS proportions. Without dilution-matched medium controls, the reductions reported here set an upper estimate of CFS activity and need confirmation against sterile MRS. *P. acidilactici* KCTC 15064 and *L. paraplantarum* KCTC 5045 merit testing as biopreservatives in food matrices.



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Sciforum-202012: DEVELOPMENT OF A NON-DAIRY MEDIUM FOR THE CULTIVATION OF *Lacticaseibacillus paracasei.*

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The demand for healthy food and supplements is constantly increasing, with probiotics being among the most favored products. However, most of the culture media for probiotic production is based on dairy substrates, limiting the options for individuals with milk-related dietary restrictions. In this context, coconut water stands out as a source of nutrients for microbial growth and a low-cost alternative to conventional culture media. Therefore, the objective of this work is to develop a non-dairy culture medium based on coconut water and yeast extract for the probiotic bacteria *Lacticaseibacillus paracasei* TRA 067308. An experimental design was applied with a factorial 2^4 matrix and four center points to increase bacterial yield. It was considered as a dependent variable: coconut water (from 25 to 50 g/L), yeast extract (from 5 to 30 g/L), monobasic and dibasic potassium phosphate (from 0 to 2.5 g/L each), and temperature (from 25 to 40 °C). The experiments were conducted in Erlenmeyer flasks containing 100 mL of the designed culture medium sterilized, inoculated with the *L. paracasei* grown for 20 h at 5% (v/v). The experiments were then incubated on a rotary shaker at 100 rpm for 44 h. Biomass was assessed by measuring optical density (OD), dry weight (DW), and viable cell count (CFU/mL). Statistical analysis was performed using Statistica Six Sigma 8.0 software (StatSoft Inc., USA). The results indicated that a coconut water concentration of 50 g/L and yeast extract at 30 g/L, combined with a temperature of 25 °C and the absence of a buffer system, favored the growth of *L. paracasei*, reaching an average of 1.5×10^9CFU/mL, 2.37 g/L of DW and 1.472 of OD. This indicates a promising culture media for probiotics, which can be used for the development of non-dairy products after additional optimization and scaling-up studies.



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Sciforum-202737: Evaluation of the microbiological quality of mayonnaise using an accelerated shelf-life test

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The growing demand for ready-to-eat foods has driven the development of products characterized by quality, safety, and storage stability. This study aimed to evaluate the microbiological quality of a newly developed mayonnaise (DM) subjected to an accelerated shelf-life test. The mayonnaise was produced in accordance with Good Manufacturing Practices and stored under different conditions: a control sample at 25 °C and two samples subjected to thermal stress at 35 °C and 45 °C for 30 days. Microbiological analyses were performed at the established storage intervals, including the detection of *Salmonella* spp., *Enterobacteriaceae*, molds, and yeasts, in accordance with current Brazilian legislation, established by Resolution RDC No. 724, of July 1, 2022, and Normative Instruction No. 161, of July 1, 2022. For mayonnaise, the microbiological standards establish the absence of *Salmonella* spp. in 25 g and a maximum limit of 10^2 CFU/g for *Enterobacteriaceae*, molds, and yeasts. The results demonstrated the absence of *Salmonella* spp. and *Enterobacteriaceae* at all evaluated storage periods, indicating adequate hygienic and sanitary conditions during product processing and storage. No mold or yeast growth was observed on days 0, 15, and 30. The analyses corresponding to day 7 were disregarded due to external contamination of the Petri dishes, which was not representative of sample contamination. The results demonstrated that the mayonnaise exhibited microbiological stability throughout the accelerated storage period, highlighting the effectiveness of the Good Manufacturing Practices and the product's potential to maintain its microbiological quality under the evaluated conditions. Further studies involving longer storage periods and a greater number of sampling points are recommended to improve the estimation of the product's microbiological shelf life.



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Sciforum-203045: Biotechnological development of active polymeric biostructures containing nanoencapsulated essential oils for antifungal protection of horticultural produce

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The highly perishable nature of fruit and vegetable products, driven by their high susceptibility to fungal spoilage and pathogenic microorganisms, demands advanced biotechnological solutions to mitigate quality deterioration and postharvest economic losses. This research focuses on developing fully sustainable, edible, and eco-friendly alternatives to synthetic fungicides through the design of bioactive biopolymers.In this study, three innovative polymeric systems were designed and developed: coatings (liquid phase applied directly to the surface), biofilms (preformed biodegradable sheets), and 3D-printed matrices (bio-designed support structures). These biostructures were formulated using edible structural polymers, naturally derived plasticizers, and emulsifiers, and were functionalized with nanoencapsulated essential oils (EOs) acting as antimicrobial agents. These biotechnological systems provide sustained antifungal protection, either through direct contact or via vapor-phase dispersion.To evaluate and validate the potential of these biostructures to extend shelf life, strawberries (Fragaria × ananassa) were used as an “in vivo” study model due to their high vulnerability. The efficacy of the developed systems was assessed by monitoring fungal infection incidence alongside critical fruit quality parameters, such as color, weight loss, and firmness.Preliminary trials suggest that applying these matrices—enriched with EO nanoparticles—reduces both the number of infected fruits and the severity of symptoms. Furthermore, the use of these biostructures ensures the preservation of key physicochemical attributes during storage. This research highlights the great potential of materials biotechnology and structural design in the creation of active packaging, offering a natural, safe, and effective strategy for the agri-food sector to address the challenge of food waste.



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Sciforum-203126: Towards Future Honey Microbiome Studies: Optimization of Molecular Approaches for Bacterial DNA Detection in Portuguese Honey

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Introduction: Honey contains DNA traces from plants, bees, and microorganisms associated with the hive and surrounding environment [1]. In recent years, the study of bacterial communities associated with honey has gained increasing attention due to its potential applications in honey quality assessment, authenticity studies, environmental monitoring, and bee health [2]. However, information regarding the bacterial diversity associated with Portuguese honey remains scarce. This study aimed to establish a preliminary molecular workflow for the detection of bacterial DNA in Portuguese honey as a first step towards future honey microbiome studies.

Methods: DNA was extracted from Portuguese honey samples using a CTAB-based protocol adapted for bacterial DNA extraction, including an enzymatic lysis step with lysozyme. The presence of bacterial DNA was evaluated by real-time PCR (qPCR) targeting the bacterial 16S rRNA gene using universal primers. In addition, qPCR assays targeting *Enterococcus* spp. and *Bacillus* spp. were evaluated and optimized. Negative controls and positive controls consisting of DNA extracted from cultured bacterial isolates were included to monitor contamination and amplification performance. Melting curve analysis was used to assess amplification specificity.

Results: Universal bacterial primers successfully amplified bacterial DNA in all analysed samples, confirming both the suitability of the extraction protocol and the presence of amplifiable bacterial DNA. The *Enterococcus*-targeted assay detected amplification in selected samples, while other samples remained negative. Amplification of *Bacillus* targets was observed in positive controls, while only late amplification signals were detected in some honey samples. Additional analyses are required to confirm the presence of *Bacillus* DNA in these samples.

Conclusions: The results demonstrate the feasibility of extracting and amplifying bacterial DNA directly from Portuguese honey. This work provides a methodological foundation for future culture-dependent and -independent studies aimed at characterizing the bacterial communities associated with Portuguese honey and exploring their relationship with honey quality, authenticity, environmental conditions, and bee health.



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Sciforum-203132: Development of lactic acid bacteria starters for cheesemaking isolated from different dairy matrices in Gran Canaria (Canary Islands)

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Introduction: Isolating autochthonous lactic acid bacteria (LAB) from dairy matrices for cheesemaking offers technological and sensory advantages, as these strains are metabolically adapted to the food matrix. **Methodology:** Raw milk (cow, sheep, goat), curd, whey, and cheeses at different ripening stages (fresh, semi-ripened, ripened) were sampled from 15 artisan dairies in Gran Canaria (Spain). Samples were homogenized in sterile peptone water, serially diluted, and duplicate-plated on LAB-selective media at 30°C under aerobiosis or anaerobiosis as appropriate. Isolates were identified by 16S rDNA sequencing and typed at the intraspecific level by RAPD. LAB were characterized in milk for growth/viability, acidification kinetics, and sensory profile (4-member panel). Selected strains were tested for compatibility in mixed cultures prior to scale-up in a 20 L bioreactor and freeze-drying. **Results and Discussion:** Ten LAB strains were identified: five *Lactococcus lactis* subsp. *lactis*, three *Lc. lactis* subsp. *cremoris* and two *Leuconostoc mesenteroides*. Most reached high viable counts in milk ($>10^9$ CFU/mL). Five were discarded for limited acidification capacity ($>$20 h to reach pH 5.0): *Lc. lactis* subsp. *lactis* 9, 10 and 42, and *Lc. lactis* subsp. *cremoris* 22 and 24, the latter also showing limited growth ($<10^5$ CFU/mL). The remaining five, combining fast acidification and a pleasant sensory profile, were selected: *Lc. lactis* subsp. *lactis* 14 and 25, *Lc. lactis* subsp. *cremoris* 15, and *Leuconostoc mesenteroides* 38 and 43. These strains were combined into five starter consortia (1A, 1B, 2A, 2B, and 3A). Mixed cultures showed no antagonism, confirming compatibility. The five freeze-dried consortia were stable for 18 months at $<$6°C and met microbiological safety specifications. **Conclusion:** This work represents the first development of autochthonous LAB starter cultures from dairy matrices in Gran Canaria. Their application in cheesemaking will be evaluated to determine their effects on the sensory, nutritional, and bioactive properties of the final products.



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Sciforum-203269: *Cronobacter turicensis* within the *Cronobacter* genus (*Enterobacteriaceae*): genomic architecture and evolutionary stability

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The genus *Cronobacter* comprises seven species of opportunistic food-borne pathogens responsible for severe neonatal infections. A defining feature across the genus is the presence of IncFIB-type virulence plasmids (pVirCro), which contribute to pathogenicity. While *C. sakazakii* is the primary research model, *C. turicensis* remains understudied despite its clinical relevance. The objective of this study was to characterize the genomic architecture of *C. turicensis* and investigate the evolutionary history of pVirCro plasmids to better understand genus-wide adaptation and species-specific divergence.

Whole-genome sequencing and comparative genomic analyses were performed on 47 *Cronobacter* strains, including nine *C. turicensis* isolates from nuts, herbs, and spices collected in Poland. Genome synteny, mobile genetic elements, the pVirCro core genome, and phylogenetic relationships between plasmids and host chromosomes were analyzed.

Phylogenetic evidence indicates that pVirCro plasmids have co-evolved with their hosts for approximately 45–68 million years and retain a conserved core of about 40 genes involved in replication, partitioning, and contact-dependent growth inhibition (CDI). Although CDI systems are widespread within the genus, they are reduced in *C. sakazakii*. In contrast, *C. turicensis* maintains complete plasmid-borne CDI together with an expanded repertoire of antagonistic systems. The genomes also display high synteny and conserved ISKpn78-related sequences and a domesticated RAYT transposase.

This study provides new insights into the long-term evolution of pVirCro plasmids and identifies genomic features that distinguish *C. turicensis* from other *Cronobacter* species, including its exceptional genomic stability and preserved antagonistic potential. Future studies should determine how these plasmid-encoded systems contribute to persistence in low-moisture foods and virulence, supporting improved food safety surveillance and risk assessment.

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Session E. Sustainable Food System & Food Security

Sciforum-180289: Agro-Waste as a Feedstock for Flour and Bioplastic Production: A Circular Economy Approach

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Introduction: The growing pressure to enhance food production while reducing associated environmental burdens has driven the development of more efficient and sustainable approaches. Recent advances in polymer science have focused on substituting conventional petroleum-based plastics with eco-friendly alternatives, following circular economy principles. The valorization of agro-industrial by-products for the production of food-grade flours and biodegradable bioplastics is proposed as an integrated strategy to reduce waste and improve technological innovation.

Materials and Methods: Surplus fractions from diverse crops were utilized as potential feedstocks. Flour production involved peeling and size reduction of raw materials to improve drying kinetics, followed by low-temperature dehydration to retain nutritional and functional properties. The flours were characterized in terms of composition and particle size distribution. Biopolymeric matrices were fabricated via injection moulding and subsequently evaluated using dynamic mechanical analysis and standardized biodegradability tests under controlled composting conditions.

Results: Flours derived from agro-industrial residues exhibited a heterogeneous particle size distribution, with a predominantly polysaccharide content. In contrast, protein-based bioplastics demonstrated suitable mechanical performance, including adequate tensile strength and elasticity. The materials showed effective biodegradation under composting conditions, with complete degradation within 30–40 days.

Conclusions: The valorization of agro-industrial surpluses into food-grade flours and biodegradable bioplastics represents a technically feasible and sustainable approach. This strategy supports circular economy models and contributes to addressing critical challenges related to food security and climate change mitigation.

Funding sources: This work forms part of an ongoing project: Project PID2024-155967OB-I00 funded by MICIU/AEI/10.13039/501100011033 and by “ERDF A way of making Europe”. Authors also acknowledge the financial support of Agencia Andaluza de Cooperación Internacional para el Desarrollo through the project “Fortalecimiento de las capacidades de investigación e innovación tecnológica de la UNAH para el desarrollo de cultivos biofortificados mediante el uso de matrices bioplásticas enriquecidas con micronutrientes como fertilizantes sostenibles (Honduras)” (expediente 2025UC005).



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Sciforum-180290: Development of Soy Protein-Based Bioplastics as Controlled-Release Systems for Iron Biofortification in Crops

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Introduction. Improving nutrient-use efficiency (NUE) is essential for sustainable food production. Controlled-release fertilizers (CRFs) allow gradual nutrient delivery synchronized with plant requirements. Biodegradable matrices from renewable resources are promising carriers. Soy protein isolate (SPI), an abundant by-product of the soybean oil industry, can be valorized to develop bioplastics for agricultural applications. This study evaluates SPI-based matrices as controlled iron-delivery systems and for crop biofortification in horticulture.

Materials and Methods. SPI was plasticized with water, glycerol or mixtures (5–15wt%), and iron sulphate heptahydrate (5wt%) as micronutrient. Tablets were produced by compression molding (300 bar). Materials were characterized by FTIR, thermogravimetric and dynamic mechanical analyses, water uptake and SEM microscopy. Selected formulations were evaluated in pepper plants to assess plant growth and iron bioavailability.

Results and Discussion. Water-plasticized systems exhibited higher stiffness and lower swelling, whereas glycerol increased flexibility and water absorption but with greater soluble matter loss. Release profiles were biphasic, showing a rapid initial stage followed by sustained delivery. Crop assays demonstrated improved plant growth and leaf coloration compared with unfertilized controls. Several formulations promoted higher iron accumulation in plant tissues, highlighting their potential as sustainable tools for crop iron biofortification.

Conclusions. SPI-based bioplastics are promising biodegradable carriers for CRFs. Their application improves NUE, supports crop iron biofortification and valorizes agro-industrial by-products, contributing to more sustainable food production systems.

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Sciforum-186157: Solar Radiation-Induced Senescence in Tropical Fruits: Mechanisms, Consequences, and Mitigation Strategies

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Sun-induced senescence in tropical fruits occurs when sunburn exceeds the photoprotective capacity of the epidermis. It accelerates post-harvest deterioration and worsens losses, which already run at 30 to 50% of total fruit production. This review synthesises the mechanism and consequences of solar radiation-induced senescence in major tropical fruits like banana (*Musa acuminata and Musa balbisiana*), plantain (*Musa paradisiaca*), mango (*Mangifera indica*), papaya (*Carica papaya*), pineapple (*Ananas comosus*), citrus (*Citrus spp.*), avocado (*Persea americana*), dragon fruit (*Hylocereus spp.*), and guava (*Psidium guajava*). This study also uncovered the mitigation interventions to abate the problem. Following the PRISMA workflow, eight thematic searches were conducted on four scholarly databases, resulting in 55 peer-reviewed articles used for this study. Results indicate that sunburn browning, photooxidative sunburn and epidermal necrosis are the three basic types of sun-induced senescence. These three types shared a mechanism for excess reactive oxygen species (ROS) generation that overwhelms both enzymatic and non-enzymatic antioxidant defences. Fruit surface temperatures above 46 to 52°C mark the most reliably documented induction point for sunburn browning. Once that threshold is crossed, membrane destabilisation follows. Mitigation strategies reviewed fall into three tiers. The first is agronomic and canopy management, which includes pruning, intercropping with shade-providing crops, and choosing rootstocks with high water supply capacity. The second is physical and microclimate interventions like using shading nets, fruit bagging, and evaporative cooling. The third strategy is biochemical and chemical approaches such as kaolin clay films, calcium carbonate, ascorbic acid, salicylic acid, 1-methylcyclopropene, and edible coatings. The identified gaps include the absence of species-specific thermal thresholds for most tropical fruits and the limited knowledge about how solar radiation interacts with the accumulation of extractable bioactive compounds in these species. Future studies need integrative multi-omics approaches and climate-adaptive management strategies calibrated to the real constraints of tropical production systems.



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Sciforum-186317: Consumer Values, Safety Perceptions, and Sustainable Vegetable Purchasing Behavior: A Cross-Sectional Study

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Abstract

Introduction:

Sustainable food systems require understanding how consumer values influence food choices related to health, safety, and environmental responsibility. Although organic vegetables are increasingly promoted as part of sustainable dietary practices, regular consumption may be shaped by a gap between positive perceptions and practical access. This study examined behavioral and values-related factors influencing organic vegetable consumption, with emphasis on health benefits, food safety perceptions, sustainability concerns, and market barriers.

Methods:

A cross-sectional quantitative survey was conducted between November 2024 and February 2025 among 408 adults. A structured questionnaire assessed consumer awareness, attitudes, purchasing practices, perceived motivators, and barriers related to organic vegetables. The tool demonstrated acceptable internal consistency (Cronbach's alpha = 0.80). Descriptive and inferential analyses, including association testing, correlation analysis, and regression modelling, were applied at a significance level of $p < 0.05$.

Results:

Participants generally expressed favorable perceptions toward organic vegetables and recognized their relevance to health, food safety, and sustainable consumption. Health benefits, environmental responsibility, and perceived product safety emerged as major factors supporting consumer interest. Education was associated with stronger awareness and more favorable purchasing behavior, while age-related differences were observed in attitudes and practices. However, high cost and limited availability remained important barriers, suggesting that values-based motivation does not always translate into consistent purchasing behavior.

Conclusions:

The findings indicate that organic vegetable consumption is influenced by both personal values and structural conditions. Improving affordability, product accessibility, and targeted consumer education may strengthen sustainable purchasing behavior and support broader adoption of health- and safety-oriented food choices.



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Sciforum-189595: Negotiating Sustainability at the Family Table: Sustainable Food Purchasing in All-Age Households

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Contemporary families face multiple considerations when practicing sustainable food consumption, including health needs, food safety, affordability, environmental responsibility, and intergenerational dietary care. Family food purchasing is therefore not merely an individual consumer choice, but a decision making practice involving everyday coordination and household governance. This study aims to develop an evaluation framework for sustainable family food purchasing applicable to households with members across age groups. The fuzzy Delphi method was employed to build expert consensus and confirm the conceptual appropriateness, practical relevance, and clarity of the proposed dimensions and indicators. Based on a literature review, an initial framework was developed, and experts participated in three rounds of evaluation. Fuzzy linguistic assessment, triangular fuzzy numbers, and defuzzification procedures were used to examine the indicators, while mean scores and standard deviations served as retention criteria for the dimensions and indicators. The results show a high level of consistency among experts. All six dimensions met the retention criteria of a mean score of 4.00 or above and a standard deviation of 1.00 or below. Mean scores ranged from 4.39 to 4.85. Food Safety and Certification Trust received the highest evaluation (MS = 4.85, SD = 0.36), followed by Health and Nutritional Value (MS = 4.78, SD = 0.41). Economic and Price Considerations received the lowest score (MS = 4.39, SD = 0.71), but still met the retention criteria, indicating that affordability remains a necessary condition for sustainable household food purchasing. This study repositions sustainable food purchasing as a micro level governance practice within family contexts and provides a framework for family food education, sustainable consumption promotion, and food policy design.



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Sciforum-189646: Asymmetric Adjustment and Structural Change in the China–Brazil Soybean–Emissions Nexus

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This study re-examines the relationship between Chinese soybean demand and Brazil's land-use CO_2 emissions within a dynamic trade–environment system. While the dominant narrative links rising external demand to environmental degradation, existing empirical studies largely rely on static or reduced-form approaches that do not distinguish between short-run correlations and long-run equilibrium relationships, nor account for structural change. As a result, current evidence remains inconclusive regarding the persistence, direction, and adjustment dynamics of this nexus. To address this gap, the study integrates cointegration analysis, a Vector Error Correction Model (VECM), structural break testing, and Local Projections within a unified empirical framework, using annual data from 1990 to 2024. This approach allows the joint identification of long-run equilibrium relationships, asymmetric adjustment mechanisms, and policy-induced structural change. The results indicate the presence of a stable long-run equilibrium linking Chinese soybean imports, Brazilian land-use emissions, agricultural land, and global soybean prices. The estimated long-run relationship reveals a negative or weak conditional association between demand and emissions, consistent with system-level adjustments shaped by institutional constraints rather than a direct causal effect. Short-run dynamics are strongly asymmetric: Chinese imports adjust to restore equilibrium, while emissions behave as weakly exogenous. Structural break tests identify a regime shift around the 2006 Soy Moratorium, primarily affecting demand dynamics. Forecast error variance decomposition shows that demand shocks explain only a small share of emissions variability, while Local Projection estimates provide no robust evidence of short-run effects. Overall, the findings highlight that trade–environment interactions are governed by long-run system dynamics and domestic structural factors, with important implications for supply-chain governance and demand-side environmental policies.



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Sciforum-190832: Gender- and Age-Related Differences in Sustainable Dietary Transitions during a Mediterranean Diet Intervention

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This study explored the influence of gender and age on sustainable dietary transitions during a Mediterranean diet intervention in adults attending a nutritional outpatient clinic. Sustainable eating patterns are increasingly recognized as important strategies for improving both human and environmental health; however, demographic factors may influence adherence to these dietary models.

1666 participants (58.2% women) aged 18–75 years followed a calorie-restricted Mediterranean dietary intervention, and food intake was evaluated before and after treatment using dietary questionnaires and a sustainability index. Changes in dietary habits were analysed according to sex and age groups ($<$30, 30–50, and $>$50 years).

At baseline, men reported higher consumption of meat and processed meat products ($p < 0.001$), whereas women consumed more whole grains and low-fat dairy products ($p < 0.01$). Following the intervention, legume consumption increased significantly (+3.2%, $p < 0.001$), although the overall sustainability index decreased in the total sample. Significant reductions in sustainability scores were observed in participants aged $<$30 years (0.27 vs. 0.19; $p = 0.0019$) and $>$50 years (0.27 vs. 0.19; $p = 0.0005$), while smaller changes were observed in the 30–50-year group (0.30 vs. 0.25; $p = 0.0123$). Men showed a greater tendency toward increased meat consumption after the intervention, whereas women maintained more sustainable dietary choices.

These findings suggest that short-term Mediterranean dietary interventions do not automatically improve sustainability-related behaviours, particularly in specific demographic groups. Gender- and age-specific nutritional strategies may therefore be necessary to facilitate long-term adherence to sustainable dietary patterns and reduce resistance to plant-based food choices.



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Sciforum-192509: From Ocean to Data: Digital Traceability for Sustainable Seafood Value Chains

Eva Martínez Ibáñez [1,*], Jara Laso Cortabitarte [1], Ruben Aldaco García [1], Ana Cláudia Dias [2], Paula Quinteiro [2], Eoghan Clifford [3], Alex Wan [4], Pedro Manuel [5], Cheila Almeida [6,7], Carla Pires [6,7], David Baptista de Sousa [8], Martin Rodriguez [8], Juan Pablo Pérez [9], Jorge Romón [9] and María Margallo Blanco [1]

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The Atlantic fisheries sector represents a cornerstone of regional economies, cultural heritage, and food security. However, increasing societal demands for sustainability and transparency are driving the need for more effective environmental product traceability, and transparency across seafood value chains. Although digital technologies have advanced in recent years, the sector still faces important limitations, such as fragmented data systems, low interoperability among stakeholders, and the lack of integrated digital infrastructures based on harmonized data protocols. This study aims to develop an integrated environmental traceability framework to support more sustainable, transparent, and data-driven seafood value chains.

The proposed approach combines Life Cycle Assessment (LCA), following ISO 14040 and ISO 14044 standards, with innovative digital technologies for the collection and integration of primary data from fishing vessels and other fisheries stakeholders. A digital platform is currently under development to harmonize environmental and operational information and generate dynamic Life Cycle Inventory datasets based on real-world data, including fuel consumption, energy use, material inputs, by-catch, and waste generation. The methodological framework is being designed to assess conventional LCA impact categories, such as climate change, eutrophication, and acidification, together with fishery-specific indicators, waste-related impacts, and an innovative plastic footprint metric.

Once implemented, the platform is expected to provide fishers, processors, consumers, and public authorities with reliable environmental information and decision-support tools, contributing to more sustainable fishing practices and greater transparency throughout the seafood value chain.



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Sciforum-192801: The use of freeze-dried black chokeberry pomace as a by-product in pork burgers

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The aim of this study was to evaluate the effect of adding freeze-dried chokeberry (*Aronia melanocarpa*) pomace at levels of 0.0%, 0.5%, 0.75%, and 1.0% on the quality of pork burgers, marked as B0, B05, B075, and B1, respectively, subjected to heat treatment and storage (+4°C, 21 days). Chokeberry pomace was incorporated as a natural source of dietary fibre and bioactive compounds, as well as a means of valorizing chokeberry-processing by-products. Burgers were baked in a convection steam oven (180°C, 10 min) until an internal temperature of 72°C was reached and subsequently evaluated for selected physicochemical and organoleptic properties.

The addition of chokeberry pomace did not significantly affect ($p > 0.05$) thermal loss, although the difference between burgers B0 and B1 reached 3.6%. In contrast, pomace addition caused a significant increase in shrinkage ($p < 0.05$), with the difference between B0 and B1 amounting to 7.8%. Increasing the pomace level reduced the water, protein, and fat contents of burgers and significantly ($p < 0.05$) increased total carbohydrate content from 0.0% (B0 and B05) to 0.34% (B1). Despite small differences in pH values (maximum 0.05 units), increasing pomace addition resulted in a significant decrease in pH ($p < 0.05$).

Instrumental color analysis showed a significant ($p < 0.05$) decrease in lightness ($L*$) and yellowness ($b*$), whereas redness ($a*$) was not affected ($p > 0.05$) on day 1. Neither chokeberry pomace addition nor storage time significantly influenced burger shear force values ($p > 0.05$). Organoleptic evaluation indicated high quality of all burger variants, with scores of at least 3.9 points on a 5-point scale. However, burgers containing 1.0% pomace received lower color scores ($p < 0.05$) on days 1 and 21. The results indicate that the addition of freeze-dried chokeberry pomace should not exceed 0.75%, providing an effective strategy for by-product valorization while maintaining desirable burger quality attributes.



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Sciforum-194881: From Food Ethics to Food Citizenship – Reframing Food Security for Sustainable Food Systems in Central and Eastern Europe

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Introduction

Food security is traditionally assessed through four dimensions: availability, access, utilization, and stability. However, persistent food insecurity despite improvements in food supply raises questions about whether food availability alone is sufficient to ensure sustainable food systems. This study examines the relationship between food availability and food insecurity in Romania and neighboring countries and discusses the implications for food ethics and food citizenship.

Methods

A comparative analysis was conducted using data from the FAO Suite of Food Security Indicators for Romania, Bulgaria, Hungary, Serbia, the Republic of Moldova, and Ukraine. Indicators related to food availability, including dietary energy supply adequacy and average protein supply, were analyzed alongside food insecurity indicators, such as prevalence of undernourishment and moderate or severe food insecurity. Descriptive statistics, trend analysis, and correlation analysis were used to evaluate the relationship between food availability and food security outcomes.

Results and Discussion

Most analyzed countries recorded relatively high levels of dietary energy and protein availability. Nevertheless, important differences persist in food insecurity indicators, with some countries experiencing moderate or severe food insecurity despite adequate food supply. These findings suggest that increased food availability does not automatically ensure equitable access to food or improved food security outcomes. The observed disparities highlight the influence of social, behavioral, and institutional factors on food system performance.

Conclusions

Food security should be understood as more than a question of food supply. While availability remains essential, sustainable food systems also require responsible consumption, social responsibility, and civic engagement. In this context, food citizenship may represent a pathway for translating food ethics into practical actions that support more equitable, resilient, and sustainable food systems. The proposed approach may be replicated in other geographical regions facing similar food security challenges.



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Sciforum-195243: Comparative Evaluation of Lakatan and Saba Banana Peel Coffee Powders as Caffeine-Free Beverage Alternatives

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This study evaluated the potential of Lakatan (*Musa acuminata*) banana peel as a raw material for the production of a roasted coffee-like beverage powder and compared its sensory, physicochemical, microbiological, and proximate properties with those of Saba (*Musa balbisiana*) banana peel beverage powder. Banana peels were cleaned, scraped, cut, roasted, ground, and brewed, with roasting treatments varying from 180 to 190°C and 15 to 25 min. Nine roasting treatments were subjected to sensory evaluation by 45 black coffee-drinking panelists using Quantitative Descriptive Analysis and a 9-point hedonic scale. Significant differences were observed among formulations in color, aroma, bitterness, and aftertaste based on QDA ($p < 0.05$), indicating that roasting condition and banana variety influenced the development of coffee-like sensory attributes. Hedonic scores for color, aroma, taste, and overall acceptability also differed significantly among treatments ($p < 0.05$), suggesting differences in panelist preference. Among the Lakatan formulations, BC7 (185°C for 20mins) was identified as the most acceptable treatment, exhibiting a very dark brown color, slightly perceptible coffee-like aroma, moderate bitterness, and moderately perceptible aftertaste. For Saba, BC2 (190°C for 15mins) showed comparable sensory characteristics and obtained higher taste and overall acceptability scores. The selected Lakatan and Saba formulations were both dark earthy brown, low in acidity, caffeine-free (<0.01 g/100 g), and free from detectable arsenic and lead. Coliform counts were <10 CFU/g, while aerobic plate counts were within the acceptable limit for powdered beverages. Proximate analysis showed that Lakatan had higher moisture and carbohydrate contents, whereas Saba had higher crude fat and ash contents. Results demonstrate that both Lakatan and Saba banana peels can be processed into microbiologically acceptable, caffeine-free roasted beverage powders with distinct sensory and compositional characteristics, supporting their potential as sustainable coffee alternatives and value-added products from banana peel waste.



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Sciforum-195327: Ready-to-drink upcycled coconut skim milk-pineapple blend: influence of formulation on physico-chemical properties and consumer acceptability

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Virgin coconut oil processing through centrifugation generates wastes such as coconut skim milk (CSM). This by-product, despite its nutritional and health functional properties, remains underutilized and is often discarded. This study determined the influence of varying pineapple juice (%) and sugar (%) levels on the physicochemical properties (i.e., color, pH, total soluble solids or TSS and viscosity) and consumer acceptability of bottled ready-to- drink (RTD) upcycled coconut skim milk-pineapple (uCSMP) blend using a two-factor mixture design. Consumer acceptability tests (i.e., 9-pt hedonic scale) involved followed a balanced incomplete block design (i.e. Plan 11.15 of Cochran and Cox) involving a total of 60 consumers aged 18-59 years old. Predictive models were generated to establish the effects of the formulation parameters on the quality of the RTD uCSMP blends. Verification experiments were conducted to validate the accuracy of the predictive models. Formulation parameters exerted a linear effect ($p < 0.05$) on viscosity and total soluble solids, and a marginally significant interactive ($p = 0.06$) effect on the pH of the samples. In addition, the combination of pineapple juice and sugar exerted a significant ($p < 0.05$) interactive effect on the flavor and aroma acceptability of the RTD blends. Verification experiments confirmed that the generated statistical models had adequate predictive accuracy for the responses. The findings of this research demonstrate the potential of utilizing CSM in developing plant-based milk alternatives such as flavored uCSM blends to minimize the industrial waste generated from virgin coconut oil processing.



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Sciforum-196624: Brewery Waste to Functional Food: Alkaline and Ultrasonic Recovery of Brewer's Spent Grain Protein and Its Application in Croissant Fortification

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Brewer's spent grain (BSG) is the primary solid by-product of beer production, constituting approximately 85% of total brewery waste yet containing 15–30% protein on a dry weight basis. Despite its nutritional potential BSG is largely directed to low-value applications. This study aimed to valorize BSG through systematic protein extraction and functional food application. This study investigated alkaline and ultrasonic assisted (UAE) techniques to improve protein recovery from BSG. Alkaline extraction process was performed with sodium hydroxide (NaOH) and potassium hydroxide (KOH) different concentrations (0.1–8 M) while the UAE was carried out under sonication amplitude (20–60 µm) and time (5–25 mins). Recovered proetins extracts were chacterized for protein concentration (Bradford assay), crude protein content (combustion method), and functional properties including water/oil holding capacity and emulsification properties. The optimizied UAE protein extract was incoporated into two croissnt formulations containing and lacking yeast, while two corresponding control formulations without protein extract were prepared. Croissants were evaluated for protein, moisture, ash, fat, carbohydrate, and energy content usisng standard AOAC methods. Results were analyzed using one-way analysis of variance (ANOVA) for extraction, functional property, and compositional data, with satistical significance established at $p < 0.05$. Moderate alkali concentrations (0.1 M KOH and NaOH) produced the highest protein recovery (49 and 59%), whereas 4 M KOH yielded the highest protein concentration (2.35 mg/mL). Further increase in alkalinity reduced protein recovery, likely due to protein degradation. Ultrasound-assisted extraction (UAE) at modified conditions (50 µm amplitude, 15 min) achieved protein recovery of 98% with a crude protein content of 24.04%. UAE-extracted proteins demonstrated excellent functional properties , with a WHC of 5.77 g/g, OHC of 4.88 g/g, and EAI of 46 m^2/g, and ESI of 98%. Fortification of croissants with UAE derived BSG protein extract (15 g per 200 g flour) significantly increased ($p < 0.05$) protein content from 4.28 g to 8.39 g and doubled ash content from 0.6 g to 1.2 g. Carbohydrate content declined from 56.02 g to 48.44 g due to protein dilution and yeast-mediated fermentation during processing. These findings establish a scientifically grounded, scalable pathway for converting brewery waste into functional food ingredient with significant implications for sustainable food systems and protein security.



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Sciforum-196818: Physicochemical, nutritional, and sensory characteristics of soy- and lentil-based patties analogous to meat

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The rising demand for plant-based alternatives has driven the development of meat analogs that mimic the composition and physicochemical properties of animal-based products. However, these alternatives have not met consumers' expectations for sensory acceptability. Moreover, there is very limited information regarding the effects of these plant-based products on satiety and hunger levels compared to meat. The aim of this study was to compare the nutritional components, physicochemical properties, sensory acceptance, and satiety levels of lentil-based and textured vegetable protein (TVP)-based patties with traditional beef patties. Formulations were optimized through preliminary trials and evaluated for water activity, moisture content, cooking loss, shrinkage, color, texture profile analysis (TPA), and nutritional composition. Satiety, liking, and purchase intent were measured using self-reported rating scales. Data was analyzed using ANOVA (alpha=0.05). Beef patties showed the highest protein levels and greater cooking loss and hardness, while lentil-based patties had the lowest protein but comparable fat levels due to canola oil additions. TVP-based patties presented intermediate values with lower textural parameters. Regarding satiety, ground beef patties showed the highest percentage increase from baseline (137.8% at 10 min), followed by lentil patties (93.4% at 10 min) and TVP patties (77.8% at 10 min). However, lentil-based patties maintained satiety levels consistently throughout the post-consumption period (score-units: 73.26 at 10 min, 74.38 at 20 min, 74.05 at 30 min), whereas ground beef and TVP patties showed greater variability across time points. Consumer acceptance revealed that beef patties achieved the highest purchase intent (80%), followed by TVP (42.5%) and lentil patties (35%). Sensory evaluation indicated that beef patties received higher acceptance scores (7.00) than TVP (5.78) and lentil patties (5.33), attributed to differences in flavor, taste, and texture attributes. These results provide valuable insights into the distinct physicochemical and sensory profiles of plant-based meat alternatives.



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Sciforum-196854: Proteomic reprogramming during amaranth seed germination reveals a domestication signature associated with stress versus growth strategies

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Introduction: Amaranth is a nutrient-rich underutilised crop with potential to enhance food security, yet the molecular effects of domestication on seed germination remain poorly understood. Elucidating how domestication has reshaped the germination proteome can guide breeding towards faster and more stress-resilient varieties. Methods: We performed label-free quantitative shotgun proteomics on seeds of cultivated (Amaranthus hypochondriacus cv Cristalina) and wild (A. hybridus) amaranth species. Seeds were germinated at 25 °C in darkness, and five morphological phases were collected according to germination curves, each with three biological replicates. Proteins were retained if quantified in at least two replicates in late stages (PIII or Post germ). After median imputation, differential expression (limma, $|\log_2 FC| > 1$, adj.$P < 0.05$), WGCNA, STRING networks, and GO enrichment were applied to 614 filtered proteins. Results: A 15-protein domestication signature was identified: chaperones (ClpB, HSP17.4), annexin D2, and antioxidant enzymes were consistently more abundant in the wild, whereas proteasome subunits, ribosomal proteins, and glycolytic enzymes were higher in the cultivated line – a pattern suggesting a trade-off between stress preparedness and rapid growth. WGCNA confirmed a stress-related module strongly upregulated in wild ($r = 0.966$, $p = 5 \times 10^{-18}$) and an energy module conserved across phases. The proportion of differentially abundant proteins peaked at PII (120/614, 19.5 %), highlighting this phase as the major divergence point. Oleosin and ribokinase were identified as stable markers of species identity and early germination vigour, respectively. Conclusions: Domestication appears to have shifted the amaranth proteome from constitutive stress defense toward accelerated energy production and translation. This work provides candidate markers for breeding and contributes to the valorization of underutilized crops for sustainable food systems.



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Sciforum-196855: Chemical characterization of condensate as a by-product in chamomile drying process

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AIM: In Croatia, chamomilla is the most dominant cultivated medicinal and aromatic plant, with total sown areas fluctuating between 7,700 and 10,000 hectares depending of seasons. Croatian chamomilla is internationally renowned for its rich concentration of essential oils and specific aroma. Up to 90% of the production is exported worldwide, with major buyers coming from Germany, Switzerland, the United States, and Japan. Chamomilla flos dryers are batch dryers with drying cycle of 15 hours at approximate drying temperature of 35 – 45 °C. During the drying process the condensate is produced and its colour, and optical characteristics, particularly limpidity are changing as the drying time is going. Usually, the condensate was treated as waste in drying process of chamomilla. So, the aim of our research was to find is it possible to treat the condensate as a useful by-product but not as waste in chamomile processing. ANALYTICAL METHOD: Volatile compounds were analysed using headspace solid-phase microextraction (HS-SPME) coupled with gas chromatography-mass spectrometry (GC-MS). Results are expressed as a percentage of the total peak area and reported as mean ± standard deviation of three replicates. RESULTS: The most dominant chemical compound in chamomile condensate is α-Bisabolol oxide A (35.22 %), than follows α-Bisabolol oxide B (29.52 %), 2-Ethylhexanol (7.64 %), α-Bisabolol (6.51 %), (E,E)-α-Farnesene (2.25 %), Artemisia ketone (2.04 %), Sulcatone (1.75 %), α-Pinene (1.64 %) and Yomogi alcohol A (1.44 %). The content of other compounds is lower than 1 %. CONCLUSION: According to results of our study, the condensates collected in different time of chamomilla drying seems like a very promising by-product. However, its standardization before final using in different purposes is required.



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Sciforum-197230: Phenolic compounds, xylose, and glucose production from vine shoots through sequential microwave-assisted processing

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Vine shoots (VS) are an abundant lignocellulosic biomass whose valorization is crucial for advancing the circular bioeconomy in the grape and winery sectors. This study evaluated the effects of three process configurations for VS valorization using microwaves for extraction and pretreatment to obtain phenolic compounds and fermentable sugars. The three process configurations were: an acid pretreatment with 0.8% H_2SO_4 at 160°C for 5 min, and two sequential processes consisting of an extraction with 69% ethanol at 80°C for 4 min followed by acid pretreatment, and an extraction with 58% ethanol at 155°C for 3.5 min followed by the same pretreatment. The phenolic profiles of the extracts and pretreatment liquors were acquired by high-performance liquid chromatography (HPLC) at 280 nm. Moreover, the hemicellulosic sugars were also determined in the pretreatment liquors. Additionally, the pretreated solids were compositionally characterized and subjected to enzymatic hydrolysis for 72 h to obtain glucose.

The standalone pretreatment degraded VS stilbenoids, suggesting that the extraction should be performed as the primary operation in the valorization cascade. The sequential process involving extraction at 155 °C with 58% ethanol, followed by acid pretreatment, enabled obtaining an extract with a total phenolic content of 21.7 mg gallic acid equivalents/g VS (including the stilbenoids *trans*-resveratrol and *trans*-ε-viniferin) and showed the highest recovery of hemicellulosic sugars in the liquid fraction, i.e., 95.5 g/100 g of hemicellulosic sugars in raw biomass, mainly xylose. This previous extraction also facilitated subsequent enzymatic hydrolysis, yielding 16.0 g/L of glucose after 72 h (17.2 g of glucose/100 g VS), indicating that enzymatic digestibility increased from 41.2% to 56.7%.

In conclusion, integrating microwave-assisted extraction before pretreatment offers a more efficient route for VS valorization than standalone pretreatment.



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Sciforum-197602: Knowledge, Attitudes, and Practices of Food Industry Professionals Toward Rabbit Meat in Filipino Cuisine

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The growing emphasis on sustainable food systems has increased interest in alternative protein sources that address nutrition, environmental sustainability, and food security. Rabbit meat offers high-quality protein and favorable production characteristics, yet its integration into Filipino culinary practice remains limited. This study examined the knowledge, attitudes, and practices (KAP) of food industry professionals regarding rabbit meat utilization in Filipino cuisine and identified factors associated with its use.

Using a mixed-methods research design, the study involved 100 food industry professionals, including chefs, culinary educators, restaurant practitioners, food service managers, and other professionals engaged in food preparation, production, management, and culinary instruction. Quantitative data were collected through a structured KAP survey, while qualitative data were obtained through focus group discussions and interviews exploring professional experiences, perceptions, and barriers to rabbit meat utilization.

Quantitative findings showed moderate knowledge (M = 9.77, SD = 4.62), generally favorable attitudes (M = 3.44, SD = 1.07), and relatively limited utilization in culinary practice (M = 1.71, SD = 1.03). Practice was significantly correlated with age ($r = 0.261$, $p = 0.004$), knowledge ($r = 0.400$, $p < 0.001$), and attitude ($r = 0.575$, $p < 0.001$), but not years of experience ($r = 0.048$, $p = 0.318$). Multiple linear regression showed that the model significantly explained variation in practice ($R^2 = 0.405$, $p < 0.001$). Attitude was the strongest significant predictor ($\beta = 0.511$, $p < 0.001$), followed by age ($\beta = 0.279$, $p = 0.003$). Knowledge and years of experience were not significant predictors when considered simultaneously.

Qualitative findings identified limited ingredient availability, inadequate familiarity with preparation techniques, supply constraints, and concerns about consumer acceptance as key barriers. Overall, the findings suggest that rabbit meat utilization is shaped not only by individual knowledge and attitudes but also by broader food system conditions. These findings provide a basis for developing targeted educational initiatives, culinary resources, and industry strategies to support the responsible, sustainable, and culturally appropriate integration of rabbit meat into Filipino cuisine.



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Sciforum-197610: Valorization of Tannat grape seed residues after ultrasound assisted extraction of antioxidant compounds

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Grape pomace, mainly composed of skins and seeds, is the major by-product of the wine industry worldwide. Due to its large volume and disposal costs, several valorization strategies have been developed. While grape skins have been extensively studied, less information is available regarding grape seed residues. In a previous study, bioactive compounds from Tannat grape seeds were extracted using ultrasound-assisted extraction (UAE), achieving the highest extraction yields with ethanol at 180 W. The aim of the present work was to characterize the residual material obtained after UAE and evaluate its potential for further valorization. The residue generated after UAE using ethanol was analyzed for its proximate composition, water-holding capacity (WHC), oil-binding capacity (OBC), protein solubility as a function of pH, total phenolic content (TPC), and antioxidant capacity by ABTS and ORAC assays. The residue contained 67.8 ± 1.1% dietary fiber, 8.08 ± 0.23% protein, and 5.98 ± 0.16% lipids. WHC and OBC values were 2.96 ± 0.02 and 2.17 ± 0.09 g/g dry sample, respectively. Protein solubility increased progressively with pH and did not exhibit the typical U-shaped profile. TPC reached 38.0 ± 1.3 mg GAE/g dry residue, while antioxidant capacities were 274.9 ± 5.7 μmol TE/g and 387.7 ± 13.7 μmol TE/g dry residue for ABTS and ORAC, respectively. Although the residue showed limited techno-functional properties, it retained considerable levels of phenolic compounds and antioxidant activity. The residue obtained after UAE of Tannat grape seeds represents a promising source of dietary fiber and residual antioxidant compounds. These characteristics suggest its potential inclusion within the concept of “antioxidant fiber”, although further studies are required for formal classification and application development.



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Sciforum-197684: Barriers and Opportunities for Valorizing Coffee Pulp as a Functional Food Ingredient in the Dominican Republic: Results from a National Producer Survey

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Coffee pulp is a bioactive agro-industrial by-product representing approximately 43.2% of the fresh fruit weight. It constitutes a matrix rich in dietary fiber (18–32%), caffeine, and polyphenols, particularly hydroxycinnamic acids, exhibiting high intestinal bioaccessibility ($>$ 80%) and significant antioxidant potential. However, its incorporation into food systems requires technical knowledge, stabilization technologies, and producer participation in circular value chains. This study evaluated coffee pulp management, technical barriers, and opportunities for valorization as a food-grade ingredient. A national cross-sectional survey was conducted using a structured digital questionnaire administered to 361 coffee producers from 25 coffee-growing provinces. Descriptive statistics summarized management practices, knowledge, barriers, and willingness indicators. Cochran's Q tests compared multiple-response categorical variables related to pulp destinations and perceived barriers. Chi-square tests assessed associations between training, knowledge of food applications, and research participation willingness. Coffee pulp management was concentrated in low-value uses, including direct soil disposal (52.1%), fresh organic fertilizer (47.1%), and composting (27.7%), whereas drying pulp for tea was only 0.6%. Cochran's Q showed significant differences among pulp destinations ($Q = 688.25$; $p < 0.001$). Knowledge gaps were evident: 44.0% of producers were unaware of food applications, and only 6.1% had consumed infusions. The main barriers were lack of technical information (29.9%) and processing equipment (23.5%) ($Q = 227.88$; $p < 0.001$). Nevertheless, 80.1% of producers were interested in training and 76.7% were willing to market dried pulp. Previous training was associated with knowledge of food applications ($p = 0.0249$), which in turn drove interest in functional food research ($p = 0.0102$). Coffee pulp remains an underutilized functional resource. Strengthening technical knowledge and food-grade stabilization is essential to support its transition from waste disposal to a circular functional food value chain.



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Sciforum-197773: Green Technologies for Circular Valorization of Agri-Food Bioresources

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The increasing generation of agri-food waste has intensified the need for sustainable management strategies that support circular economy principles. Unlike previous studies addressing biomass valorization more broadly, this study focuses on food-oriented valorization pathways and the recovery of ingredients intended for food and nutraceutical applications. The study combines a systematic literature search with bibliometric analysis to investigate the use of green technologies for the circular valorization of agri-food bioresources in food-related applications. A search of the Web of Science Core Collection was conducted in June 2026 using keywords related to agri-food waste, by-products, valorization, green extraction, fermentation, bioconversion, and food applications. A total of 1,893 records were retrieved. After restricting the dataset to English-language articles and reviews and removing records belonging to the ongoing year and to non-food-related subject categories, 986 publications were retained for analysis. Bibliometric mapping and keyword co-occurrence analysis were performed using VOSviewer. The retrieved publications indicate that green extraction, fermentation, and bioconversion are the main technological approaches used to transform agri-food residues into value-added products. The frequently reported techniques included ultrasound-assisted extraction, microwave-assisted extraction, green solvent-based extraction, solid-state fermentation, and microbial fermentation. Regarding the raw materials used, fruit and vegetable residues, cereal by-products, and agro-industrial waste were the most commonly investigated bioresources. In the same time, the analyzed technologies facilitated the recovery of polyphenols, antioxidants, dietary fibre, carotenoids, proteins, and other bioactive compounds with potential applications in functional foods and nutraceutical products. The evidence from the selected studies suggests that recovering such ingredients from underutilized waste streams can improve resource efficiency, increase the availability of nutritional ingredients, and generate additional value without competing with conventional food or feed resources. The bibliometric mapping identified four dominant research themes associated with biorefinery concepts, fermentation technologies, biomass recovery, and the extraction of bioactive compounds. The findings indicate a gradual transition from waste disposal practices towards resource recovery and value creation. By combining a systematic literature search with bibliometric analysis, this study provides an overview of current research trends while drawing attention to challenges related to process scalability, techno-economic feasibility, and industrial implementation.



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Sciforum-197776: Life Cycle Sustainability Assessment of Gluten-Free Food Systems: Evidence Gaps & Integration of Nutritional Functional Units

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Gluten-free foods are critical for managing coeliac disease; however, the evidence on the sustainability of GF product systems is fragmented and methodologically inconsistent. This protocol-driven systematic literature review (SLR) examines (i) the application of Life Cycle Sustainability Assessment (LCSA) to gluten-free (GF) food systems, (ii) the use of nutritional Life Cycle Assessment (nLCA) or nutrition-linked functional unit approaches, (iii) the reported environmental, nutritional, economic and social trade-offs, and (iv) the methodological challenges that limit synthesis. A structured search of major bibliographic databases for English-language studies published between 2009 and March 2025 yielded 14,723 records, of which 553 were assessed for eligibility. Only six studies met the inclusion criteria, highlighting a significant evidence gap and limited methodological convergence in GF LCSA.

The reviewed studies include gluten-free bakery products and cereal or legume-based products, with most employing cradle-to-gate or cradle-to-grave environmental life cycle assessment (LCA). Although this review is framed by LCSA, the evidence is largely environmental. Economic (Life Cycle Costing, LCC) and social (Social Life Cycle Assessment, S-LCA) aspects are minimally addressed or discussed narratively, limiting systematic analysis across sustainability pillars. Nutritional integration is inconsistent, as most studies rely on mass-based functional units rather than nutrient-linked methodologies.

Scenario and sensitivity analyses indicate that ingredient reformulation, local sourcing, or changes in waste management can improve climate outcomes. However, such interventions may shift environmental burdens to freshwater eutrophication, climate change, or ozone depletion, and multi-dimensional trade-offs are rarely quantified. Cross-study comparability is limited by heterogeneous system boundaries, incomplete specification of the background database, and limited reporting of uncertainty. Current sustainability claims for GF food systems rely on a small and heterogeneous evidence base. Advancing credible LCSA requires harmonised nutrition-relevant functional-unit reporting, transparent inventory and LCIA disclosure, and systematic integration of environmental, economic, and social indicators to support decision-making for healthier and more sustainable GF food systems.



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Sciforum-197830: Nutritional composition and antioxidant potential of *Talinum paniculatum* (Jacq.) Gaertn. seeds

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Talinum paniculatum (Jacq.) Gaertn., an unconventional food plant (UFP) native to tropical and subtropical America, is commonly known as jewels-of-opar and as major-gomes in Brazil. In addition to its culinary use, this species is also recognized for its antioxidant, antimicrobial, anti-inflammatory, and diuretic properties. Despite the growing interest in UFPs, studies on *T. paniculatum* have mainly focused on its leaves, highlighting their nutritional value and bioactive composition, while its seeds remain underexplored. Therefore, this work aimed to evaluate the nutritional composition and antioxidant activity of *T. paniculatum* seeds. The seeds were collected in Medianeira, Paraná, Brazil (25°17'49.5"S 54°06'51.9"W), and transported under vacuum to Bragança, Portugal (41°47'53.6"N 6°45'56.7"W). Moisture, ash, lipid, protein, and total dietary fiber analyses were performed in triplicate according to AOAC methods, while carbohydrates were calculated by difference. The seeds'hydroethanolic extract (ethanol/water, 80:20, v/v) was evaluated for antioxidant activity using the TBARS and ORAC methods. The seeds showed a moisture content of 12.42 ± 0.20 g/100 g and were particularly rich in total dietary fiber (54.17 ± 1.11 g/100 g dry weight (dw)), followed by proteins (23.92 ± 0.30 g/100 g dw), lipids (12.24 ± 0.87 g/100 g dw), carbohydrates (6.17 ± 1.43 g/100 g dw), and ash (3.00 ± 0.16 g/100 g dw), with an energy value of 342.96 ± 2.54 kcal/100 g dw. The extract demonstrated significant inhibition of lipid peroxidation by the TBARS method (EC_{50} = 0.12 ± 0.01 mg/mL) and high antioxidant capacity by the ORAC method (641.9 ± 19.14 µmol TE/g). The results demonstrate that *T. paniculatum* seeds have a valuable nutritional profile, characterized by a particularly high dietary fiber content and marked antioxidant activity, highlighting their potential as a promising underexplored food resource and as a functional ingredient for the development of innovative food products with added nutritional value.



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Sciforum-197881: Recovery of residual oil from canola meal by ultrasound-assisted extraction, using a green solvent: influence of process variables

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Canola oil ranks among the most widely consumed vegetable oils worldwide, and its industrial production yields byproducts with considerable valorization potential. Residual oil retained in canola meal after mechanical pressing is conventionally recovered using hexane extraction, a method associated with environmental and occupational health concerns. This work aimed to develop a sustainable alternative for residual oil recovery .

Seeds were subjected to hydrothermal pretreatment (autoclave steam, 130 °C, 5 min) followed by microwave conditioning (2450 MHz, 5 min). Ultrasound-assisted extraction was then performed using a probe sonicator (VCS-500, Sonics & Materials, USA) with isopropanol as the extraction solvent. The effects of ultrasound amplitude (25–75%) and solid-to-solvent ratio (1:17–1:34) were assessed at fixed extraction time (60 min) and temperature (60 °C). Following each extraction, samples were centrifuged, filtered, and distilled to remove solvent and quantify total extract yield. A hexane wash followed by a second distillation step was applied to isolate and quantify the solvent-free lipid fraction.

ANOVA combined with Tukey's post-hoc test identified 50% amplitude and a 1:22 solid-to-solvent ratio as the best performing conditions, yielding 74% lipid recovery. Increasing ultrasound amplitude significantly increased oil recovery, while solid-to-solvent ratios between 1:22 and 1:28 consistently produced the highest extraction yields. No significant differences in total extract yield were observed across treatments, suggesting that the evaluated process variables selectively affected lipid extraction without significantly altering total extract recovery. The results highlight the potential of ultrasound-assisted extraction to improve residual oil recovery from canola meal while reducing reliance on conventional hexane-based processes.



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Sciforum-198087: Comparison of the effect of ultrasound and antioxidants application on the stability of fruit seeds oil.

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The global fruit industry annually generates large amounts of by-products, many of which are underutilized or used only for animal feed. Blackcurrant and rose hip seeds are considered a by-product of fruit industry which may be processed to highly nutritive oil. The aim of this study was to compare the effects of ultrasound application in extraction process and a syntethicantioxidant (BHT) addition on the oxidative stability of rosehip and blackcurrant seed oils. Oils were obtained conventionally via solid-liquid extraction and by ultrasound-assisted extraction at various sonication times and intensities. The oils were subjected to analysis immediately after extraction and after 2 and 3 months of storage. The DSC, PDSC and GC analysis were performed for all of the oil samples. All oils were characterised by a high content of unsaturated fatty acids. The study determined differences in the oxidative stability of the oils between those with the addition of BHT and those obtained using ultrasound assistedextraction. The average initation time of oxidation for blackcurrant seed oils ranged from 30.56 to 46.47 minutes, and for rosehip seed oils, from 30.82 to 48.71 minutes. However, the stability of oils obtained from black currant seeds at a time of 5 minutes and amplitudes of 30% and 90%, as well as from rosehip seeds at a time of 10 minutes and an amplitude of 90%, did not differ from that of conventionally extracted oils. Optimization of ultrasound assisted extraction process made itpossible to obtain oils from fruit seeds with a prolongedoxidation induction time.



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Sciforum-198128: Storage Stability of Horseradish Peroxidase Immobilized in Alginate Beads Reinforced with Almond Shell-Derived Nanocellulose

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Valorising almond-processing residues as functional materials for enzyme immobilisation can support circular agri-food systems; however, their effects on long-term enzyme retention and storage stability are unclear. This study investigated the use of cellulose nanocrystals (CNCs) isolated from almond shells as reinforcement for calcium alginate beads containing horseradish peroxidase (HRP). Isolation yielded a CNC suspension of 40.3 ± 0.4 mg/mL. Transmission electron microscopy showed elongated rod-like particles 200–800 nm long, while Fourier-transform infrared spectroscopy revealed characteristic cellulose bands and no lignin-associated signal near 1510 cm^{-1}, indicating effective delignification. CNCs were incorporated at 0, 0.5, 1.0, and 2.0 wt.%, and HRP loading, initial activity, and deactivation over 96 days at 4 and 20 °C were assessed. Three independent bead batches were divided according to temperature. At each sampling time, three 12-bead subsamples were analysed per batch and temperature (n = 3 independent batches). Data for each temperature were evaluated using two-way ANOVA followed by Tukey's HSD test ($\alpha = 0.05$). HRP loading increased from 0.55 ± 0.04 mg/mL without CNCs to 1.07 ± 0.20 mg/mL at 1.0 wt.% but decreased to 0.59 ± 0.13 mg/mL at 2.0 wt.%. The 2.0 wt.% formulation showed the highest initial activity (0.90 ± 0.03 U/g versus approximately 0.50 ± 0.06 U/g for formulations containing ≤1.0 wt.%) but faster storage deactivation. Activity decay followed a biphasic first-order model ($R^2 \geq 0.95$), declining markedly during the first 14 days, and more slowly thereafter. Storage at 4 °C preserved activity better than at 20 °C; at 4 °C, 0.5 and 1.0 wt.% showed the lowest deactivation rates, whereas 2.0 wt.% reached $k = 0.20 \pm 0.02$ d^{-1}. The non-monotonic CNC effects may reflect concentration-dependent changes in enzyme–matrix interactions and alginate network organisation, influencing HRP retention, substrate accessibility, and storage stability.



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Sciforum-198212: Subcritical water extraction of tiger nut by-products: Assessment of nutritional value and safety

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This work tackles a chemical valorization of tiger nut by-products using subcritical water treatment (SWE, Subcritical Water Extraction). The process intensification mechanisms generated in this system enable the recovery of targeted compounds in a cleaner and more efficient manner through enhanced mass transfer. In particular, the combination of high pressures (100 bar) and temperatures (100-200 °C) enables a more direct extraction, saving time and avoiding the use of organic solvents. After an exhaustive chemical characterization of the matrix, the recovered extracts by SWE were structurally characterized. Particularly, the presence of mono- and disaccharides was detected by Nuclear Magnetic Resonance (NMR), which points out the potential prebiotic activity of tiger nuts extracts towards novel, healthier food products. In turn, a nutritional and safety evaluation of these SWE crude extracts was carried out. Firstly, the mineral and heavy metals profile was evaluated through ICP-MS. In parallel , the antioxidant activity was determined by means of TEAC and DPPH assays. Cell viability assessed by MTT assay in CaCo-2 cell lines was maintained around 100% until 500 mg/mL concentration. Overall, the results reveal that tiger nut by-products represent a suitable alternative for their subsequent application in the development of healthier and safer foods. In addition, it should be highlighted the value of extraction methodologies aligned with Green Chemistry principles and Sustainable Developments Goals (SDGs).



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Sciforum-198213: Thermal Stabilization and Kinetic Modeling of an Enriched Hydrophilic Extract from Grape Pomace Using Alginate-Carboxymethyl Cellulose Blended Hydrogels

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Introduction: This study investigated binary biopolymer matrix engineering to preserve fragile anthocyanins and phenolic acids in encapsulated aqueous grape pomace extracts under thermal stress.

Methods: An enriched hydrophilic aqueous phase stripped of lipophilic interferences was encapsulated in 2% pure sodium alginate (SA) or a 1.5% SA and 0.5% carboxymethyl cellulose (CMC) blend. Beads were stored for 27 days at 30°C, 40°C, and 50°C. Total Phenolic Content (TPC) and DPPH activity were monitored following complete matrix dissolution. Data were modelled using Three-Way Mixed ANOVA and Principal Component Analysis (PCA).

Results: A highly significant three-way interaction ($P < 0.001$) confirmed undulating, non-monotonic profiles for both parameters, invalidating linear degradation models. For DPPH, the formulation effect was exceptionally robust ($F(1, 6) = 1668.07$, $P < 0.001$); pure SA suffered an abrupt loss of radical scavenging activity by Day 7, whereas the CMC blend significantly stabilized and enhanced radical scavenging activity, uniquely peaking at 40°C on Day 7, hypothetically due to the matrix-promoted formation of acid-stable pyranoanthocyanins and highly structured intermolecular copigmentation complexes. Conversely, TPC showed a non-significant overall formulation effect ($p=0.360$). Heat degrades complex compounds in pure SA. This artificially raised the TPC scores even though the actual antioxidant power had crashed. In contrast, the CMC blend protected the extract and maintained close links between phenolic levels and antioxidant activity. PCA components of eigenvalues greater than 1.0 captured 82.6% of the variance. Variable contribution analysis confirmed PC1 mapped overall phenolic concentration, while PC2 and PC3 tracked proposed functional degradation and transient molecular association phases, respectively.

Conclusions: Standard linear modeling fails to capture the complex, multi-phasic kinetics of encapsulated grape pigments. Blending 0.5% CMC creates a dynamic molecular shield that prevents unchecked thermal cleavage, potentially redirecting degradation pathways toward highly stable, functional anthocyanin networks under thermal stress.



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Sciforum-198225: Effect of Acid Hydrolysis Conditions on the Physicochemical Properties of Nanocellulose from Almond-Shell-Derived Cellulose

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The growth of the food industry has increased interest in the valorization of agro-industrial by-products. Consequently, the upcycling of lignocellulosic residues such as almond shell (AS) has emerged as a promising strategy to obtain nanocellulose (NC), a high-value material with potential use in advanced food packaging and other functional applications. In this study, AS was pretreated with a natural deep eutectic solvent (choline chloride:urea, 2:1 mass ratio, 4 h at 80 °C) and subsequently bleached to isolate cellulose [$NaClO_2$ 1.3%, 2 h, 75 °C, x2; NaOH 10%:H_2O_2 6%:H2O (1:1:100), 1.5 h, 60 °C]. Thereafter, acid hydrolysis was performed to obtain NC. A two-factor central composite design was employed to investigate the effects of H_2SO_4 concentration (38 to 70 wt%) and acid-to-cellulose ratio (10 to 30 mL g^{-1}) on the characteristics of the resulting NC. The resulting materials were characterized by mass yield, TEM and AFM imaging, X-ray diffraction and FTIR spectroscopy. Experiments demonstrated that acid concentrations above 65 wt% induced cellulose over-hydrolysis, yielding negligible results. Meanwhile, microscopic observations confirmed the successful transformation of cellulose into NC, revealing both nanocrystal and nanofiber morphologies in the remaining samples. XRD unveiled significant differences in the crystallinity index (CI) across the nine samples, with the highest CI values consistently observed in those hydrolyzed at 54 wt% acid, averaging 62.5% ± 0.9%, regardless of the sample-to-acid ratio. The FTIR spectra showed that all the samples preserved the characteristic cellulose absorption bands. The results demonstrated that hydrolysis conditions strongly influenced the mass yield, NC morphology and crystallinity index, maintaining the characteristic chemical structure of cellulose. These findings highlight the importance of tailoring processing conditions to achieve specific physicochemical properties required for targeted applications and provide a basis for the future optimization of the process.



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Sciforum-198234: A mathematical simulator to evaluate the crop production in agrivoltaic systems

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Agrivoltaic systems may contribute to sustainable food systems by combining crop production and photovoltaic energy generation on the same surface, especially in territories where land availability is limited. This work presents a simulator designed as a decision-support tool for the preliminary assessment of agrivoltaic systems in Mediterranean and Tropical regions, with special attention to crops of local interest.

The simulator was developed from scientific literature, agronomic information and solar radiation databases. It allows users to configure scenarios by defining geographical location, simulation period, terrain resolution, albedo, photovoltaic geometry, module height, tilt, transparency, row spacing, crop type and baseline yield. The selected crops are assigned to shade-tolerance groups according to literature data, allowing comparison between species with different responses to reduced radiation. The terrain is discretised into a two-dimensional mesh, where solar position and shading patterns are calculated at 15-min intervals. Direct, diffuse and global radiation data are obtained from PVGIS typical meteorological year datasets to estimate irradiance distribution at ground level. Crop productivity is evaluated through the relative shading ratio, and yield is estimated using empirical equations specific to each shade-tolerance group.

The simulator provides accumulated irradiance maps, monthly photovoltaic energy production, the proportion of cultivated area affected by different shading intervals and relative crop yield. These outputs make it possible to analyse how photovoltaic design modifies light availability and crop performance. In simulations comparing different horticultural crops such as chard, pepper and onion, chard showed the best performance under shade, pepper an intermediate response, and onion the greatest sensitivity to radiation reduction. Overall, the simulator offers a reproducible framework to explore agrivoltaic configurations, support crop selection and guide the design of systems aimed at improving food security, renewable energy production and land-use efficiency.



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Sciforum-198247: Investigating Biofilm Formation by Endophytic Bacteria from Plant Roots under Thermal and Nutritional Stress: Implications for Sustainable Crop Resilience and Food Safety

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Climate change and resource constraints are increasing crops' exposure to abiotic stresses, with direct consequences for yields and global food security. In this context, endophytic bacteria that promote plant resilience and reduce the need for synthetic inputs represent a promising tool for sustainable food systems. This study investigated endophytic bacteria isolated from the roots of *Euphorbia* resinifera O.Berg and *Caralluma europaea* (Guss.) N.E.Br and evaluated their biofilm-forming ability under nutritional and thermal stress conditions. A total of 40 endophytic bacterial isolates were obtained after root surface sterilization and cultivation on appropriate growth media. Biofilm formation was assessed in polystyrene microtiter plates using the crystal violet staining method after 48 h of incubation. Isolates were tested under two nutritional conditions, using either tryptone soy broth (TSB) or 1:10 diluted TSB, and two temperatures, 20 °C and 37 °C, to simulate normal and stress conditions. The isolates showed considerable variability in biofilm production, with several strains displaying increased biofilm formation under stress, particularly at elevated temperature. These results suggest that biofilm formation may be an adaptive strategy that enhances the survival and persistence of endophytic bacteria in challenging environments, supporting more resilient plant–microbe associations. Ongoing work aims to select biofilm-forming endophytic strains and evaluate whether their cell-free extracts can inhibit biofilm formation by foodborne pathogens, thereby linking plant resilience with safer, more sustainable food production.

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Sciforum-198355: Development and Evaluation of Soy Fiber enriched Functional Cookies by utlization of Okara

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Okara, a protein- and fiber-rich byproduct of soybean processing, is often underutilized despite its potential as a valuable food ingredient. Its incorporation into food products offers an opportunity to recover nutrients from food-processing residues, improve resource efficiency, and support the development of value-added, potentially affordable, nutrient-enriched foods. This study aimed to utilize okara flour in the development of soy fiber-enriched cookies and to evaluate its effects on proximate composition, antioxidant activity, physical characteristics, color, and sensory acceptability. Okara obtained from Rawal-1 soybean was dried at 50–60 °C, milled into okara flour, and incorporated into whole wheat flour at substitution levels of 5, 10, 15, and 20%. Five formulations were prepared: T0 (100% wheat flour), T1 (5% okara + 95% wheat flour), T2 (10% okara + 90% wheat flour), T3 (15% okara + 85% wheat flour), and T4 (20% okara + 80% wheat flour). Okara flour contained 19.97 ± 0.09% protein, 17.08 ± 0.08% fat, and 42.02 ± 0.04% crude fiber, demonstrating its nutritional potential as a functional ingredient. Okara incorporation significantly affected the cookies' proximate composition. Ash and crude fiber increased progressively with increasing okara incorporation, while T4 showed the highest moisture (7.25 ± 0.05%), ash (1.08 ± 0.03%), crude protein (7.29 ± 0.17%), crude fat (21.18 ± 0.05%), and crude fiber (1.74 ± 0.04%) contents. Antioxidant activity also increased significantly with okara incorporation, with T4 recording the highest value (54.47 ± 0.28 mg/100 g). Increasing okara incorporation reduced cookie diameter and spread ratio and increased instrumental hardness, while thickness decreased numerically but not significantly. Instrumental color was also significantly affected, with L* decreasing and a* increasing as okara incorporation increased. Sensory evaluation showed that T3 had the highest numerical overall acceptability among the okara-enriched formulations (8.02 ± 0.17), although overall acceptability did not differ significantly among treatments. Overall, T4 demonstrated the greatest nutritional enhancement, whereas T3 represented the most numerically acceptable okara-enriched formulation. These findings demonstrate the potential of okara valorization as a resource-efficient approach for converting a soybean-processing byproduct into value-added, nutrient-enriched cookies. Further research on consumer acceptance and production economics is recommended to establish the feasibility of okara-enriched cookies as potentially affordable nutrient-enriched foods.



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Sciforum-198480: Life Cycle Assessment of Bovine Bone Meal Production in Paraguay: A Methodological Framework for Comparing Steam-Cooking versus Calcination Scenarios

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Paraguay's beef sector produces around 1.8 million tons of bone waste every year, creating both environmental pressure and an opportunity for nutrient recovery. Bone meal production fits circular economy thinking, yet its environmental footprint has never been examined locally. This study puts forward a comparative Life Cycle Assessment framework to evaluate two production routes. Following ISO 14040:2006 and ISO 14044:2006 standards, a cradle-to-gate approach was adopted with a functional unit of 1 metric ton of bone meal (moisture below 5%, packed). Two scenarios were modeled using OpenLCA software. The first reproduces current practice in a local plant with primary data on electricity, water, materials, and emissions. This route, based on steam-cooking, aims to produce a fertilizer that preserves the original organic matrix of the bone, making it suitable for direct soil application as a slow-release phosphorus source. The second scenario is hypothetical and based on calcination, a thermal treatment intended to obtain a soil amendment with different characteristics: higher pH, lower organic content, and greater crystallinity, making it more suitable for acidic soils or as a material with adsorbent properties. Preliminary results indicate that calcination carries a significantly heavier load, with climate change impacts roughly 40% higher and fossil resource depletion nearly 55% greater, mainly due to additional fuel demands. The heating stage and input transport emerge as the main hotspots in both routes. Steam-cooking performs better overall, largely because it uses existing infrastructure and requires less energy. These early findings offer the first quantitative evidence for bone meal production in Paraguay, establishing a baseline to inform company decisions, support national greenhouse gas inventory efforts, and contribute to SDGs 9, 12, and 13.



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Sciforum-198481: Future Food as an Optimization Problem: Balancing Nutrition, Sustainability, Justice, and Agency

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Introduction: Future-food debates often frame innovation in terms of technological intensification, market substitution, and nutritional optimization. This paper argues that they must also address the organization of material dependence. Industrial food systems generate abundance and convenience, but they also externalize ecological harms, obscure labour relations, and distance consumers from the material conditions of nourishment. The central question is therefore how food provision can balance nutrition, ecological responsibility, social justice, feasibility, and materially engaged agency.

Methods: The paper applies a value-pluralist optimization framework to four pathways: (A) industrial market dependence, (B) ethical market consumption, (C) calibrated self-provisioning, and (D) complete autarky. These are assessed according to nutritional adequacy, environmental burden, labour requirements, dependence on opaque supply chains, preservation of modern capabilities, and opportunities for practical agency. The normative analysis is supported by data from a long-term Mediterranean agroecological case study of nutritional self-sufficiency.

Results: Industrial market dependence maximizes convenience while preserving structural opacity. Ethical consumption may reduce some harms but remains market-mediated. Complete autarky is rejected as practically and normatively sub-optimal, since it would sacrifice essential modern capabilities. Calibrated self-provisioning emerges as the strongest pathway: it combines direct food provision with selective reliance on tools, shared knowledge, and wider institutions. The case study shows that, under favourable Mediterranean conditions, complete nutritional self-sufficiency can be achieved on under 0.1 hectare, with modest training, about one day of labour per month, no synthetic chemicals, and compatibility with full-time employment. It also provides nutritional yield per area broadly comparable to conventional agriculture while generating substantially lower environmental burdens.

Conclusions: Sustainable food policy should redefine efficiency to include nutritional sufficiency, ecological burden, resilience, justice, and agency. Policy should support calibrated food self-provisioning where feasible through land access, agroecological training, shared tools, seed and compost infrastructures, water-sensitive regulation, and community-scale provisioning models.



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Sciforum-198517: A bibliometric analysis of microgreens research (2003-2025): Global agricultural and nutritional trends

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Microgreens —tender, immature vegetables harvested 7 to 21 days after planting— have gained significant popularity for their culinary appeal and exceptional nutritional value. Proposed as a new generation of functional foods, they contain significantly higher concentrations of vitamins, minerals, and bioactive compounds compared to mature vegetables. To map the growing scientific and commercial interest in this domain, this study presents a comprehensive bibliometric analysis of microgreens research from 2003 to 2025. After filtering and standardizing research retrieved from the Scopus database, a single corpus of 950 documents was used and analyzed via the Bibliometrix-R package. We evaluated research trends, collaborative networks, and central thematic areas. The findings reveal a remarkable surge in publication activity over the past decade, driven by a highly interconnected and collaborative international research community. Keyword analysis (e.g. “antioxidants”, “human”, “phytochemicals”, and “LED lighting”) highlights the inherently interdisciplinary nature of the field. Research clusters predominantly around the nutritional profiling of microgreens, potential health benefits, and innovative cultivation methods. Notably, advanced cultivation systems —such as hydroponics and aeroponics— have emerged as focal points, offering promising solutions for sustainable agriculture and food security. Finally, the study identifies critical challenges and outlines future research directions. Key priorities include the need to standardize cultivation protocols and to further explore the bioavailability and physiological health effects of the bioactive compounds found in microgreens.



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Sciforum-198552: Hempseed oil bodies: physicochemical characterization and emerging applications in food products

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Hempseed (*Cannabis sativa* L.) is a plant-based source of nutrients and functional compounds. Among them, hempseed oilbodies (OB) are naturally occurring emulsified lipid droplets with high physical stability. Unlike hempseed oil, OB retain their native protein-phospholipid interface around lipid droplets, enabling them to act as both lipid and structuring ingredients. However, their applications in food systems remain largely unexplored. In this study, OB were recovered through aqueous extraction and investigated as ingredients in two food applications: emulsions and cocoa-based spread formulations. The physical properties of the formulations were evaluated to assess the potential of OB to replace conventional fats, while also serving as food-structuring ingredients. Statistical significance ($p < 0.05$) was assessed by ANOVA followed by Tukey's HSD test (Real Statistics, Microsoft Excel®). OB-emulsions were formulated by homogenizing hempseed protein isolate and OB at varying protein ratios and compared to hempseed oil-emulsions as controls. Microscopic observation showed that OB-emulsions exhibited the smallest lipid droplet size (0.769-0.825 μm), unaffected by the protein ratio. Conversely, droplet size increased with decreasing protein ratios in oil-emulsions, reaching up to 2.4 μm. The OB-emulsions showed resistance to creaming (Creaming Index, CI=0%) during storage (20 days at 4, 25 and 37 °C). In contrast, oil-emulsions showed lower stability, with CI reaching 11.0% at lower protein ratios. In cocoa-based spread, OB were used to replace coconut oil at substitution levels of 25, 50, 75 and 100%. Lipid droplet size decreased as the OB content increased, ranging from 5.3 to 1.87 μm. The formulations exhibited similar melting behavior and water activity. Replacing coconut oil with OB at substitution levels >50% reduced hardness (up to 67.4%). Rheological analysis showed shear-thinning behavior (n<1) in all formulations, with viscosity decreasing with increasing OB substitution. OB inclusion improved their lipid profile as the polyunsaturated fatty acids (mainly linoleic acid and α-linolenic acid) content increased. Overall, cocoa spreads containing OB showed high sensory acceptability, with taste differing significantly only between the control and 100% OB substitution. These findings highlight the potential of OB as sustainable and functional lipid-based ingredients for innovative food products with improved physical stability and nutritional value



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Sciforum-198584: Climate-resilient native resources for sustainable bioeconomies: extraction and stabilization of bioactive compounds from *Schinus molle*, *Neltuma ruscifolia* and propolis

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In the context of climate change and environmental degradation, the valorization of resilient biological resources is a key strategy for developing more sustainable food systems and regional bioeconomies. Underutilized native species adapted to arid and semi-arid environments, such as *Schinus molle* and *Neltuma ruscifolia*, along with regional propolis, represent promising sources of phenolic compounds with antioxidant, anti-glycation, and coloring properties. The objective was to develop sustainable strategies for the valorization of *Schinus molle, Neltuma ruscifolia*, and regional propolis through the extraction, characterization, stabilization, and potential application of their bioactive constituents. Extracts were obtained using technologies including ultrasound-assisted extraction, microwave-assisted extraction, and dynamic maceration. The resulting extracts were evaluated in terms of total phenolic content, flavonoid concentration, antioxidant capacity, anti-glycation activity, colorimetric properties, energy efficiency, and carbon footprint. Subsequently, the optimized extracts were stabilized by microencapsulation using rice flour as the encapsulating matrix and characterized according to their technofunctional and stability properties. The green fruits of *S. molle* and the milling residue of *N. ruscifolia* exhibited the highest phenolic contents (360 ± 8 and 72 ± 3 mg GAE/g dry weight, respectively), while the optimized propolis extract reached 339.1 ± 9.95 mg GAE/100 mL. The sustainability of the processes was validated using indicators such as a microwave energy consumption of 0.14 Wh/mg GAE for *S. molle* and a carbon footprint of 0.00025 kg CO_2/mg GAE for *N. ruscifolia* under ultrasound. The extracts showed antioxidant and anti-glycation potential, achieving polyphenol retentions of 61% for propolis, 37% for *S. molle*, and 25% for *N. ruscifolia* after microencapsulation. Thermal analysis revealed a plasticizing effect of the extracts, placing the glass transition temperature (Tg) between 27.7 and 30.9 °C. In extrudates, the powders contributed clearly perceptible color differences and reduced the browning rate constant (k) in model systems by up to 55%. The results demonstrate that these species constitute valuable sources of natural functional ingredients. Their valorization promotes the sustainable use of biodiversity and strengthens climate-resilient bioeconomies.



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Sciforum-198653: Technological properties and optimization of lentil aquafaba for the development of vegan meringues

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Demand for plant-based food alternatives has driven the search for sustainable egg white substitutes. Aquafaba (AF), the cooking wastewater of legumes, presents excellent foaming properties due to its proteins, carbohydrates, and saponins. Compared to other legumes such as beans, lentil AF offers higher protein content, overrun, and foam stability, making it a promising candidate for aerated systems. This study aimed to evaluate the techno-functional properties of spray-dried lentil AF and its application in vegan meringues compared with conventional egg white meringues.

AF was obtained by soaking and boiling dry lentils (*Lens culinaris* var. *variabilis*), followed by spray drying. Based on preliminary screening assays and optimal foam stability ranges reported in the literature, meringue batters were prepared by whipping rehydrated AF at 5 and 10% (g/100 g) with sucrose. Small-amplitude oscillatory shear tests included amplitude sweeps to determine the linear viscoelastic region (LVR) and 60-min time sweeps within the LVR to monitor G′, G″, and tan δ. Overrun was also determined. Baked meringues (100 °C, 120 min) were characterized by baking weight loss, specific volume, water activity (a_w), and CIELAB color (L*, a*, b*). Rehydrated egg white powder (EWP, 1:8) was used as reference. Data were analyzed by one-way ANOVA and Tukey's test ($p < 0.05$).

All batters exhibited G′ > G″ throughout the time sweep. The 10% AF formulation showed significantly higher viscoelastic moduli, lower tan δ, and greater overrun (1360 vs. 1129%) than 5% AF. After an initial decrease, both moduli approached asymptotic values, although 5% AF showed a smaller relative decrease over time. After baking, 10% AF meringues showed lower weight loss (41.4 vs. 48.9%), while specific volume (~7.04 cm^3/g) and a_w (~0.270) did not differ significantly between AF formulations. Compared with EWP meringues, AF meringues showed higher a* values, higher baking weight loss (EWP: 27.9%), comparable specific volume, and slightly lower aw (EWP: 0.314).

Despite higher baking weight loss and darker color, lentil AF showed strong potential as a plant-based foaming agent, producing stable solid foams with technological properties comparable to EWP meringues.



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Sciforum-198670: From Bovine Bone Waste to Value-Added Resources: Opportunities for Circular Bioeconomy in the Meat Industry

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The meat industry generates substantial volumes of by-products that are often underutilized despite their potential to support more sustainable and resource-efficient production systems. Among these by-products, bovine bones represent a valuable source of organic and mineral compounds that can be transformed into higher-value products through circular bioeconomy strategies. This study aimed to identify and analyze valorization pathways for bovine bone by-products within the meat industry through a systematic literature review. A PRISMA-based methodology was applied to identify relevant studies published between 2020 and 2025. Scientific articles addressing circular economy approaches, waste valorization, meat processing by-products, and bovine bone applications were screened and evaluated according to predefined inclusion and exclusion criteria. The studies were selected for qualitative analysis. The reviewed literature revealed a wide range of valorization routes for bovine bones, including the production of biofertilizers, hydroxyapatite-based materials, bioceramics, adsorbents for wastewater treatment, biochar, biofuels, and collagen-derived products. The results also highlighted the role of emerging technologies in the area - such as pyrolysis, calcination, hydrothermal processing, enzymatic hydrolysis, and industrial symbiosis- schemes in enhancing resource recovery and value creation. Beyond their environmental benefits, these approaches may contribute to increased resource efficiency, diversification of industrial outputs, and improved competitiveness within the meat sector. The findings suggest that bovine bones should be viewed not merely as residual waste streams but as strategic resources capable of supporting circular bioeconomy initiatives. For meat-producing countries such as Paraguay, the adoption of valorization strategies could foster innovation, strengthen sustainability performance, and create new opportunities for value-added production. Future research should focus on the technical, economic, and logistical challenges associated with scaling these solutions within industrial supply chains.



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Sciforum-200334: Sustainable Recovery of Astaxanthin from Crustacean By-Products Using Green Extraction Technologies

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The seafood processing industry generates large amounts of crustacean by-products, including shells, heads, and appendages, which are often discarded despite containing valuable bioactive compounds. Among them, astaxanthin (ASX), a carotenoid with remarkable antioxidant properties, has attracted considerable attention for applications in functional foods, nutraceuticals, and dietary supplements. The recovery of ASX from seafood residues represents an attractive strategy within the framework of circular economy and sustainable food production.

In this study, crustacean by-products from seven species were investigated as alternative natural sources of astaxanthin. Green extraction approaches based on ultrasound-assisted extraction (UAE) and natural deep eutectic solvents (NaDES) were evaluated and compared with conventional organic solvent extraction. Extraction conditions were optimized to maximize ASX recovery while minimizing solvent consumption, extraction time, and environmental impact.

Among conventional solvents, acetone provided the highest extraction efficiency, being 1.7-fold higher in comparison to other solvents such as acetonitrile. UAE significantly reduced extraction time from 30 to 10 min while maintaining comparable yields. Furthermore, hydrophobic NaDES formulations based on naturally derived components showed promising extraction performance, demonstrating their potential as environmentally friendly alternatives to traditional organic solvents (exhibiting similar yields than with acetoner, 50 mg total ASX/kg dry sample).

Chromatographic analysis revealed substantial differences in astaxanthin content among the studied species, with *Penaeus kerathurus* showing the highest levels (55.5 mg total ASX/kg dry sample). Besides free astaxanthin, a complex profile of esterified forms was observed, highlighting the richness of these marine by-products as sources of high-value carotenoids.

Overall, the results demonstrate that crustacean processing residues can be efficiently transformed into valuable sources of natural astaxanthin through sustainable extraction technologies. The combination of UAE and NaDES constitutes a promising approach for the development of greener recovery processes, contributing to waste valorization, resource efficiency improved, and the implementation of circular economy principles in the seafood sector.



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Sciforum-201845: Assessment of Household Food Waste and Consumer Behaviours in Portugal Using Smart Scale Technology

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Aims: Household food waste represents a major challenge for sustainable food systems, contributing to environmental impacts and unnecessary resource losses. Objective monitoring technologies can complement questionnaire-based approaches, providing more reliable estimates of household food waste generation. This study aimed to characterize household food waste and associated consumer behaviours using a smart scale monitoring system developed by the Jožef Stefan Institute within the framework of the WASTELESS project. This pilot study also represents one of the first applications of the WASTELESS smart scale technology in Portugal.

Methods: Twenty Portuguese households, with 58 residents, were monitored for seven consecutive days using the WASTELESS Scale, an integrated digital system that records the weight, food category, avoidability, and method of disposal of household food waste. Participants also answered a structured questionnaire that covered household composition, socioeconomic characteristics, purchasing habits, dietary patterns, organic waste management practices, and perceived barriers to reducing food waste. Non-parametric descriptive and exploratory statistical analyses were performed.

Results and Discussion: During the monitoring period, households generated 70.33 kg of food waste, which corresponds to 173.2 g/person/day and 502.4 g/household/day. Avoidable food waste represented 57.9% of the total, corresponding to 40.72 kg and 100.3 g/person/day, while unavoidable food waste represented 42.1%, corresponding to 29.61 kg and 72.9 g/person/day. Family size, income, education level, shopping frequency, separation of organic waste, and composting did not show a significant association with total food waste generation. These findings should be interpreted considering the pilot nature of the study, the limited sample size, and the short monitoring period. Most families reported having access to organic waste collection, but only a minority regularly separated food waste. Absence of planning and lack of time were the main barriers reported for reducing food waste.

Conclusions: Smart scale monitoring, combined with behavioural survey data, provided objective evidence on food waste generation in households. The predominance of avoidable waste indicates substantial potential for prevention strategies focused on meal planning, food management, and consumer behaviour. These preliminary findings support the feasibility and usefulness of digital monitoring tools and provide a basis for future larger-scale studies on household food waste.



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Sciforum-202041: Reformulation of "Toscana" Sausage: Reduction of Sodium and Curing Salts Using Potassium Chloride and Spray-Dried Rosemary Extract

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The search for healthier meat products has driven the demand for sausages with reduced sodium chloride (NaCl) and curing salts. This study evaluated the technological and oxidative parameters of a fresh pork sausage ("Toscana" type) formulated with partial substitution of NaCl by KCl (25% to 50%) and the incorporation of spray-dried rosemary (Rosmarinus officinalis) extract (0.05% to 0.4%) during 14 days of refrigerated storage (4C). Formulations were assessed for physicochemical standards, water-holding capacity (WHC), cooking loss (CL), emulsion stability, lipid oxidation (TBARS), and color parameters (L*, a* and b*). All formulations complied with Brazilian Standards of Identity and Quality (PIQ). A 30% NaCl substitution with KCl maintained WHC and CL ($p > 0.05$) comparable to the control, preserving batter texture without compromising emulsion stability ($p < 0.05$). During 14 days of storage, the incorporation of 0.2% and 0.4% rosemary extract significantly reduced lipid oxidation, lowering TBARS values by up to 45% compared to the reduced-nitrite control ($p < 0.05$). Furthermore, the extract effectively preserved redness (a*) over time ($p < 0.05$), delaying discoloration. In conclusion, a 30% NaCl reduction combined with 0.2% rosemary extract maintains the technological properties and extends the oxidative stability of "Toscana" pork sausage, serving as an effective strategy to reduce conventional additives.



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Sciforum-202440: Natural Alternatives to Synthetic Additives in Meat Products: A Five-Year Review of Antioxidants, Antimicrobials, and Yeast-Derived Biomolecules

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This theoretical study systematically reviews the primary natural ingredients and additives evaluated in meat products over the last five years (2019–2024), driven by the industry-wide shift toward clean-label products. Literature searches were conducted using Scopus, Web of Science, PubMed, and ScienceDirect databases, focusing on peer-reviewed articles in English and Portuguese addressing natural antioxidants, biopreservatives, and nitrite alternatives in meat matrices. Recent literature highlights natural bioactive alternatives that ensure oxidative stability and microbiological safety without compromising sensory properties. In meat lipid preservation, traditional synthetic antioxidants (BHA, BHT, and propyl gallate) are being replaced by polyphenol-rich botanical extracts from rosemary, grape seed, and propolis. These extracts reduce oxidative rancidity (TBARS values) by up to 60% and extend shelf life by over two weeks. Microencapsulation technologies are increasingly applied to safeguard these compounds from thermal degradation during processing and to mask astringent off-flavors. Regarding antimicrobials, innovation centers on biopreservation, essential oils, and yeast-derived biomolecules to replace synthetic preservatives such as sodium benzoate and potassium sorbate. Purified essential oil compounds (thymol and carvacrol) directly disrupt the cell membranes of Listeria monocytogenes and Salmonella spp. Concurrently, fermentative biopreservatives including bacteriocins from lactic acid bacteria and novel yeast-derived antimicrobial peptides significantly reduce microbial loads. Notably, yeast-produced glycolipids like sophorolipids, killer toxins, and specialized extracts from non-conventional strains (Hansenula spp. and Starmerella spp.) have gained prominence due to their high surfactant properties and targeted membrane-disrupting capabilities. Finally, synthetic nitrite and nitrate replacement has been successfully achieved using pre-converted vegetable powders (celery, radish, and chard) combined with bacterial starter cultures. This synergistic approach provides the necessary nitric oxide for nitrosomyoglobin formation, securing both the characteristic pink color and critical protection against Clostridium botulinum.



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Sciforum-202513: Early phytotoxicity response of L. sativa L. to calcined bovine bone powder aqueous extracts through a germination bioassay

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Thermochemical processing of bovine bone waste produces calcium phosphate-rich materials with potential for agricultural use. However, their effects on early plant development require assessment before soil application. This study investigated how calcination temperature influences aqueous extract chemistry and early plant responses in *Lactuca sativa*, linking processing conditions to preliminary biological screening of bone-derived materials. Bovine bones from a meat-processing facility were calcined at 400, 600, and 800 °C for 1 h and ground into a homogenized fine powder. Aqueous extracts were prepared in distilled water at a 1:20 (w/v) ratio and characterized for pH, electrical conductivity (EC), and total dissolved solids (TDS). An adapted EN 16086-2 germination bioassay followed a completely randomized design with five replicates per treatment and a distilled water control, using 20 seeds per plate incubated for 72 h at 25 °C. Germination percentage, mean root and hypocotyl lengths, and the Munoo-Liisa Vitality Index (MLV%) were determined. Continuous response variables were analyzed using the Kruskal–Wallis test followed by Dunn–Holm multiple comparisons ($\alpha = 0.05$), while germination frequencies were assessed using a chi-square contingency test. Extract pH ranged from 6.97 to 7.02. EC and TDS were highest at 600 °C (1787 µS cm^{-1} and 895 mg L^{-1}) and lower at 800 °C (972 µS cm^{-1} and 487 mg L^{-1}). Germination percentage did not differ significantly among treatments ($p = 0.071$). Root length differed significantly among treatments ($p < 0.001$), with mean values of 10.5 mm in the control and 19.1 mm at 800 °C. MLV values were 104%, 143%, and 161% for the 400, 600, and 800 °C treatments, respectively. Significant differences were detected among treatments (Kruskal–Wallis, $p = 0.002$), and Dunn–Holm comparisons confirmed that both the 600 and 800 °C treatments produced significantly higher MLV values than the control. Under the tested extraction and exposure conditions, the extracts showed no evidence of inhibition of lettuce germination and promoted early root development. These findings identify calcination temperature as a relevant processing variable for further evaluation of bovine bone-derived amendments. Testing additional plant species, conducting soil-based trials, and directly measuring phosphorus release are needed to establish broader applicability and agronomic performance.



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Sciforum-202757: Upcycling Virgin Coconut Oil Byproducts into Hybrid Textured Vegetable Protein for Plant-Based Sausages

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The rising demand for sustainable alternative proteins has driven the exploration of agro-industrial byproducts as functional food ingredients. Virgin coconut oil (VCO) wet processing generates protein- and fiber-rich residues that remain largely underutilized. This study optimized the formulation for producing hybrid textured vegetable protein (hTVP) from VCO byproducts for plant-based sausage applications using cold extrusion. Using Design-Expert®, a combined experimental design evaluated the effects of the soy protein isolate to coconut dietary fiber ratio (SPI:CDF, 70:30–90:10) and moisture content (60–70%) across 14 experimental runs. The functional properties of the resulting hTVP (i.e., bulk density, oil/water holding capacities, and rehydration capacity) and the sensory acceptability (9-point Hedonic rating) of the formulated plant-based sausages were modeled using multiple linear regression and response surface methodology. Significant models ($p < 0.05$) were established for hTVP oil holding capacity (2.47–3.08 g oil/g sample), and mouthfeel acceptability (5.43–6.93) and overall acceptability (6.14–7.21) of the plant-based sausages, indicating that the SPI:CDF ratio and moisture content strongly influence both ingredient functionality and product quality. However, experimental validation is still required to confirm the optimal conditions. This study demonstrates a viable method to upcycle VCO processing waste into functional ingredients, offering a more sustainable, resource-efficient raw material option for the rapidly growing plant-based meat industry.



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Sciforum-203187: Valorizing Red Grape Pomace through the Development of Biscuits with Potential Health-Promoting Properties

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Long-term adherence to a dietary pattern rich in polyphenols with proven cardiometabolic benefits remains challenging for the general population. In this study, red grape pomace (GP), an agro-industrial by-product, was incorporated into biscuits as a sustainable ingredient to enhance dietary polyphenol intake. Crude crushed GP was added to a control (CTR) biscuit formulation at 20% and 30% (w/w), improving the nutritional profile by increasing dietary fiber while reducing lipid and energy contents. The enriched biscuits provided up to 540 mg GAE of total polyphenols per 100 g.

In addition to anthocyanins, GP supplied flavonoids and grape seed procyanidins, which contributed to the high antioxidant capacity of the 20-GP and 30-GP biscuits. Following in vitro gastro-duodenal digestion, both GP-enriched formulations exhibited significantly lower concentrations of reducing sugars than the CTR biscuits, suggesting that the combined effects of GP fiber and polyphenols may slow glucose release and intestinal absorption.

A total of 60 volatile compounds were identified in the biscuits. Notably, GP-enriched biscuits contained lower levels of Maillard reaction products than the CTR formulation, likely owing to the free radical-scavenging activity of grape polyphenols. Despite the relatively high GP incorporation levels, sensory attributes and overall consumer acceptance—particularly for the 20-GP biscuits—were largely preserved.

Overall, these findings demonstrate that red grape pomace can be successfully valorized as a functional food ingredient, improving the nutritional and bioactive profile of biscuits while maintaining acceptable sensory quality. This work provides a basis for future nutritional studies investigating the health-promoting potential of GP-enriched biscuits and supports the sustainable large-scale production of foods that transform an agro-industrial waste into a value-added resource.



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Sciforum-203234: Valorization of Industrial Orange Residues: Effect of Essential Oil Extraction on Bioactive Compounds and Tocopherol Profile

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Citrus production is a major agro-industrial activity worldwide, generating large amounts of by-products during juice processing. Food Machinery Corporation (FMC) technology enables the simultaneous extraction of juice and essential oils, generating an orange residue after essential oil extraction (OER) whose composition may differ from that of the original orange residue (OR). This study evaluated the effect of industrial essential oil extraction on the bioactive properties and lipophilic composition of Navel orange residues. OR and OER by-products were freeze-dried and milled, yielding dried powders designated as DOR and DOER, respectively. Total phenolic content (TPC), total flavonoids, carotenoids, and antioxidant activity (ABTS and ORAC-FL assays) were determined. Oil extraction yield was determined, and the tocopherol profile was evaluated by chromatographic analysis. DOR showed higher contents of TPC (12.8 ± 1.1 vs. 10.5 ± 0.2 mg GAE/g), total flavonoids (0.97 ± 0.01 vs. 0.74 ± 0.01 mg quercetin equivalents/g), and carotenoids (129.2 ± 1.9 vs. 74.05 ± 0.02 μg/g) than DOER. However, ORAC-FL values were significantly higher in DOER (212.0 ± 5.6 μmol TE/g) than in DOR (172.1 ± 5.6 μmol TE/g), whereas no significant differences were observed by ABTS. These findings suggest that antioxidant activity depends not only on the concentration of bioactive compounds but also on their availability and interactions within the food matrix. FMC processing reduced total tocopherol content by approximately 65%, from 276.5 ± 0.4 to 97.0 ± 0.5 mg/kg of residue. α-Tocopherol was the most affected homologue, decreasing from 186.2 to 50.5 mg/kg of residue (≈73% reduction), whereas β+γ-tocopherols showed a lower decrease. This differential behavior resulted in a reduction of the α/(β+γ) ratio from 2.1 to 1.1. These results demonstrate that FMC essential oil extraction significantly modifies the bioactive and lipophilic composition of orange residues, while preserving or enhancing specific antioxidant properties, highlighting their potential as sustainable functional ingredients.



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Session F. Sensory & Consumer Research

Sciforum-185157: Reframing Non-Alcoholic Wine Studies: Sensory Characteristics and Bioactive Changes Induced by De-Alcoholization

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Excessive alcohol consumption continues to represent a major public health concern in the 21st century, with significant impacts on both individual health and societal well-being. In response to this challenge—and to meet the needs of consumers who avoid alcohol for health, religious, or personal reasons—alternative beverages have emerged, among which low- and non-alcoholic wines have gained growing relevance. These products aim to retain the sensory characteristics of traditional wines while reducing or eliminating ethanol content.

This study addresses a critical gap in the literature by offering a comprehensive evaluation of non-alcoholic wines across three key dimensions: sensory properties, the influence of de-alcoholization techniques, and their impact on bioactive compounds and antioxidant capacity—areas that remain underexplored.

A panel of 29 trained assessors conducted sensory evaluations of eleven non-alcoholic wines (four white, four red, and three rosé) using Quantitative Descriptive Analysis (QDA). The results revealed marked differences in aroma profiles compared to conventional wines. Additionally, wines produced through low-temperature vacuum distillation consistently exhibited higher levels of total phenolics, flavonoids, and ortho-diphenols, alongside greater antioxidant activity across all categories. In contrast, samples obtained via spinning cone column (SCC) technology showed the lowest values for these parameters.

Despite these findings, non-alcoholic wines continue to experience lower acceptance within the industry, highlighting persistent challenges in achieving sensory and qualitative equivalence with traditional wines. Overall, this study advances current knowledge on non-alcoholic wine production and provides relevant insights to support future innovation and product development in this rapidly evolving sector.



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Sciforum-189006: Certification Engagement and Consumer Trust in Organic Food Markets: Evidence from Portugal

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This study examines the associations between consumer trust, certification engagement, and consumption behaviour in the Portuguese organic food market. Using a nationwide survey of organic food consumers in Portugal (N = 313), the analysis adopts a triangulated empirical strategy combining non-parametric tests, econometric models with robust standard errors, behavioural segmentation techniques, and exploratory machine-learning validation. Trust is measured through a composite index derived from exploratory factor analysis of certification- and retail-related credibility indicators. Across all empirical specifications, certification-checking behaviour emerges as the strongest and most consistent factor associated with consumer trust. Consumers who actively verify certification labels and institutional guarantees report significantly higher trust levels in organic food products and retail channels. In contrast, sociodemographic characteristics lose explanatory relevance once behavioural variables are incorporated into the models. Consumption intensity, proxied by monthly expenditure on organic products, exhibits a positive association with trust, although less consistently than certification engagement, while consumption frequency presents weak and unstable associations in multivariate specifications. Behavioural segmentation identifies distinct consumer profiles primarily differentiated by trust perceptions and certification engagement rather than demographic attributes. Furthermore, exploratory mediation analysis does not reveal statistically significant indirect associations between consumption frequency, certification engagement, and trust. Overall, the findings suggest that consumer trust in organic food markets is closely linked to active engagement with certification systems and confidence in institutional verification mechanisms, highlighting the central role of transparency and certification credibility in strengthening sustainable food consumption.



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Sciforum-190286: AI-assisted food design: co-creation with young consumers

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Advancements in food design and technology are reshaping creative product development by driving highly collaborative workflows. Generative Artificial Intelligence (AI) addresses a critical challenge in traditional consumer research: the barrier to verbalizing subjective sensory ideas. By rendering abstract user insights into explicit visual representations, this technology bridges the gap between consumer imagination and initial product execution.This study evaluated a novel food design framework that embeds generative AI as a visual mediator during the participatory co-creation of an innovative alfajor concept tailored to young consumers.A multi-stage participatory design approach was deployed. First, an online ideation survey with frequent consumers (n=124; 61% women, average age 28.0±3.4 years) explored novel configurations of the alfajor's core components. From these inputs, nine high-potential innovative concepts were defined by calculating an Innovation Index based on market novelty. Second, textual concepts were translated into realistic visual stimuli using generative AI (GPT-5) with standardized prompts. Finally, a second group of consumers (n=343; 75.3% women, average age 24.6±4.1 years) evaluated these visual prototypes to measure expected sensory acceptability (9-point hedonic scale), purchase intention (9-point scale), willingness to pay (categorical scale), and text-image conceptual congruence (7-point scale).The findings validate generative AI as a novel and efficient asset for agile food design. Participants reported an 80% image-concept congruence (5.2±1.6 out of 7). Purchase intent and congruence demonstrated a positive, weak correlation (r = 0.23). Expected acceptability ranged from a maximum of 7.0±1.9 to a minimum of 6.0±2.6, both being comparable to the value of 6 standardly used in sensory evaluation to indicate an acceptable product. While no physical prototypes were used, meaning the results reflect expected sensory acceptance, this visual mediation successfully transformed textual descriptions into anticipated consumption experiences. Ultimately, AI-assisted co-creation significantly streamlines early-stage food product design by delivering promising, user-validated visual concepts.



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Sciforum-195019: Valorization of virgin coconut oil processing wastes: initial sensory insights on pretreatment effects on aroma of coconut skim milk

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Virgin coconut oil (VCO) is considered globally as a premium, versatile, and natural product, demand of which will continue to grow. This expected market growth will be accompanied by a rise in VCO processing wastes such as coconut skim milk. Coconut skim milk (CSM) was reported to contain substantial amounts of proteins which makes it a sustainable and cheap ingredient in plant-based milk alternatives. Due to its susceptibility to rapid spoilage, CSM is often discarded, thus pretreatment is necessary. This study presents initial findings on the possible effects of pasteurization on the temporal evolution of aroma attributes of CSM over one month of storage (i.e., 0, 7, 14, 21, and 28 days). Samples pasteurized at 63 °C for 30 min were compared with untreated CSM. Aroma was assessed by four untrained panelists using a 5-point intensity scale for key attributes (i.e. acid and nutty) and median scores were recorded. Both untreated and pasteurized CSM samples appeared to maintain none to slight acidic aroma and slight to moderate nutty aroma, suggesting limited development of spoilage-related sensory notes. Interestingly, a durian-like aroma was generally perceived and tended to be stronger in untreated CSM samples, suggesting that pasteurization may have attenuated some odor-active compounds while potentially preserving desirable sensory characteristics. These observations are preliminary, but suggest that mild pasteurization could contribute to maintaining sensory quality of CSM, supporting its potential use in sustainable plant-based products, reducing food waste, and contributing to circular food systems. Further validation with a larger trained panel is recommended.



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Sciforum-195252: Characterization of Banana Blossom (*Musa acuminata* Colla) and Taro (*Colocasia esculenta*) Flours and Their Application in Soft Cookies

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This study evaluated banana blossom flour (BBF) and taro flour (TF) as partial substitutes for all-purpose flour (APF) in soft cookies. Banana blossoms and taro tubers were dried at 70 °C for 4 and 3 h, respectively, milled, and sieved through a 60-mesh screen. Nine composite flour formulations were developed using D-optimal mixture design, with BBF, TF, and APF ranging from 3–15%, 10–30%, and 55–87%, respectively. The physicochemical, proximate, pasting, microbiological, and sensory properties of the flours and cookie formulations were determined. BBF had higher crude protein (28.16 ± 1.00%), crude fiber (22.43 ± 0.90%), ash (12.43 ± 0.07%), total phenolic content (27.86 ± 1.66 mg GAE/100 g), and DPPH radical scavenging activity (36.80 ± 0.23%) than TF, whereas TF had higher nitrogen-free extract (78.14%). Pasting analysis indicated distinct technological functions relevant to cookie production. BBF showed high peak viscosity (7279 cP), suggesting strong water-binding and thickening capacity, but its low hot-paste stability may constrain performance during heating and shearing. Conversely, TF had lower breakdown viscosity (261 cP), higher final viscosity (1956 cP), and better thermal stability, indicating its possible contribution to dough consistency and baked texture. Sensory evaluation was conducted in two stages. In the first stage, 45 semi-trained panelists evaluated the nine formulations using Quantitative Descriptive Analysis and a 9-point hedonic scale, showing significant formulation effects on appearance, color, aroma, texture, taste, and overall acceptability ($p < 0.05$). BT07 (3:20:77 BBF:TF:APF) ranked highest, followed by BT01 (3:10:87 BBF:TF:APF). In the second-stage consumer acceptability test, BT01 obtained the highest overall acceptability score (7.49). Results indicate that BBF and TF can be incorporated in soft cookies, but acceptable quality was best maintained at low substitution levels.



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Sciforum-196795: Sensory Characterization of Dairy and Plant-Based Yogurts Using Napping® and Multiple Factor Analysis

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Consumer demand for plant-based yogurt alternatives continues to increase; however, sensory differences between dairy and plant-based products remain a major challenge for the food industry. Rapid sensory profiling methods, such as Napping®, provide an innovative approach for evaluating perceptual similarities and differences among products. Therefore, the objective of this study was to characterize the sensory properties of dairy and plant-based yogurt formulations using Napping® and Multiple Factor Analysis (MFA).

Eleven yogurt formulations were evaluated, including dairy, soy, oat, standardized oat, and matrix-modified oat treatments. Formulations were fermented using two duration times (16 and 24 h). Fifty consumers participated in the Napping® evaluation task in which samples were simultaneously positioned on a two-dimensional space according to perceived similarities and differences. Participants also provided descriptive terms to support their samples' placement, which were used to interpret the sensory dimensions underlying the product's spatial configuration. Data were analyzed using Multiple Factor Analysis (MFA).

MFA explained 66.37% of the total variability, with Dimension 1 accounting for 55.10% and Dimension 2 accounting for 11.27%. A clear separation was observed between dairy and plant-based formulations along Dimension 1. Dairy yogurts clustered together and were associated with "creamy" texture and "fermented" dairy characteristics. Oat-based formulations occupied a distinct sensory space, characterized by lower viscosity and greater perception of plant-derived attributes ("fruity" and "plant-like"). Soy samples showed an intermediate position between dairy and oat products. Matrix-modified oat formulations containing hydrocolloids and protein shifted toward the dairy cluster, reflecting improvements in texture-related attributes. These sensory patterns were consistent with physicochemical measurements, particularly viscosity and syneresis.

Napping® effectively differentiated dairy and plant-based yogurt formulations and revealed the sensory effects of matrix modification strategies. The technique provided valuable insights into consumer perception and product positioning, supporting its application in the development of plant-based fermented foods.



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Sciforum-197118: Consumer Acceptance of Upcycled Foods: Attitudes, Neophobia, and Nutrition Involvement of Filipino Consumers

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With the continuous rise in global food waste, sustainable food innovations such as upcycled foods (UF) are emerging as promising strategies, yet consumer acceptance remains a key challenge. This study examined Filipino consumers' awareness, attitudes, perceptions, food neophobia and food technology neophobia, nutrition involvement, and willingness to purchase upcycled food (UF) through a structured online survey (QualtricsXM) administered to Filipino respondents (n = 407) from Metro Manila, Philippines. Results indicated that the majority of respondents (55%) had never heard of or were unaware of upcycled foods. Respondents who were aware (45%) of UF reported significantly ($p < 0.05$) more positive attitudes and higher nutrition involvement than those who were unaware. In contrast, unaware respondents had higher food neophobia and food technology neophobia ($p > 0.05$) than those who were aware. Additionally, consumers with greater nutrition involvement were more likely to view UF positively. In general, the willingness to purchase UF was significantly ($p < 0.05$) influenced by favorable perceptions and attitudes, and negatively associated with neophobia. Exploratory Factor Analysis (EFA) identified three underlying dimensions driving consumers' willingness to purchase: consumer disposition, neophobia, and nutrition involvement. These findings suggest that increasing consumer awareness and targeting key behavioral drivers are essential for advancing the adoption of upcycled food, consequently promoting sustainable food consumption practices.



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Sciforum-197338: Mapping Alternative Food Product Perceptions: The Interplay of PROP Taster Status and Food Neophobia

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Alternative food products (AFPs) such as non-animal and plant-based proteins are key innovations for sustainable diets, yet driving their widespread adoption requires a deeper understanding of the consumer factors that influence their acceptance. This study examined the relationships among 6-n-propylthiouracil (PROP) taster status, food neophobia (FN), and perception toward AFPs. PROP taster status was determined using PROP test strips and classified via generalized Labeled Magnitude Scale (gLMS) ratings. Food Neophobia and perception toward AFPs were collected through a structured online questionnaire (Qualtrics^{XM}). A total of 125 respondents were classified as nontasters (n = 14), medium tasters (n = 86), and supertasters (n = 25). Overall, respondents demonstrated low FN (3.00 ± 1.49) and maintained neutral baseline views on general AFP perception (0.41 ± 0.58). While AFPs were rated significantly higher ($p<0.05$) than conventional food products for perceived healthiness, safety, environmental friendliness, animal welfare, and sustainability, they scored lower for perceived taste, enjoyment, and affordability. Notably, supertasters gave significantly lower ratings ($p < 0.05$) for perceived tastiness than other groups. No other significant associations were found between PROP taster status and overall AFP perception or FN ($p>0.05$). These findings indicate that acceptance of AFPs is primarily driven by perceived health and sustainability benefits rather than sensory appeal, while genetic taste sensitivity may introduce specific barriers to expected palatability. This underscores the need for intervention strategies that address both sensory and non-sensory determinants to support sustainable dietary transitions.



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Sciforum-197585: Visualization of television cooking shows and culinary programs: Insights from a sample of Portuguese citizens

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Introduction: In the past years, a number of TV programs and competition shows have intensified their presence on TV, reaching many homes, and involving a huge number of spectators. This work aimed to investigate people's habits and perceptions related to these types of TV programs.

Methods: We conducted a cross-sectional study, by means of a questionnaire survey, applied online to a sample composed of 250 Portuguese adult participants. The survey was approved by the Ethics Committee at the Polytechnic University of Viseu, and the research and data management followed the principles of the Declaration of Helsinki. Statistical treatment of data was made using SPSS software.

Results and Discussion: Results showed that most participants watch these programs (63%), but with a low frequency (63% do it less than once/week). The time of day when they visualize culinary TV is at the end of the day (71%), and the most viewed programmes are competition shows, like MasterChef, and also recipe programs (seen by 62% and 59% of the participants, respectively). Nearly half of the participants report that they prepare meals based on recipes from TV programs (46%), and more than half consider that these programs influence their daily diet (54%), especially because they have more recipe ideas to prepare (reason pointed out by 67% of the participants).

Conclusions: The visualization of culinary TV content is nowadays an important way to incentivise home cooking, self-meal preparation, and possibly influence daily diets.



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Sciforum-197768: Exploring consumers' perception of craft beer from social agriculture tracked with blockchain technology

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Despite growing interest in food traceability, the intersection between digital transparency and social sustainability remains underexplored, particularly within the craft beer sector. This study addressed this gap by investigating how blockchain-mediated communication about social sustainability influences consumers' perceptions and willingness to buy a beer produced within a prison-based economy project that supports inmates' reintegration through their work in hop cultivation and harvesting. Firstly, an online survey (n = 456) explored the willingness to buy (WTB) a social beer tracked with blockchain technology (BT). Partial Least Square Structural Equation Modelling showed that, although BT was perceived as slightly complex, it significantly enhanced trust, positively affecting WTB. A significant positive attitude toward "made in prison" initiatives emerged as the primary driver of WTB, whereas general interest in social farming did not directly translate into higher WTB. Secondly, a sensory test (n = 148) evaluated the impact of social information on beer acceptability. Participants were divided into a *Blind* and an *Informed* group (only the latter receiving details on social impact). Independent-samples t-tests showed that social information did not significantly affect liking scores or WTB, but *Informed* participants considered the social beer more appropriate for sharing with family or friends, thus appreciating it not only for its sensory quality but also for its social value. By linking digital traceability with social impact, these findings demonstrated how the brewing industry can contribute to SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production), supporting socially responsible brewing initiatives.



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Sciforum-198252: Consumer Acceptance and Sensory Evaluation of a Hybrid Yogurt with Milk and Fava Bean Protein

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Introduction

The increasing demand for sustainable and functional foods has led to the development of hybrid products combining animal and plant protein sources. The aim of this study was to investigate consumer acceptance of a hybrid yogurt enriched with fava bean.

Methods

A hybrid yogurt combining animal (milk) and plant (fava bean) proteins was developed, and consumer evaluation was conducted using a questionnaire including both quantitative and qualitative assessment of product attributes.

Results and Discussion

The results indicated a generally positive consumer attitude toward the hybrid yogurt with fava bean. Specifically, 51.9% of participants stated that they would consume it as part of a healthy diet, while the product was rated positively in terms of its perceived healthiness, suitability for a flexible diet, and contribution to protein intake. The inclusion of fava bean positively influenced perceptions of the product's environmental impact; however, sustainability alone was not a strong purchase driver. Higher willingness to pay was observed when the product was labeled as high in protein. The qualitative analysis showed that consumers mainly appreciated the innovation, uniqueness, and textural characteristics of the product. However, the intensity of the fava flavor and aroma, as well as astringency, were identified as key areas for improvement. Suggested improvements focused on optimizing the sensory profile through milder fava taste, better flavor balance, and the development of product variations.

Conclusions

The findings suggest that the hybrid yogurt with fava bean is generally well accepted by consumers and shows potential as a functional and more sustainable product. However, further optimization of its sensory properties, particularly the intensity of fava flavor and aroma, is expected to enhance consumer acceptance and purchase intention.



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Sciforum-198305: Milk minimizes sensory penalties in coffee pulp infusions more effectively than rice and soy beverages

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Coffee pulp (*Coffea arabica* L.), authorized in the EFSA as a traditional food from a third country under the novel food framework, is a bioactive by-product with potential for sustainable beverage development. Although its extraction and bioaccessibility have been optimized in dairy and plant-based matrices, consumer acceptance of these formulations remains unexplored.

A pilot consumer study involving thirty-three target consumers, all self-reported users and likers of coffee and/or tea products, evaluated an optimized coffee pulp infusion prepared at 0.08 g/mL for 9 min and formulated with reduced-fat milk, rice beverage, soy beverage, or water as a control, according to a balanced Williams Latin square design. Samples were maintained at 65 °C until serving. No panelist or serving order effects were detected ($p > 0.05$).

Overall liking did not differ significantly among formulations ($p > 0.05$); however, purchase intent showed marked differences, with positive responses of 48%, 45%, 45%, and 21% for control, milk, rice, and soy formulations, respectively. RATA profiling showed that milk and soy reduced perceived acidity compared with the control and rice formulations, whereas only milk reduced astringency to levels comparable to the ideal product. Consistently, mean drop analysis based on five-point JAR scales identified no significant sensory penalties in the milk formulation, while rice was penalized for excessive aftertaste (mean drop: -1.98) and soy for excessive aftertaste (-2.25), insufficient aroma (-1.28), and insufficient sweetness (-1.95). Instrumental analyses supported these findings: milk and soy increased pH (4.36 and 4.23 compared with 3.82 in the control) and turbidity, contributing to perceived acidity masking. Finally, the first two principal components explained 84.1% of total variance and revealed a persistent aromatic gap between formulations and the ideal product.

Among the tested matrices, milk was the most effective for coffee pulp valorization, reducing acidity and astringency without generating sensory penalties. Although soy mimicked several physicochemical properties of milk, its sensory profile substantially reduced purchase intent. Aroma enhancement emerged as the main target for future product optimization.



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Sciforum-198399: Before Taste: The Role of Vision in Flavour Perception

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The sensory perception of food results from the integration of multiple stimuli, with vision being one of the main factors in the formation of expectations and in the interpretation of flavour. Colour, as the dominant visual component, influence the identification and intensity of basic tastes, even when the physicochemical characteristics of foods remain unchanged. This study aimed to evaluate the influence of colour on flavour perception and on the construction of sensory expectations. A quantitative experimental study was conducted with 35 participants using a discriminative sensory test with four macaron samples of identical composition, varying only in colour (pink, green, yellow and brown). Consumer panel evaluated flavour expectations, aroma and the intensity of basic tastes before and after tasting. Statistical analysis was performed using ANOVA tests, complemented by the Tukey test to identify significant differences between samples, and revealed that colour significantly influenced the perception of sweetness, acidity and bitterness, with p-value < 0.05. The pink sample was perceived as sweeter, while the green and yellow samples were perceived as more acidic and the brown sample as more bitter. Before tasting, colour generated distinct expectations of flavour and aroma, highlighting the visual impact on the sensory experience. No significant differences were observed in the perception of saltiness and umami. These results highlight the multisensory nature of the eating experience and the relevance of visual stimuli in flavour interpretation, with implications for product development, gastronomy and sensory marketing.



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Sciforum-198509: Environmental Concern Challenges the Health Halo: Rethinking the Communication Strategy for Organic Foods in Emerging European Markets

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The marketing of organic food has long been anchored in the health halo. This concept refers to the assumption that consumers primarily perceive organic products as instruments of personal health, with other benefits operating as a secondary motivation. While this premise is well established in two decades of Western European and North American consumer research, evidence from emerging European organic markets remains scarce and may not fit the inherited paradigm.

This exploratory study examines the hierarchy of psychographic antecedents of organic food consumption among Romanian consumers, testing whether the conventional precedence of health over environmental motivation holds in an emerging market context. Data were collected through an online structured questionnaire (N = 73) measuring three latent psychographic constructs: environmental concern, health motivation and experiential orientation. In addition, behavioral indicators of organic interest, preference and consumption were measured. Composite scores were used (validated through Cronbach's alpha). Non-parametric Spearman correlations tested the formulated hypotheses.

Results revealed a clear and consistent pattern that challenges the conventional health-first hierarchy. Environmental concern emerged as a correlate of organic food interest, preference and consumption at least as strong as health motivation, with a marginal lead in every comparison. Experiential orientation also proved a robust antecedent, particularly of preference for organic products. Demographic factors, such as age and generational cohort, proved to be weak and non-significant correlates, contrasting with much of the existing segmentation literature.

These findings suggest that communication strategies for organic food brands in emerging European markets should reorganize their message hierarchy: ecological arguments (such as verifiable carbon footprint, regenerative agriculture, short supply chains) should occupy a central narrative position alongside health considerations, rather than functioning as a secondary appeal. The persistent relevance of experiential orientation further suggests that storytelling around novelty, origin and sensory experience can complement the dual environmental-health core of brand communication.



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Sciforum-198734: Sensory impact of three essential oils from the genus Cymbopogon as natural flavorings for fermented yogurt

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Essential oils (EOs) used as flavor additives in yogurt are a natural alternative; however, it is essential to conduct sensory tests to determine the appropriate concentrations and thus ensure good product acceptability. The objective of this study was to evaluate the sensory impact of adding three concentrations of EOs from three species of the genus Cymbopogon, C. winterianus (citronella), C. flexuosus (lemongrass), and C. martinii (palmarosa) to yogurt as natural flavorings and aromatics. The yogurt was prepared using reconstituted instant skim milk powder and a commercial starter culture YC-X16 (Chr. Hansen) (4 hours at 40°C). Three concentrations of EOs were also added: 0.02%, 0.01%, and 0.002% w/w. A qualitative focus group analysis was conducted with 8 consumer assessors. For the descriptive analysis, 8 panellists were selected; they were trained and calibrated over four sessions totalling two hours, during which the sensory attributes to be assessed (essence intensity (EI), essence flavour (EF) and yoghurt flavour (YF)) were defined. QDA and Spectrum techniques were combined, using an unstructured linear scale ranging from 0mm (not noticeable) to 150 mm (very intense). For the statistical analysis of the descriptive study, summary statistics, ANOVA and the Tukey test ($\alpha = 0.05$) were calculated. In the focus group, the flavour enhancers were perceived as best at a concentration of 0.01%. In contrast, the highest concentration (0.02%) was perceived as overpowering in terms of EF. All three EOs were considered products they would consume, but palmarosa was described as the subtlest and lemongrass as the best-tasting additive. In the descriptive analysis, citronella at 0.02% had the highest values for EI (60) and EF (71). At a concentration of 0.01%, no statistically significant differences were observed among the three EOs. In YF, a reduction in intensity was observed with the addition of the EOs, demonstrating a greater effect with citronella. This EOs can be used at lower concentrations to achieve the same intensity as the others. The three EOs evaluated have the potential to enhance the aroma and flavour of yoghurt, which reaffirms that these natural compounds are a good source of aromatic compounds.



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Sciforum-198738: Sensory effects of using the Cymbopogon genus as a flavoring agent in cream cheese: focus group and descriptive analysis

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Essential oils (EOs) from the genus Cymbopogon contain terpenes with antioxidant activity that slow oxidative deterioration in products with high lipid content, such as cream cheeses, but they affect their sensory properties. The objective of the study was to evaluate the sensory changes in cream cheese resulting from the addition of lemongrass (C. flexuosus - LEO), palmarosa (C. martinii - PEO), and citronella (C. winterianus - CEO) at three concentrations (0.02, 0.01, and 0.002% w/w). The EOs were added at the concentrations to be evaluated to commercial cream cheese without flavor additives. The results were then determined using a focus group (8 panelists) and a discriminative test with a hybrid model of QDA and Spectrum (8 trained panelists, 0–150 mm scale). The focus group found that the essential oils altered the flavor of the cream cheese, with the 0.01% w/w being the most accepted and CEO presenting the most pleasant perception. The focus group provided information indicating that the application is feasible. The descriptive analysis indicated that the intensity of the EO aroma (IEO) was perceived at lower values (maximum 28) compared to the EO flavor attribute (FEO) (maximum 82). Furthermore, it was observed that the EO with the greatest flavoring capacity at 0.02% was palmarosa (30), followed by lemongrass (22) and citronella (10). Regarding the cheese-like flavor (FC), it was evident that as the concentration of EOs increased, the perception of the food's characteristic flavor decreased. No differences were observed among the EOs when compared at the same concentration, with the exception of palmarosa, which generally exhibited a lower intensity value for the FC attribute. The three EOs do not have a negative effect when used in cream cheese; however, as their concentration increases, the cheese flavor decreases. The use of these additives as flavorings is feasible.



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Sciforum-200155: Visual hierarchy, attention and choice: an eye-tracking study of PGI extra virgin olive oil packaging

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Packaging is a key driver of in-store purchase decisions, yet many purchases occur under conditions of low attention and high visual competition. This study tests whether redesigning the front label of an extra virgin olive oil carrying a Protected Geographical Indication (PGI) affects consumers' visual attention and choice. Using a between-subjects design, 100 habitual olive-oil buyers (50 control, 50 experimental) completed a remote, webcam-based eye-tracking session comprising a simulated shelf task and an isolated-bottle viewing task. The experimental label removed a dominant vertical wordmark, enlarged the logo, denomination and PGI mark, and rebalanced the visual hierarchy. At the shelf, the redesigned label nearly doubled mean fixation time (1.14 versus 0.59 seconds; Welch $p = .008$, $d = 0.55$) and spread attention more evenly across front-of-pack elements rather than concentrating it on a single feature. Choice and pre-click latency pointed in the same direction: the redesigned label was selected about twice as often and prompted longer deliberation, although these effects rest on a small subsample and should be considered only preliminary. Findings indicate that even modest changes to visual hierarchy can measurably enhance attention to PGI cues, supporting packaging as a strategic silent salesman. These results align with attention-based models of choice. Implications for label design and geographical-indication branding are discussed.



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Sciforum-202927: Nutritional Composition of Common Beans for Succulent Stage Harvest in the Mid-Atlantic USA

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Consumption of green legumes in the United States increased significantly in recent years, representing $50-100+ million annually in imported goods. Common beans (*Phaseolus vulgaris* L.) are an under-utilized, low-cost crop with potential to expand the portfolio of green legumes consumed in the USA and provide sustainable income to small and medium-sized farmers in the Mid-Atlantic region. Pinto, Great Northern (GN), Dark Red Kidney (DRK), Black, and Cranberry beans were grown in VSU, UD, VT ESAREC locations in June-August 2025. Up to three varieties per bean type were harvested at the fully formed, succulent stage, then blanched, shelled, and stored frozen (-20 °C) until nutritional analysis. Crude protein (Nitrogen) and lipid content were measured in duplicate; moisture and ash content were measured in triplicate. ANOVA and Tukey's HSD tests (α=0.05) were performed using R/RStudio. Mean scores for all analyses were significantly different across bean types ($p<0.05$). Navy and GN beans had the highest protein content, while Pinto and Cranberry had significantly less ($p<0.05$). Lipid content was significantly higher in Pinto and Black beans. GN and Black beans had significantly higher ($p<0.05$) moisture and ash contents, respectively. Considering growing demand for plant-based protein sources, first-year data suggests GN, Navy, and Pinto beans as most appealing, but confirmation in year two is needed. The incomplete sample set limited evaluation of growing location effects and identification of varieties with best nutritional profiles within each bean type. Incorporation of fiber analysis in future years of the project will further strengthen the nutritional profile assessment. This work, alongside field performance evaluation, sensory testing, and consumer research, is guiding a multidisciplinary team in recommending common beans best suited for succulent stage harvest in the Mid-Atlantic USA. Developing this affordable crop supports local economic growth and expands consumer access to nutritious, domestically produced foods.



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Session G. Food Safety, Toxicology & Quality

Sciforum-180659: Transporter-Mediated Modulation of Veterinary Drug Residues in Milk: A One Health Computational Toxicology Framework

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Veterinary drug residues in milk represent a critical interface between animal health, food safety, and public health, particularly when co-administered pharmaceuticals influence residue dynamics. Current residue risk assessment frameworks are primarily based on single-compound pharmacokinetics and do not account for transporter-mediated drug–drug interactions that may alter the secretion of xenobiotics into milk. In this study, a One Health-oriented computational toxicology framework was developed to investigate the potential modulation of marbofloxacin residues by ivermectin via the ABCG2/BCRP efflux transporter. An ovine ABCG2 homology model was constructed and evaluated using established structural quality metrics. Molecular docking and molecular dynamics simulations were employed to assess binding affinity, interaction stability, and potential inhibitory effects of ivermectin on transporter function in comparison to marbofloxacin. The study combined homology modelling, molecular docking, and molecular dynamics simulations to investigate the interaction of marbofloxacin and ivermectin with the ovine ABCG2/BCRP transporter and to evaluate potential effects on transporter-mediated drug secretion. The results indicate that ivermectin exhibits stable binding within the transporter cavity and interacts with key functional residues, suggesting a potential inhibitory effect on substrate efflux. This interaction may influence the secretion of marbofloxacin into milk and modify the kinetics of residue depletion. These findings highlight the importance of considering transporter-level interactions in veterinary drug residue evaluation. The proposed framework supports integrating in silico approaches into predictive residue toxicology and provides a mechanistic basis for improving risk assessment strategies. From a One Health perspective, this approach contributes to a more comprehensive understanding of factors affecting food safety, antimicrobial exposure, and regulatory decision-making related to maximum residue limits and withdrawal periods.



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Sciforum-185378: Mineral profiles across the Iberian rice chain: from soil to grain.

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Background:
Rice is a staple crop globally, and Spain is the second-largest producer in the EU. Its mineral composition is influenced by environmental factors, soil availability, and processing. While essential elements are vital, non-essential ones can pose health risks for consumers. This study evaluates the elemental profile of the soil-shoot-grain system across the main rice producing regions of the Iberian Peninsula to assess its nutritional and toxicological status.

Methodology:
The study analyzed commercial rice (brown, parboiled, and polished) and field samples (soil, shoots, and grains) from key regions: Andalucía, Aragón/Navarra, Cataluña, Extremadura/Portugal, Murcia, and Valencia. Concentrations of 13 essential and non-essential elements were quantified using ICP-MS. Statistical tests were applied to identify regional variations and the impact of grain processing.

Results:
Processing was the primary factor affecting mineral density, with brown rice showing significantly higher levels than polished or parboiled varieties. Significant regional differences were found: Andalucía had higher soil concentrations of Cu, Mn, Ni, and Cr, while Valencia led in soil P and Sr. In grains, Andalucía showed the highest Mn, Mo, and Zn levels. Importantly, toxic elements like Pb and Cr remained at trace levels, well below European safety limits.

Conclusions:
The elemental profile of Iberian rice is mainly modulated by industrial processing and geographic origin. Presumably, plant exclusion mechanisms effectively limit the translocation of non-essential elements to the grain, ensuring a safe product. Although polishing reduces toxic heavy metals, it also significantly decreases beneficial micronutrients. Overall, Iberian rice is confirmed as a safe and nutritionally valuable food source.



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Sciforum-185584: Species- and Tissue-Specific Accumulation of Cd, Cu and Zn in Wild Mushrooms from Leicestershire, UK

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Introduction: Metal accumulation in wild mushroom fruiting bodies is influenced by fungal taxonomy, fruiting-body structure and the environmental metal burden of the habitats where they develop. This study assessed species- and tissue-specific patterns of cadmium (Cd), copper (Cu) and zinc (Zn) accumulation in wild mushrooms from urban and rural green spaces in Leicestershire, UK, and interpreted them in relation to local topsoil metal concentrations.

Methods: Wild mushroom fruiting bodies were collected from public green spaces in Leicester and Bradgate Park. Species identity was confirmed by macroscopic assessment and DNA barcoding. The retained dataset included *Agaricus bitorquis*, *Panaeolus foenisecii*, *Marasmius oreades*, *Coprinopsis atramentaria* and *Mycena citrinomarginata*. Samples were cleaned, dried, homogenised, digested and analysed for Cd, Cu and Zn by ICP–MS. Where sufficient biomass was available, caps and stipes were analysed separately.

Results and Discussion: Urban topsoils showed higher median Cu and Zn concentrations than rural topsoils, whereas Cd medians were similar. The SW sector showed the highest topsoil medians for all three metals, indicating spatial heterogeneity in environmental metal burden. Mushroom accumulation differed markedly between taxa and did not simply mirror topsoil concentrations. *A. bitorquis* showed the highest median Cd concentration (3.878 mg kg^{-1} dry weight) and Cu concentration (114.908 mg kg^{-1} dry weight), whereas *C. atramentaria* and *M. oreades* showed the lowest Cd medians. Median Zn was highest in *M. citrinomarginata* (111.359 mg kg^{-1} dry weight), followed by *C. atramentaria* (104.036 mg kg^{-1} dry weight). In *A. bitorquis* from St Augustine Road, caps showed higher median concentrations than stipes for Cd, Cu and Zn.

Conclusions: Cd, Cu and Zn accumulation in wild mushrooms from Leicestershire was species- and tissue-dependent and occurred against a spatially heterogeneous topsoil metal background. These findings support considering fungal identity, fruiting-body tissue and local environmental metal concentrations when interpreting wild mushrooms as food-safety matrices or environmental biomonitors.



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Sciforum-186485: Cumulative Risk Characterization of Bisphenol Residues in Food Contact Materials During the EU Regulatory Transition

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Introduction:

Bisphenol A (BPA) analogues, introduced as safer alternatives following BPA restrictions in food contact materials (FCM), have been subject to an EU ban due to similar endocrine-disrupting properties. With EFSA's 20,000-fold reduction in the Tolerable Daily Intake (TDI), industry now faces the challenge of eliminating even trace-level residues from packaging supply chains. This study presents a cumulative risk characterization of the most prevalent bisphenol residues during this critical transitional period, assessing whether current exposure levels remain within the newly established safety thresholds.

Methods:

A cumulative risk characterization was conducted using an exposure assessment approach. Exposure data were derived from available migration studies, EFSA scientific opinions, and published occurrence data for BPA and its analogues in canned foods and other FCM categories. The Hazard Index (HI) was calculated using the current 0.2 ng/kg bw/day TDI for BPA as the reference threshold, applied to analogues in the absence of specific values. A dose-addition approach was used to evaluate the combined exposure to trace-level bisphenol mixtures potentially present due to cross-contamination in production lines or recycled packaging materials.

Results and Discussion:

Cumulative exposure from packaging materials and pre-ban residues frequently yields a HI exceeding 1, demonstrating that even trace-level bisphenol mixtures represent a risk under the 2023 TDI. These results indicate that the new TDI offers little tolerance for cumulative background exposure. We also discuss the implications of the group-prohibition approach in light of these findings.

Conclusions:

The EU ban on bisphenols is a necessary regulatory response to cumulative exposure risks documented over previous decades. However, the ongoing transition period demands active monitoring of residual bisphenol mixtures in FCM. Our findings support the inclusion of cumulative HI into routine official controls to ensure that combined bisphenol intake – even at trace levels – does not compromise the public health objectives of the new regulatory framework.



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Sciforum-189351: Food–Drug Interactions: Knowledge, Training, and Counselling Practices Among Portuguese Community Pharmacists — A Preliminary Cross-Sectional Study

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Food–drug interactions (FDIs) represent a clinically critical yet frequently overlooked intersection between nutrition and pharmacotherapy, capable of substantially altering drug absorption, bioavailability, and therapeutic outcomes. Community pharmacists occupy a frontline role in FDI risk communication and patient counselling. While knowledge gaps among healthcare professionals have been documented in other professional groups, pharmacist-specific evidence in Portugal remains scarce, representing a relevant gap in the context of medication safety. A preliminary cross-sectional observational study was conducted using a structured, purpose-designed online questionnaire administered to community pharmacists in Portugal (n = 62). The instrument assessed general and specific FDI knowledge, undergraduate and continuing education exposure, perceived clinical relevance, and counselling behaviours. Descriptive statistics and exploratory analyses examining associations between professional background variables and knowledge outcomes were performed. Sample expansion is ongoing to enable inferential analyses in a forthcoming full study.
Over 95% of participants recognised FDIs as clinically relevant to patient safety. Although 87.1% reported undergraduate exposure to the topic, only 11.3% rated that training as adequate. Approximately half of the respondents did not systematically screen patients' complete medication regimens during counselling. Critically, ~40% failed to identify the most frequently occurring FDI, and 50% were unable to identify the most clinically severe one. Continuing professional education was considered essential by over 98% of participants.
These preliminary findings reveal meaningful knowledge deficiencies and training gaps regarding FDIs among Portuguese community pharmacists. As an underexplored professional group in this domain, these results underscore the need for targeted educational interventions, revised undergraduate curricula, and clinical decision-support tools. Expanded data collection is underway to consolidate and extend these findings.



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Sciforum-192709: Postharvest Quality Changes and Thermal Injury Development in Hot Water-Treated Philippine Carabao Mangoes (*Mangifera indica* L.) During Ripening

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Hot water treatment (HWT) is a postharvest procedure used to control diseases in mangoes and to meet phytosanitary requirements. However, excessive thermal exposure may induce quality deterioration, affecting marketability and contributing to postharvest losses. This study evaluated changes in the physicochemical, structural, and visual quality of hot water-treated Philippine Carabao mangoes (*Mangifera indica* L. cv. Carabao) during a four-day ripening period to support postharvest quality assessment. Philippine Carabao mangoes were subjected to HWT at 55°C for 10 min, followed by rapid cooling. The treated fruits were monitored daily for four days for pH, total soluble solids (TSS), moisture content (% (MC), water activity (aw), internal temperature, firmness, and peel and pulp color parameters (L*, a*, b*). Whole-fruit images from six orientations were captured to document external quality changes, while mesocarp tissues were examined using stereomicroscopy to observe structural modifications during ripening. Ripening progression was characterized by a significant daily increase ($p < 0.05$) in TSS, temperature, and a* and b* values, while pH increased significantly on day four. In contrast, L* values and firmness significantly decreased ($p < 0.05$) throughout storage, indicating tissue softening and darkening. Moisture content and water activity (aw) remained stable, ranging from 82.657% to 84.467% and 0.9814 to 0.9924, respectively. Microscopic observations revealed a smoother mesocarp and reduced fiber hairs by day three of ripening. External imaging documented atypical peel browning, light spot formation, and surface wrinkling, which are indicators of postharvest thermal injury. The integration of physicochemical measurements, stereomicroscopic observations, and fruit imaging enabled the characterization of normal ripening changes alongside quality defects that emerged following HWT. These findings characterize the ripening progression and the development of quality defects in hot-water-treated Carabao mangoes, providing a basis for ripeness classification and postharvest quality assessment.



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Sciforum-193223: High-Throughput and Green Screening Methods for the Botanical Classification of Spanish Honeys Using UV–Vis and FIA-UV–Vis Spectral Fingerprints

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Honey is a highly consumed product with high nutritional value and multiple health benefits. However, honey is highly vulnerable to fraud, with mislabeling and adulteration as the most common practices, making it necessary to develop fast, reliable analytical methods to detect them.

In this work, two high-throughput and green non-targeted screening methodologies based on UV-Vis and FIA-UV-Vis spectral fingerprints combined with chemometrics were developed for honey classification and authentication. Both methods were evaluated as efficient screening systems to perform a preliminary analysis of 110 Spanish honey samples of different botanical origins (labelled as almond, blossom, chestnut, eucalyptus, forest, heather, holm oak, lavender, mountain, rosemary, and thyme). These approaches avoid the immediate use of classic confirmatory techniques that are more expensive, time-consuming, and frequently less environmentally friendly.

Principal component analysis yielded reasonably well-structured distributions according to botanical attributes; partial least squares-discriminant analysis provided acceptable sensitivity, specificity, and low classification error rates, confirming that non-targeted spectral fingerprints successfully capture key chemical markers, such as polyphenolic and floral absorption descriptors, required for robust differentiation.

Regarding method suitability, the automated FIA-UV-Vis method proved more efficient for classifying botanical varieties, demonstrating a high capacity to handle a large number of samples (ca. 30 samples per hour). Both methodologies confirmed that rapid analytical speed does not imply a sacrifice in classification accuracy. Their highly favorable environmental and operational performances were confirmed by sustainability and operational practicality metrics. Both systems achieved an identical AGREE score of 0.71 by avoiding the use of hazardous organic solvents, while the practical BAGI index yielded scores of 70.0 and 77.5 for UV-Vis and FIA-UV-Vis, respectively. This research provides the beekeeper sector with two eco-friendly and practical screening alternatives that successfully strengthen honey fraud prevention while ensuring low operational costs and a minimal ecological footprint.



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Sciforum-193417: LC-HRMS fingerprinting for Ecologic and Conventional Honey Discrimination

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In recent years, food certifications associated with specific production practices have acquired considerable market significance and are widely recognized by consumers despite their generally higher prices. However, due to market differences and high value, these types of products are susceptible to fraud, consequently affecting consumer trust. Honey, in particular, is highly susceptible to fraud, including that associated with production certifications such as ecologic labeling. For this reason, it is important to study the differences on ecologic and conventional honey for a better understanding of its composition.

In this study, the classification of honey samples produced under conventional and ecologic beekeeping was evaluated using LC-HRMS fingerprinting. Analyses were performed on an LC-QTOF system, acquiring mass spectra over an m/z range of 50–1500. Raw data were subsequently processed with MSConvert and mzmine software to generate LC-HRMS fingerprints. Exploratory assessment of the fingerprinting data was conducted using principal component analysis (PCA), while class discrimination was performed through partial least squares-discriminant analysis (PLS-DA).

The results obtained from PCA demonstrated the effectiveness of LC-HRMS fingerprints as chemical descriptors for the differentiation of honey samples produced under ecologic and conventional beekeeping practices. PLS-DA achieved a cross-validated classification error of 16.5%, supporting the suitability of the proposed approach. Furthermore, variable importance projection (VIP) scores highlighted the variables most relevant to class discrimination, offering a starting point for the identification of chemical markers associated with specific production systems.

Overall, these findings highlight the potential of LC-HRMS fingerprinting as an approach to discriminate between ecologic and conventional honey, and provide valuable information into the compositional differences associated with these production systems.



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Sciforum-193508: Highlighting the Underestimated Role of Fungi in Food Safety and Occupational Health: Preliminary Screening of Potential Mycotoxigenic Fungi Isolated from Slaughterhouses and Cutting Rooms in Northern Portugal

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Background: Mycotoxins are fungal secondary metabolites with carcinogenic and genotoxic potential, and contamination can occur throughout meat processing facilities. Assessing the presence of mycotoxin-producing fungi is essential for food safety and occupational health within a One Health framework. Coconut Agar Medium (CAM) allows screening of fungal isolates for mycotoxin production, specifically aflatoxin and citrinin, detectable as fluorescence under UV light. This study performed a preliminary screening of fungi isolated from slaughterhouses and cutting rooms in northern Portugal.

Methods: Between July and December 2025, air, surface, and carcass samples were collected from slaughterhouses and cutting rooms for ruminants and pigs in northern Portugal. Air samples were collected passively using Chloramphenicol Glucose Agar (CGA) Petri dishes, while carcass and surface samples were obtained with sterile pre-moistened sponges. Fungal isolates were screened for mycotoxigenic potential on Coconut Agar Medium (CAM) using UV fluorescence (365 nm). Pure cultures were subcultured in the last week of February, excluding yeast-containing plates, and some sampling locations yielded more than one plate if multiple fungal species were isolated.

Results: Of the 48 analysed plates, 20 originated from fungal cultures isolated from slaughterhouse air, 13 from air and surface samples in cutting rooms, 9 from carcass swabs, and 6 from lairage air samples. Seventeen plates were strongly fluorescent (35.4%), 19 were slightly fluorescent (39.6%), and 12 showed no fluorescence (25.0%). Strong fluorescence was observed in cultures from slaughterhouse air before and during slaughter (n = 7), lairage air (n = 2), cutting room air and surfaces (n = 4), and carcass swabs before and after meat inspection (n = 4). Sequencing of isolates from fluorescent and slightly fluorescent plates revealed a diverse range of fungal species, including *A. fumigatus*, *P. brevicompactum*, *P. crustosum*, *P. canescens*, and *P. solitum*.

Conclusions: Fungal isolates with potential mycotoxigenic activity were detected in slaughterhouse air, lairage areas, cutting rooms, and on carcass surfaces. Fungal isolates with potential mycotoxigenic activity were detected in slaughterhouse air, lairage areas, cutting rooms, and on carcass surfaces. These findings are preliminary, and further analytical characterisation is required to confirm and identify the specific metabolites involved.



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Sciforum-193686: The One Health Gap in the Arab World: Diagnosing Governance Deficits through Brucellosis and Hepatitis A

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The Arab region faces intensifying interconnected health risks driven by water scarcity, rapid urbanisation, climate-induced agricultural adaptation, livestock intensification, food-system change, and humanitarian emergencies. These challenges are best understood not as isolated disease burdens but as manifestations of fragmented governance across human, animal, and environmental health systems. Using food systems as the analytical lens, this analysis examines two interfaces where One Health governance becomes operationally visible: hepatitis A at the environmental–human interface within the water–food nexus, and brucellosis at the animal–human interface as a food-safety and governance challenge. Drawing on epidemiological evidence, surveillance reports, wastewater and food-safety studies, policy evaluations, and institutional assessments, the analysis identifies persistent weaknesses in integrated surveillance, regulatory enforcement, and financing for multisectoral coordination. It also acknowledges regional variability across the Gulf, Levant, and North Africa, where stronger technical capacity, conflict-related disruption, and research-to-policy gaps shape implementation differently. The case studies show how hepatitis A exposes weak links among wastewater monitoring, food safety, clinical notification, vaccination, and genotyping, while brucellosis reveals gaps in veterinary surveillance, animal traceability, informal dairy regulation, and livestock movement control. Advancing One Health governance requires interoperable data systems, harmonised regulatory frameworks, legal data-sharing obligations, and practical pilots in countries such as Jordan, Tunisia, Egypt, the UAE, and Saudi Arabia before wider regional scaling.



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Sciforum-195936: The impact of seasonal weather on mycotoxin content in barley, triticale and oat during a two-year cropping period (2024-2025)

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During field growth, barley, triticale and oat crops can be contaminated with mycotoxin-producing fungi, posing risks to human and animal health. The aim of this study was to determine and compare the *Fusarium* mycotoxin content in three cereal species over two growing years to assess the impact of seasonal weather on the dynamics and intensity of cereal contamination. For this purpose, 36 barley, 22 triticale and 21 oat samples were analyzed. In both years, cereal samples were collected from the same fields in northern and eastern Croatia. Mycotoxin analysis (zearalenone, zearalenone 14-Oβ glucoside, zearalenone-14 sulfate, deoxynivalenol, T-2 and HT-2 toxin, fumonisin B1 and B2, nivalenol, 3-acetyl deoxynivalenol and deoxynivalenol 3 glucoside) was performed using liquid chromatography coupled with mass spectrometry (LC-MS/MS). Zearalenone, zearalenone 14-Oβ glucoside, fumonisins, and 3-acetyl deoxynivalenol were not detected in any cereal sample in either year. Nivalenol was not detected in barley and triticale in 2024, while T-2 and HT-2 toxins were not detected in triticale in 2025. The concentrations of other mycotoxins varied depending on the year and cereal, with deoxynivalenol showing the highest incidence, at concentrations from 22.74 to 1638.88 μg/kg. Furthermore, the results indicate a statistically significant difference ($p < 0.05$) in zearalenone-14 sulfate ($p = 0.027$) in barley and deoxynivalenol ($p = 0.013$) and HT-2 toxin ($p = 0.014$) in triticale between the observed years. Although, mean temperature and precipitation were lower in 2024 (12.6 °C and 60.71 mm, respectively) than in 2025 (13.8 °C and 68.42 mm, respectively) and these climatic factors did not differ significantly between years ($p > 0.05$). However, differences in mycotoxin contamination in barley and triticale may be associated with a lower mean temperature in May and June 2024 as a critical period of flowering phase with the possibility of mycotoxin formation.



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Sciforum-196001: Shelf-life dynamics of plain and lemon-flavored goat's milk kefir

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Interest in probiotic foods has surged globally, with Europe's market reaching approximately USD 14 billion in 2025, driven primarily by fermented dairy products like yogurt and kefir. Kefir is a probiotic beverage produced through combined lactic acid and alcoholic fermentation of animal or plant milks. Goat's milk kefir is especially valued for its high nutritional quality and excellent digestibility.

This study evaluated the physicochemical, microbiological, and textural characteristics of goat's milk kefir during refrigerated storage, comparing plain and lemon-flavored varieties and assessing consumer preferences. Two kefir types were produced: a plain control and a lemon-flavored kefir with 1% lemon extract added before fermentation. Fermentation occurred at 20 °C for 24 h using a 0.9% grains-to-milk ratio, followed by storage at 4 °C. Over 13 days, pH, acidity, syneresis, proteolysis, firmness, viscosity, consistency, and microbial counts were monitored. Sensory evaluation was performed on samples stored up to 2 days. Data were analyzed using linear models and variance analysis, with graphs generated in R.

Lemon-flavored kefir maintained a lower pH, creating a less favorable environment for pathogens, reducing proteolysis, and improving textural stability. Both formulations exhibited similar firmness and cohesiveness, but lemon-flavored kefir showed higher viscosity and consistency, providing better mouthfeel and greater consumer acceptability. Microbiological analysis revealed slightly higher lactic acid bacteria and mesophile counts in plain kefir, though both remained within desirable probiotic ranges. Sensory results confirmed a significant preference for lemon-flavored kefir ($p < 0.05$).

Overall, Lemon-flavored goat's milk kefir showed favorable sensory attributes along with stable physicochemical and microbiological quality over 13 days of refrigerated storage. These results highlight its potential as a value-added probiotic dairy product and a promising candidate for industrial optimization and commercial development targeting health-conscious consumers.



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Sciforum-196245: Fermentation-Driven Inactivation of *Salmonella* Enteritidis: Linking Microbiome Succession and Physicochemical Dynamics

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Acidic fermented beverages contain active microbial communities that produce organic acids and other antimicrobial metabolites that can limit the survival of foodborne pathogens. This study investigated the survival of *Salmonella* Enteritidis in acidic fermented beverage (kombucha) and the associated physicochemical, microbiological, and microbiome analyses over a 14-day fermentation.

Kombucha was prepared using 1.6% (w/v) black tea, 10% (w/v) sucrose, and a starter culture containing a symbiotic culture of bacteria and yeast (SCOBY). The SCOBY consisted of cellulose-based pellicle together with previously fermented kombucha broth. The beverage was inoculated with 7.2 log CFU/mL of *Salmonella* and fermented at 23 ± 1.0 ℃ for 14 days. Pathogen populations, lactic acid bacteria (LAB), total yeast and mold (TYM), microbiome composition, pH, titratable acidity, and total phenolic content (TPC) were monitored over 14 days. Microbiome profiling of kombucha with *Salmonella* and SCOBY with *Salmonella* was evaluated after fermentation. Significant differences ($p \leq 0.05$) were determined using one-way analysis of variance while microbiome data were analyzed using the Galaxy Nanopore bioinformatics platform.

The initial *Salmonella* population (7.24 ± 0.44 log CFU/mL) decreased by 5 log units by day 10 (2.01 ± 0.1 log CFU/mL) and further declined to 1.4 ± 0.3 log CFU/mL by day 14, while the *Salmonella* population in the non-fermentable control increased and remained stable throughout the fermentation. The *Salmonella* reduction coincided with decreases in pH and an increase in titratable acidity. LAB and TYM populations increased during fermentation, indicating active microbial metabolism. TPC increased, indicating a breakdown of complex compounds. Microbiome analysis of kombucha and SCOBY samples showed that both the fermented liquid and SCOBY maintained fermentation-associated communities, including yeasts/fungi, acetic acid bacteria, and LAB-related organisms, while *Salmonella* declined by the end of fermentation.

These findings demonstrate that acidic fermented beverages can suppress *Salmonella* Enteritidis through combined physicochemical and microbial changes. Using kombucha as a model matrix, this study provides insight into pathogen behavior and microbial safety in acidic fermented beverage systems.



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Sciforum-196576: Quality and Microbiological Stability of Pasteurized Coconut Skim Milk During Refrigerated Storage

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Coconut skim milk (CSM), a high-moisture by-product of wet centrifugation-based virgin coconut oil processing, requires appropriate post-pasteurization storage to maintain its quality and microbiological safety for further food utilization. This study evaluated the stability of pasteurized CSM under refrigerated storage at 4 °C over 28 days, focusing on physicochemical, color, and microbiological changes. Pasteurized CSM treatments (e.g C1T1=70°C at 5mins; C1T2=70°C at 10mins; C2T1= 80°C at 5mins; C2T2 = 80°C at 10mins) were monitored for pH, titratable acidity, L* value, hue angle, chroma, aerobic plate count, total coliforms, and yeast and molds. Results showed that pH remained relatively stable during refrigerated storage, with no significant Day 0–Day 28 changes in most treatments, except C2T2, which showed a significant decrease ($p < 0.05$). In contrast, titratable acidity significantly increased in C1T1, C1T2, and C2T1 ($p < 0.05$), indicating progressive acid development despite limited pH variation. Color changes were also observed, particularly in chroma, which significantly changed in C1T1, C2T1, and C2T2 ($p < 0.05$). Microbiological results further showed significant logarithmic increases in aerobic plate count, total coliforms, and yeast and molds during storage. Refrigerated pasteurized CSM remained relatively safe up to Day 7, after which microbial increases indicated progressive deterioration. Overall, refrigeration slowed but did not prevent quality loss, supporting only short-term refrigerated storage or the need for further preservation.



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Sciforum-197020: qPCR-HRM Authentication of Single-Component Dominant Functional Foods

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Accurate identification of biological components is of fundamental importance for food quality. Currently, DNA-based methods are considered the most accurate and receive significant attention. Among them, High-Resolution Melting analysis of qPCR-amplified fragments (qPCR-HRM) allows for sequencing-free amplicon differentiation at single-base resolution. The initial research showed that statistical clustering of yeast strains, based on profiles of three rDNA sub-regions from qPCR-HRM analysis of pure cultures, closely corresponded to species identification by MALDI-TOF mass spectrometry and Sanger sequencing. Consistent with existing validation methods, the primary limitations of the procedure were the completeness and accessibility of the reference database. Further work proved that qPCR-HRM analysis with the plastidial DNA *rbcL* fragment identified the botanical variety of honey with a prevalent plant pollen within a complex honey mixture and enabled the detection of the honey product “mis-labelling”. The results demonstrated good correspondence between the more time-consuming melissopalynology analysis and the more rapid qPCR-HRM. The subsequent study evaluated a previously designed primer set targeting heterogeneous regions of yeast rDNA and genes associated with the physiological divergence of *S. cerevisiae* var. *boulardii*, the only yeast with confirmed probiotic properties. This qPCR profiling approach successfully distinguished the *boulardii* variety in pure cultures and verified the probiotic composition of dietary supplements. The identification of *S. cerevisiae* var. *boulardii* within the complex microbial mixtures of kefir was successful when intraspecific sequences were utilised. The dominance of *S. cerevisiae* var. *boulardii* at levels typical for probiotic-fortified food was crucial for its identification via qPCR–HRM. Effective HRM analysis heavily relies on both the purity and quantity of the DNA template, which must be comparable to the reference. Consequently, while challenges may arise in detecting and identifying biological constituents within complex food matrices, our research demonstrated that the qPCR-HRM method can be successfully applied to the authentication of dominant-component functional foods.



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Sciforum-197071: Redefining *Salmonella* spp. challenge testing in *Ready to eat* (RTE) products: current gaps and harmonisation proposal

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Introduction

Salmonellosis remains a leading global cause of foodborne illness, with non-typhoidal *Salmonella* responsible for an estimated current global estimate of 93.8 million infections. While the pathogen's physiological characteristics, prevalence, and pathogenesis are well-established, significant knowledge gaps persist regarding the standardisation of experimental designs for challenge testing in food matrices. This review will address these gaps by analysing current protocols across diverse food products and proposing a comprehensive harmonisation process.

Methods

The review will follow the PRISMA methodology and it will identify the main issues of the topic, including regulations and industry guidelines on food products subjected to *Salmonella* spp. contamination, methods for challenge testing, and the different laboratory methods. Secondly, publications will be extracted from different search engines (Scopus, PubMed, and Web of Science), and a series of keywords will be used: “regulation”, “*Salmonella* spp.”, “challenge test”, “enumeration”, “risk”, “public health”, “RTE”, “food”, and “review”. Combinations and permutations of these keywords will be made to gain a comprehensive analysis of the scientific literature. Then, publications will be analysed and skimmed based on their relevance and coherence with the topic.

Results

This review will delineate the current scientific gaps in creating a harmonised challenge testing methodology for *Salmonella* spp. for the diverse types of food products, according to their intrinsic and extrinsic characteristics, and the current detection/enumeration methodologies, according to ISO procedures and internal methods. Moreover, by synthesising the different regulatory frameworks and industry guidelines, a harmonisation attempt will be made.

Conclusions

Effectively managing *Salmonella* risks requires translating robust scientific evidence into protective, proportionate regulatory decisions. Challenge testing serves as the critical operational interface between laboratory science and food law. Implementing a harmonised protocol directly supports regulatory compliance, enabling food business operators to make validated, scientifically sound decisions regarding shelf-life verification, process control, and product formulation to ensure global public health.



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Sciforum-197125: Assessment of protein oxidation in beef treated with pomegranate (*Punica granatum* L.) peel extract

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Introduction: Proteins are a major part of muscle tissue and have a significant impact on its taste, nutritional value, and its behavior during processing. During storage, heme pigments, transition metals and oxidative enzymes help the formation of reactive oxygen species (ROS), which damage proteins. Meat proteins are susceptible to oxidation, leading to formation of carbonyl compounds and advanced oxidation protein products (AOPP).

Methods: In our study, we investigated the oxidative stability of proteins in minced beef meat that was treated with pomegranate (*Punica granatum* L.) peel extract (PPE) during refrigerated storage at +4 °C for 21 days. The experimental design included a control sample, a positive control (treated with 0.2% sodium acetate), and samples treated with varying concentrations of PPE (0.5%, 1% and 3%). Protein oxidation was assessed at day 0, 7, 14, and 21, by determining myoglobin oxidation, AOPP, and protein carbonyl compounds.

Results and Discussions: Results showed that storage time significantly increased oxidative modifications in all samples; however, PPE-treated groups exhibited markedly lower levels of metmyoglobin formation, AOPP, and carbonyl compounds compared to the untreated control. The antioxidant efficacy of PPE was concentration-dependent, with higher extract levels providing better protection against oxidative deterioration.

Conclusions: These findings indicate that pomegranate peel extract can serve as a natural antioxidant alternative to synthetic preservatives, meeting clean-label consumer demand while effectively inhibiting protein oxidation and enhancing the oxidative stability and quality of refrigerated minced beef.



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Sciforum-197129: Suitability of Gluten-Free Offerings in Spanish Food Service Establishments: An Exploratory Study of Safety and Allergen Management Practices

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The increasing prevalence of celiac disease has led to a growing availability of gluten-free options in food service establishments. However, the presence of such alternatives does not necessarily ensure their safety, as cross-contamination and inadequate allergen management remain significant concerns. The aim of this study was to evaluate whether gluten-free preparations offered in Spanish food service establishments are suitable for individuals with celiac disease.

An exploratory cross-sectional study was conducted using an online survey targeting workers in the Spanish food service sector (restaurants, cafeterias, hotels, catering, and food delivery services). A total of 211 responses were collected, of which 102 were considered valid. First, a descriptive analysis of all variables was performed. Then, the effect of several factors—such as collaboration with celiac disease associations and staff training in food allergies—was assessed, including comparisons between groups ($P \leq 0.05$).

A high proportion of establishments (94.1%) reported offering gluten-free dishes; however, 25.6% identified foods exposed to cross-contamination as “gluten-free” on their menus. Low levels of collaboration with celiac disease associations (13.7%) and staff training (47.1%) were observed, despite both factors being associated with improved handling practices and safer gluten-free preparations. Untrained participants more frequently reported moderate to high probabilities of gluten cross-contamination during preparation ($P < 0.001$) and showed greater misconceptions regarding gluten management, including the incorrect belief that high temperatures can eliminate gluten (14.6%; $P = 0.001$)

Establishments collaborating with celiac disease associations were more likely to have designated personnel and specific protocols for gluten-free preparations ($P < 0.001$).

Under the conditions of this study, although a certain degree of adequacy was observed, gluten-free offerings do not fully meet the requirements of individuals with celiac disease. These findings highlight the importance of staff training and specialized guidance in improving allergen management and ensuring the suitability of gluten-free offerings



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Sciforum-197195: Formulation and Quality Optimization of a Goat Whey-Milk Kefir Enriched with Powdered Milk

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Introduction: Whey is a by-product of the dairy industry. It can be processed into kefir, but kefir made solely from whey has a very liquid consistency that is not popular with consumers. The objective of this study was to improve the excessively liquid consistency of pure whey kefir by developing new hybrid formulations using powdered milk and goat's milk.**Methods:** To improve the consistency of the kefir produced, different concentrations of goat's milk and powdered milk were first tested. Based on sensory and textural optimization from these preliminary trials, a standardized hybrid formulation containing 50% goat whey and 50% goat's milk was selected. This matrix was enriched with different concentrations of powdered milk (0%, 2.5%, and 5%) and fermented at three incubation temperatures (22 °C, 26 °C, and 30 °C) for 24 h using an inoculum of 1% (w/v) kefir grains. Principal Component Analysis (PCA) was applied to analyze multivariate correlations between sensory, physicochemical, and textural attributes and to classify the formulations. Additionally, analysis of variance (ANOVA) and linear regressions were employed to assess the direct and interactive effects of incubation temperature and powdered milk concentration on specific physicochemical, microbiological, and textural properties.**Results:** Goat's milk maximizes sensory acceptability (taste, appearance), while powdered milk improves the instrumental index of viscosity and sensory smoothness. Enrichment with 5% powdered milk exhibited temperature-dependent pH stabilization under thermal stress at 30 °C, limiting the pH drop to 25% compared to 34% in the control (0% powdered milk). This formulation reduced syneresis and promoted lactic acid bacteria (8.39 log CFU/mL) and mesophilic bacteria (8.65 log CFU/mL) proliferation at 26 °C, compared to 7.67 and 8.27 log CFU/mL in the control. **Conclusion:** Enriching the hybrid matrix with 5% powdered milk and fermenting it at a constant temperature of 26 °C results in the optimal formulation, with favorable physicochemical, microbiological, and sensory characteristics under the conditions tested.



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Sciforum-197232: Simultaneous voltammetric method for quality control of brilliant blue FCF and tartrazine in beverages

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Brilliant Blue FCF (BB; INS 133) and tartrazine (TZ; INS 102) are among the most used synthetic dyes in processed foods and beverages, enhancing product appearance and consumer acceptance. However, the widespread use of these additives requires effective analytical strategies to ensure compliance with food regulations and product safety. In this work, a voltammetric method was developed for the simultaneous determination of BB and TZ using a boron-doped diamond electrode (BDDE). Voltammetric measurements were performed using an Autolab PGSTAT 101 potentiostat/galvanostat connected to an electrochemical cell containing the BDDE as the working electrode, an Ag/AgCl (3.0 mol L^{-1} KCl) as reference electrode, and a platinum plate as the auxiliary electrode. Both dyes presented well-defined oxidation peaks at 0.95 V and 1.20 V, respectively, for BB and TZ, in Britton–Robinson (BR) buffer solution (pH 2.0), employing cyclic voltammetry and the cathodically pretreated BDDE (-0.25 A cm^{-2}, 240 s). The peak potential separation of approximately 250 mV demonstrates the suitability of the proposed method for the simultaneous analysis of both dyes. The analytical curve was constructed using square-wave voltammetry (frequency: 30 Hz, amplitude: 0.1 V, potential increment: 2 mV) by varying the dyes concentration and obtaining linearity in the range from 0.69 to 6.25 µmol L^{-1} for BB and from 0.49 to 4.46 µmol L^{-1} for TZ, with limit of detection of 4,20 nmol L^{-1} and 3,60 nmol L^{-1}, respectively. The method was successfully applied to the determination of BB and TZ in beverage samples (isotonic drinks and soft drinks). The results demonstrate that the cathodically pretreated BDDE in conjunction of voltammetry provides a simple, sensitive, and reliable platform for the simultaneous determination of BB and TZ, showing potential for application in quality control of beverages.



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Sciforum-197244: Development and validation of voltammetric method of synthetic dye amaranth in foods employing a boron doped diamond electrode

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The synthetic dye amaranth (AM; Bordeaux Red S), also known as INS 123, is widely used in the food industry to color foods and beverages. The use of this dye by some countries highlights the importance of its analysis to ensure consumer safety. For this reason, this work describes the development and validation of a voltammetric method for quality control analysis of beverages containing AM. Voltammetric measurements were performed in a conventional three-electrode single-compartment glass cell, comprising a boron-doped diamond electrode (BDDE; working electrode), an Ag/AgCl (3.0 mol L^{-1} KCl; reference electrode), and a platinum plate (auxiliary electrode), connected to a potentiostat/galvanostat. AM exhibits three oxidation peaks and one reduction peak. The second oxidation peak (~0.97 V) was selected for AM determination due to its higher current intensity. The experimental conditions employed for AM determination were 0.05 mol L^{-1} $HClO_4$ as the supporting electrolyte and a cathodically pretreated BDDE. Under these conditions, the analytical curve was obtained by differential pulse voltammetry over the concentration range from 0.010 to 0.128 µmol L^{-1}, with a detection limit of 0.005 µmol L^{-1}. Selectivity was assessed against water ions (Fe^{2+}, Ca^{2+}, Zn^{2+}, Mg^{2+}, K^{+}, Na^{+}, SO^{2-}, PO_4^{3-}, and NO_3^{-}) and dyes; interference was observed from brilliant blue, sunset yellow, and tartrazine yellow in concentrations higher than 1:1 in proportion (AM: dye). Precision showed relative standard deviation values below 7%. The accuracy of the method was evaluated through the analysis of AM in different samples. For water and alcoholic beverage samples, recoveries ranged from 94.47% to 109.8%. Finally, the greenness of the method was assessed using the GREEnness calculator, yielding scores of 0.69 for beverage analysis and 0.72 for water analysis, demonstrating that the proposed method can be considered environmentally friendly.



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Sciforum-197321: Evaluation of Sulfite-Free Anti-Browning Pretreatments on Moisture Content of Osmotically-Dehydrated Philippine Carabao Mango (Mangifera indica L.) Slices During Cabinet Drying

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The Philippine Carabao mango (*Mangifera indica* L. cv. Carabao) is a highly perishable fruit that requires effective preservation techniques to prolong shelf life and maintain product quality. Anti-browning pretreatments are commonly applied during dried mango processing. However, their influence on moisture removal during osmotic dehydration is insufficiently studied. This study evaluated the effects of different anti-browning pretreatments on the moisture content of osmotically dehydrated Carabao mango slices subjected to cabinet drying at 60°C for 16 hours. Five treatments were investigated: sodium metabisulfite (T1), untreated control (T2), 1% ascorbic acid (T3), 1% citric acid (T4), and a combination of 0.5% ascorbic acid and 0.5% citric acid (T5). Following osmotic dehydration, moisture contents ranged from 62.05% to 75.23%. One-way analysis of variance (ANOVA) revealed a significant effect of pretreatment on moisture content after osmotic dehydration ($p < 0.05$). Post hoc analysis showed that T1 had significantly lower moisture content than all other treatments. In contrast, no significant differences were observed among the untreated, ascorbic acid, citric acid, and combined acid treatments. The mango slices underwent cabinet drying after osmotic dehydration, which further reduced moisture content in all samples. After 16 h of drying, mean moisture contents were 4.27%, 8.45%, 11.53%, 13.07%, and 12.74% for T1, T2, T3, T4, and T5, respectively. ANOVA indicated significant differences among treatments ($p < 0.05$). Post hoc analysis showed that T1 achieved significantly lower final moisture content than T4 and T5. Sodium metabisulfite-treated slices exhibited the greatest moisture reduction throughout the drying process, while citric acid-treated samples retained the highest moisture levels. These findings demonstrate that pretreatment significantly influences moisture removal during osmotic dehydration and cabinet drying. Furthermore, the combined application of osmotic dehydration and cabinet drying offers a promising preservation strategy for improving the storage stability of Carabao mango slices.



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Sciforum-197423: Buckwheat as an emerging allergen: a pilot study for its detection in food products by real-time PCR

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Introduction

Buckwheat (*Fagopyrum esculentum*) is a pseudocereal commonly used in gluten-free products. It is recognised as a food allergen in Japan and South Korea. Although buckwheat is not included among the allergens listed in Regulation (EU) No 1169/2011, its inclusion has been proposed by the *Codex Alimentarius*. Given the need to provide accurate information to allergic consumers, reliable and sensitive methods for its detection in food products are essential. The aim of this study was to assess the presence of buckwheat DNA in commercially food products using a real-time PCR.

Methods

A total of 50 food products were randomly purchased from supermarkets in Turin (North-West Italy): (i) baked products and confectionery (n = 35: biscuits, cakes, crackers) or (ii) cereals and milled products (n = 15: flours, breakfast cereals, polenta mixes). Overall, 47 samples did not contain buckwheat among their ingredients. DNA was extracted by SureFood PREP Advanced kit (r-Biopharm) and amplified by real-time PCR SureFood Allergen Buckwheat kit (r-Biopharm). The assay targets a highly specific multi-copy DNA sequence of *F. esculentum*, ensuring high sensitivity and cross-reactivity with other plant species.

Results and discussion

Buckwheat DNA was detected in 28% (n=14) of samples tested (n=9 baked products and confectionery, n=5 cereals and milled products). Of these, 3 reported different percentages of buckwheat among their ingredients. It is assumed that the positive results are due to possible cross-contamination during the production process, as the same manufacturers also produce foods that may include buckwheat.

Conclusions

In a global market context, the implementation of sensitive and specific analytical methods is crucial for food safety. Given that 22% of samples showed undeclared positivity, our findings clearly expose a European regulatory gap. Buckwheat is currently excluded from European mandatory labeling; however, the high frequency of cross-contamination found strongly supports the need to align EU legislation with *Codex Alimentarius* guidelines to properly protect allergic consumers.



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Sciforum-197500: Supporting Allergen Risk Management in Spice Supply Chains: Detection of Peanut Contamination in Garlic and Garlic-Derived Products Using Molecular and Protein-Based Approaches

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Introduction: Peanut (*Arachis hypogaea*) allergy is one of the leading causes of severe food-induced allergic reactions worldwide. Effective allergen management requires reliable methods for detecting unintended peanut contamination in food products. While protein-based methods such as enzyme-linked immunosorbent assays (ELISA) are widely used, their performance can be influenced by food processing and matrix complexity. DNA-based approaches, building on advances in molecular species authentication and DNA barcoding, offer a complementary strategy owing to the stability and specificity of nucleic acid targets.

Methods: Artificially contaminated garlic samples, commercial garlic products, and garlic-derived supplements were analysed using conventional polymerase chain reaction (PCR), quantitative PCR (qPCR), high-resolution melting (HRM) analysis, and ELISA. A peanut-specific molecular marker was evaluated alongside ELISA to compare the analytical performance, sensitivity, and suitability of DNA-based and protein-based approaches across different contamination levels and garlic-based matrices.

Results and Discussion: Peanut DNA was successfully detected in artificially contaminated samples and in selected commercial garlic products and garlic-derived supplements using DNA-based approaches. ELISA analysis was also successfully completed for the same sample set. No amplification was observed in uncontaminated controls, demonstrating assay specificity. Comparative analyses are ongoing to evaluate the relative analytical sensitivity and practical performance of PCR, qPCR, HRM analysis, and ELISA across different contamination levels and garlic-based matrices.

Conclusions: This research addresses the growing need for robust allergen monitoring tools within spice supply chains, where complex sourcing networks and processing practices can increase the risk of unintended cross-contamination. The study supports the development of evidence-based allergen detection strategies with the potential to strengthen food safety, quality assurance, traceability, and regulatory compliance within the spice sector.



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Sciforum-197601: Microplastic Contamination of Honey: A Systematic Review of Occurrence, Sources, and Bee Health Effects

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Microplastics (MPs), synthetic polymer particles smaller than 5 mm, are emerging contaminants from the degradation of larger plastics. These particles infiltrate terrestrial ecosystems through soil, air, water, nectar, pollen, and resins, entering food chains. Honeybees (*Apis mellifera*), with their extensive foraging ranges and direct interactions with multiple environmental compartments, serve as effective bioindicators of pollution. Consequently, the accumulation of MPs in hive products such as honey, pollen, and propolis jeopardizes beekeeping sustainability and poses potential dietary risks to human consumers. This review examined peer-reviewed studies on MPs occurrence and impacts in honey and bee products, focusing on contamination levels, polymer types, sources, bee health effects, and analytical techniques. Studies from Europe, Asia, and South America report MPs contamination in honey, with levels ranging from tens to over 1,000–2,600 particles per kg or L. Dominant polymers include polypropylene, polyethylene, polyethylene terephthalate, nylon, and ethylene-vinyl acetate. Pathways involve atmospheric deposition during foraging, alongside beekeeping practices and processing. Advances in Fourier-transform infrared (FTIR) and Raman microspectroscopy have improved detection reliability. MPs exposure disrupts honeybees gut microbiota, immune function, foraging behavior, learning ability, and survival, potentially synergizing with other stressors. Honey thus serves as an environmental sentinel for terrestrial MPs pollution and a potential low-level route of human exposure. Regional and methodological variations emphasize the need for standardization, including gaps in source apportionment, temporal trends, and long-term risk assessment. This review confirms the widespread presence of microplastics in honey and bee products, highlighting their dual value for environmental monitoring and food safety. Future work should refine analytical protocols, quantify risks, and implement mitigation strategies. These efforts are essential to protect vital ecosystem services and ensure the purity of natural foods in the face of global plastic pollution.

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Sciforum-197632: Antifungal and Anti-mycotoxigenic Potential of *Lachancea thermotolerans* ST12 and *Starmerella* sp. CMGB-ST8.2 against *Aspergillus ochraceus* for Biocontrol Applications

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Food and feed contamination by mycotoxins remain a global challenge due to the adverse effects on food safety, public health and agricultural sustainability. The ochratoxin A (OTA) produced by species of *Aspergillus* and *Penicillium,* has a major negative impact on human health, its control representing a priority for the food industry. Due to the increasing restrictions on chemical fungicides and the growing demand for sustainable agriculture, the biocontrol practises using antagonistic microorganisms have emerged as promising alternatives for reducing fungal growth and mycotoxin contamination.

In the present study, two epiphytic yeast strains, *Lachancea thermotolerans* CMGB-ST12 and *Starmerella* sp. CMGB-ST8.2, were evaluated for their antifungal and anti-mycotoxigenic activity against the OTA-producing fungus *Aspergillus ochraceus*. Antifungal activity was determined through co-cultivation on culture media containing glucose (SAB), sucrose (YES) or potato dextrose (PDA) as carbon sources. The inhibition of OTA biosynthesis was investigated using thin-layer chromatography (TLC). The effect of sodium bicarbonate supplementation on antagonistic activity was also evaluated.

The results demonstrated a significant inhibition of fungal growth. *L. thermotolerans* CMGB-ST12 determine 100% inhibition of *A. ochraceus* cultivated on YES and more than 79% inhibition on SAB. *Starmerella* sp CMGB-ST8.2 showed inhibition rates between 56.6% and 76.9%, with the highest activity on PDA. Both yeast strains reduced fungal sporulation, the TLC analysis revealing a decrease in OTA production. A strong and consistent anti-mycotoxigenic effect was observed for *Starmerella* sp. CMGB-ST8.2 regardless of the culture media, whereas *L. thermotolerans* CMGB-ST12 showed anti-mycotoxigenic activity mainly on SAB. No significant impact of sodium bicarbonate was observed.

These findings highlight the potential of the two yeast strains as promising biocontrol agents against ochratoxigenic fungi growth and food contamination with OTA, which recommend them for safer food production and development of sustainable alternatives to conventional fungicides.



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Sciforum-197729: Beyond the bar: Uncovering hazards in chocolate

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Chocolate is a globally consumed food with a complex supply chain in which safety hazards may originate from raw materials, agricultural and post-harvest practices, processing, formulation, and labeling.

This study integrated chocolate-related notifications from the European Union Rapid Alert System for Food and Feed (RASFF) for 2016–2025 with available published evidence on contaminant occurrence, technological determinants, and dietary risk assessment.

A total of 170 RASFF notifications were identified, with the highest annual number recorded in 2025 (29). Undeclared allergens predominated (70 notifications), particularly milk and tree nuts, followed by foreign bodies (32), pathogenic microorganisms (13), and heavy metals (11). Overall, 71.2% of notifications were classified as serious, meaning that the product poses a high direct or indirect threat to public health, requiring urgent cross-border action or product recalls. However, notification frequencies should not be interpreted directly as contamination prevalence or consumer risk because they are influenced by trade volumes, surveillance intensity, and regulatory priorities. Integration with published evidence revealed hazard-specific risk profiles. Mycotoxin exposure from chocolate generally remained low under typical consumption scenarios, despite recurrent occurrence of ochratoxin A and aflatoxins. In contrast, cadmium represents a more persistent concern because concentrations increase with cocoa content and are strongly influenced by the geographical origin and soil characteristics of cocoa beans; cumulative exposure to multiple metals may further increase risk among frequent consumers. Processing-related hazards are potentially more amenable to technological mitigation, whereas Salmonella prevention requires stringent control throughout manufacturing.

Overall, RASFF data are most informative when interpreted alongside trade, occurrence, processing, and exposure evidence. Risk-based surveillance should prioritize allergen management, microbiological control, origin- and cocoa-content-informed cadmium monitoring, cumulative metal exposure, and preventive interventions targeting hazards at the stages where they arise.



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Sciforum-197751: Effect of thyme essential oil against pathogenic microorganisms inoculated on chicken breast

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Introduction: Food contamination remains a global concern, increasing interest in natural alternatives to food preservation. Thyme essential oil (TEO) has garnered attention due to its antimicrobial and antioxidant properties. Its application in fresh meat aims to reduce microbial contamination and extend shelf life.

Methods: Solutions of TEO at concentrations of 28 and 14 µl/ml were prepared by diluting the TEO with Tween 80. Chicken breast pieces (25×25×5mm and 5 g) were inoculated with 5×10^6 cfu/ml of a microbial cocktail (Cocktail A: *Escherichia coli* and *Staphylococcus aureus*; Cocktail B: *Salmonella* Typhimurium and *Listeria monocytogenes*) standardized by OD600 nm. After 15 minutes, samples were treated by direct surface application with 2 ml of each TEO solution. All samples were stored under aerobic conditions at 3 °C. Decimal dilutions were then prepared and spread-plated onto selective agar plates for enumeration on days 0, 2, 5, 8 and 12. An inoculated chicken breast piece without EO was used as control. Results were expressed as log cfu/g.

Results: Treatment with TEO showed efficacy against pathogenic microorganisms on chicken breast. At t0, *Escherichia coli* counts were lower in treated samples than in the positive control, with greater reductions at 28 µl/ml. For *Staphylococcus aureus*, no significant differences ($p>0.05$) were observed during storage. However, compared with the positive control, reductions of up to 1.1 log cfu/g were achieved at 28 µl/ml. In *Salmonella* Typhimurium, TEO at 14 µl/ml resulted in greater reductions (up to 1.72 log cfu/g at t12) than 28 µl/ml (1.44 log cfu/g), with significant differences ($p<0.001$) between treatments. For *Listeria monocytogenes*, counts increased over time, although values were lower at 28 µl/ml, with reductions against the positive control ranging from 0.77 to 0.94 log cfu/g.

Conclusions: TEO exhibited antimicrobial activity on chicken breast, being most effective against *E. coli* and *Salmonella* Typhimurium, less on *S. aureus* and limited on *L. monocytogenes*. These findings indicate selective antimicrobial potential for application in poultry safety.



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Sciforum-197757: Effect of slightly acidic electrolyzed water against pathogenic microorganisms inoculated on chicken skin

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Introduction: Slightly Acidic Electrolyzed Water (SAEW) has emerged as an environmentally friendly disinfectant in food safety. Its antimicrobial action, due to the presence of chlorinated compounds makes it suitable for reduction of pathogenic microorganisms in fresh meat.

Methods: SAEW was produced by the electrolysis of 5g NaCl/L using an AquaVolta® Water Tractor to obtain a solution of pH 6. Subsequently, different concentrations of active chlorine (5, 25, and 100 ppm) were prepared. Chicken skin pieces were inoculated with 5×10^6 cfu/ml of a microbial cocktail (Cocktail A: *Escherichia coli* and *Staphylococcus aureus*; Cocktail B: *Salmonella* Typhimurium and *Listeria monocytogenes*) standardized by OD600 nm. After 15 minutes, the samples were immersed in 45 ml of SAEW for 5 minutes. Then, decimal dilutions were prepared and spread-plated onto selective agar plates for enumeration in days 0, 1, 3, 7 and 9. Drinking water was used as negative control and drinking water inoculated was used as positive control. Results were expressed as log cfu/g.

Results: Treatment of inoculated chicken skin with SAEW proved effective in reducing the pathogenic microorganisms. For *Escherichia coli*, an initial reduction in counts was observed, with absence of detection in day 7 (25 and 100 ppm) and day 9 (5 ppm). For *S. aureus*, 100 ppm was the most effective treatment, achieving a 2.06 log cfu/g reduction. SAEW at 100 ppm was the most effective treatment against *Salmonella Typhimurium*, eliminating it by day 9 with a 3.18 log cfu/g reduction. For *L. monocytogenes*, higher chlorine concentrations achieved reductions of up to 2 log cfu/g, despite no significant changes during storage ($p > 0.05$).

Conclusions: SAEW demonstrated effective antimicrobial activity on chicken skin, notably against *E. coli* and *Salmonella* Typhimurium, moderate efficacy on *S. aureus*, and limited effect on *L. monocytogenes*, highlighting its potential as a sustainable decontamination method.



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Sciforum-197766: What's Brewing in Tea? A Decade of Food Safety Alerts in the EU RASFF Database

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Tea is a globally traded commodity subject to extensive food-safety surveillance, but safety notification frequencies must be interpreted in the context of trade patterns, targeted controls, and differences in regulatory requirements between producing and importing countries.

This study evaluated food-safety issues associated with tea entering the European market by integrating notifications from the European Union Rapid Alert System for Food and Feed (RASFF) for 2016–2025 with European Food Safety Authority (EFSA) monitoring evidence, and published occurrence and dietary risk-assessment studies.

A total of 469 RASFF notifications involving 476 hazards were identified. Pesticide residues predominated (267 notifications; 518 individual pesticide detections), followed by novel-food issues (87) and natural toxins (47; pyrrolizidine alkaloids). China accounted for the largest number of notifications (162; 34.5%), consistent with its prominent role in tea supplied to the European market. However, differences in notification numbers among countries cannot be interpreted directly as differences in product safety because notification frequency is influenced by import volume and intensity of official controls. Border rejections represented 45.6% of notifications, emphasizing the role of import surveillance in intercepting non-compliant consignments. Published occurrence studies corroborated the predominance of pesticide contamination, particularly multi-residue profiles and occasional exceedances involving pesticides not authorized in the EU. Nevertheless, dietary exposure assessments generally indicate low pesticide-related health risks under typical tea-consumption scenarios. Pyrrolizidine alkaloids showed a different risk profile, characterized by highly heterogeneous occurrence and occasional heavily contaminated products that may be of concern for frequent consumers and vulnerable groups. Processing and brewing can further modify the transfer of contaminants into the consumed infusion.

Overall, RASFF notifications primarily identify regulatory and import-control priorities rather than population-level health risk. Their interpretation alongside trade patterns, occurrence data, processing factors, and exposure assessments supports more targeted surveillance focused on recurrent pesticide non-compliance and prevention of high-level pyrrolizidine alkaloid contamination.



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Sciforum-197805: Food Safety in Rice-Based Beverages: Labeling Screening and LAB-Driven Metal(loid) Detoxification Review

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Introduction and aims:

The Spanish plant-based beverage sector represents 66% of market value. Rice (*Oryza sativa*) represents a strategic raw material tailored to specific dietary needs, including celiacs, lactose-intolerant individuals, athletes, and "veggie" populations. However, its natural accumulation of Cd and i-As poses a critical food safety threat under European regulation (EU) 2023/915. While Lactic Acid Bacteria (LAB) fermentation offers nutritional advantages, current research on rice-based beverages overlooks heavy metal remediation. This study aimed to evaluate the labeling of commercial rice beverages in Spain and, through a literature review, assess the biotechnological potential of LAB starter cultures to reduce metal(oid) bioavailability and modulate arsenic speciation.

Methods: A market screening of 342 plant-based references (295 beverages and 47 fermented alternatives) was conducted. Inclusion criteria required: (1) availability in Spanish online supermarkets, and (2) accessible ingredient lists and mandatory nutritional labelling. Concurrently, a literature review analysed LAB-mediated fermentation of rice beverages and their metal(loid) levels, evaluating starter cultures as a biotechnological strategy to enhance safety.

Results and Discussion: Market analysis revealed cereals lead the beverage category (57%), with rice constituting 32%. Conversely, a major void exists in the fermented segment: soy (83%) and nuts (17%) dominate, whereas cereals are residual (2%), with absence of fermented rice alternatives. Regarding safety, scientific evidence confirms specific LAB strains (mainly *Lactobacillus*) effectively sequester Cd, Pb, Ni, and methylmercury through cell-wall binding, offering a strategic pathway to alter arsenic speciation toward less toxic forms. Consequently, this lack of fermented rice products in Spain represents a significant technological and market opportunity.

Conclusion: Implementing tailored LAB fermentation serves as a novel dual-purpose industrial strategy: it drives innovation by diversifying the functional food market while enhancing food safety through biotechnological mitigation of dietary toxicological risks.



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Sciforum-197808: Current Status of Texture-Modified Transitional Foods for Infants: A Scoping Review and Spanish Market Analysis

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Introduction

During complementary feeding for infants beyond 6 months of age, transitioning to diverse food textures is essential for oral-motor and sensory progression. Addressing this need, non-homogenized semi-solids – referred to here as *texture-modified transitional foods* (TMT foods) – have entered the market. Unlike smooth purées, TMT foods deliberately combine varied structural components to support feeding development. This study reviews the literature on TMT foods and investigates their market availability in Spain.

Methods

Following PRISMA-ScR (2020) guidelines, a scoping review in Web of Science and Scopus (2019-2026) included 13 of 82 identified records, excluding 69 due to duplication, irrelevance, publication type or language. Additionally, a Spanish market survey assessed appearance, ingredients, nutritional composition, and labelling of 20 TMT foods from five leading infant brands across four supermarket chains, representing an estimated 45-50% of total infant food sales, between October 2025 and May 2026.

Results and Discussion

The 13 studies revealed discrepancies between feeding recommendations and commercial practice, as smooth purées were often prolonged based on parents' perceptions of infant preferences, potentially delaying textured food introduction. Only 20 TMT foods were identified, all labelled as "chunky purées" (recommended age: over 8-12 months), indicating limited diversity compared to conventional purées. All contained vegetables (mostly carrot), 75% included meat, 65% cereals, 50% pulses, and 15% fish. Furthermore, 40% were organic, 65% included extra virgin olive oil, and 60% herbs and spices, with no added salt. The energy density was 36-107 kcal/100g, with macronutrients ranging from 1.0-3.2 g fat, 6.4-9.4 g carbohydrates (no added sugar) and 1.9-3.1 g protein per 100g.

Conclusions

Despite the sampling limitations associated with surveying four retail chains, the availability and diversity of TMT foods in the Spanish market appear limited. Scientific evidence is scarce regarding novel food matrices. Further research is needed to develop nutritionally adequate and age-appropriate TMT foods, and to evaluate safety regarding contaminants, such as heavy metals, metalloids, nitrates, and pesticide residues.



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Sciforum-197821: Preharvest sorbitol–calcium treatment reduces chilling injury and postharvest losses in pomegranate cv. 'Mollar de Elche' stored at 2 °C and 7 °C

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Pomegranate (*Punica granatum* L.) cv. 'Mollar de Elche' is a Protected Designation of Origin (PDO) variety cultivated in south-eastern Spain, with an annual production of approximately 40,000 tonnes. Chilling injury during cold storage is the main postharvest disorder affecting this cultivar, resulting in membrane damage, loss of firmness, and premature deterioration that collectively contribute to substantial food waste along the supply chain. Conversely, storage at higher temperatures may lead to dehydration, rind hardening, and a shortened shelf life. Calcium is an essential macronutrient involved in maintaining cell wall integrity and membrane stabilisation by phospholipid binding, whereas sorbitol acts as a carrier for metabolites with limited mobility and it's been studied the osmoprotective effect and enhancing the synthesis and accumulation of bioactive compounds. In this study, trees received eight preharvest foliar applications, one every 15 days, of a sorbitol–calcium complex (2.5% sorbitol + 0.7% $Ca(NO_3)_2$) and a control with water, both supplemented with a non-ionic surfactant. After harvest, fruit were held at 2 °C or 7 °C and 95 % relative humidity for 41 days under commercial storage conditions. Firmness, respiration rate, ion leakage, and malondialdehyde (MDA) content were monitored at regular intervals, and chilling-injury symptoms were evaluated visually. Treated fruit showed lower ion leakage (26.166 ± 1.221 % vs 34.027 ± 1.220 % ($p < 0.05$)) and MDA accumulation (0.928 ± 0.261 µmol kg^{-1} vs 3.280 ± 0.725 µmol kg^{-1} ($p < 0.05$)), higher firmness retention, lower respiration rate, and a reduced incidence of chilling-injury symptoms compared with untreated controls, with the most pronounced differences observed at 2 °C. These results indicate that the combined preharvest application of sorbitol and calcium enhanced cell membrane stability, delaying the development of chilling injury symptoms and thereby extending the commercial shelf life of pomegranate and reducing postharvest food losses.



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Sciforum-197836: Pre-harvest treatments with sorbitol and salicylic acid to preserve quality and reduce chilling injury in 'Sanguinelli' blood oranges during cold storage

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'Sanguinelli' blood oranges are highly valued for their characteristic flavour and red purplish colour. However, cold storage is required to extend shelf-life and boost red colour, which frequently induces chilling injury (CI), causing significant weight loss and hindering the red colouration. This study evaluates pre-harvest foliar sprays of 1 mM salicylic acid (SA), 2% sorbitol, and their combination (Sor+SA) applied from fruit set until harvest at intervals of 14 days for a total of 4 applications. SA is a key signal molecule that activates defence-related pathways, including reactive oxygen species scavenging and heat-shock protein induction, while sorbitol provides an osmoprotective function to preserve membrane integrity under cold stress.

After harvest, fruits were stored at 2°C and 8°C for 28 days, followed by 2 days at 20°C to simulate retail conditions. The treatments significantly reduced CI symptoms by 28.9-50.0% and weight loss by 7.3-15.6% compared to the control group. Furthermore, the applications enhanced red pigmentation in both the peel and pulp. While CI typically diminishes the anthocyanin pathways responsible for the fruit's characteristic colouration, the effects of SA and Sor+SA treatments mitigated this decline, resulting in an external and internal hue angle significant ($p < 0.05$) decrease of 15.6-22.8 % respectively compared to control at 2°C. Sorbitol treatments could be reinforcing this effect by upregulating metabolic activity within the phenylpropanoid pathway. Treated oranges maintained superior physicochemical quality, preserving stable values for total soluble solids, titratable acidity, and the maturity index at both temperatures, especially the Sor+SA treatment, reaching a 12.0% and 7.1% MI increase ($p<0.05$) at 2°C and 8°C respectively compared to control. Pre-harvest application of SA, sorbitol, and their combination represent a viable strategy for the citrus industry to mitigate cold stress and weight loss, thereby preserving the quality of 'Sanguinelli' blood oranges during storage and distribution.



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Sciforum-197877: Essential Fatty Acids and Human Health Indexes in Gilthead sea bream (*Sparus aurata*): Evaluating Sustainable Feed Alternatives and growing stage

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Introduction: The development of sustainable aquaculture feeds is a key challenge for modern aquaculture, particularly with regard to replacing fish meal and fish oil with alternative ingredients without compromising fish performance or nutritional quality. Particular attention has been paid to maintaining adequate levels of essential fatty acids, which are critical both for fish physiology and for the nutritional value of aquaculture products intended for human consumption.

Objective: Consequently, this study evaluated the effects of alternative feed formulations on the lipid quality of gilthead seabream (*Sparus aurata*) at two growth stages (300 and 800 g body weight).

Methods: Three iso-energetic and iso-proteic diets were tested: a fishmeal-based control (CTRL), a processed animal protein-based diet (PAP), and an alternative protein-rich diet including insect and algae (ALT). Each diet was administered with varying pellet sizes adapted to the fish's developmental stage. Fatty acid profiles (SFA, MUFA, PUFA, EPA, SHA),fatty acid ratios and health-related lipid indices (PUFA/SFA, n-6/n-3, AI, TI, HH, FLQ) were assessed in fillet samples.

Results and discussion: Results showed that at 300 g fillets, fish fed the ALT diet were richer in omega-3 fatty acids, DHA levels was highest in ALT-fed fish at 800 g. However, PAP-fed fish at 800 g showed the most balanced PUFA/SFA ratio.

Conclusions: These findings demonstrate the viability of sustainable feed alternatives for maintaining the nutritional quality of gilthead sea bream. The study also shows that both diet composition and growth stage influence the fatty acid profile and nutritional quality of the fish. Therefore, sustainable feed alternatives can support aquaculture sustainability while preserving nutritional value across different production stages.



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Sciforum-197892: *Eurycoma longifolia* (Tongkat Ali) as an unauthorised novel food in food products: An overview of RASFF notifications

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Eurycoma longifolia Jack (Simaroubaceae), commonly known as Tongkat Ali, has traditionally been used in Malaysia as an aphrodisiac and energy-enhancing agent. Despite its status as an unauthorised novel food in the European Union, *E. longifolia* is commonly found in male-targeted food supplements, where it is promoted for supporting erectile function and improving muscle mass and strength. Additionally, based on findings indicating genotoxic potential, the European Food Safety Authority (EFSA) Panel concluded in 2021 that the safety of *E. longifolia* root extract could not be established. Therefore, the present study aimed to assess the occurrence of *E. longifolia* in food products based on the Rapid Alert System for Food and Feed (RASFF) database.

RASFF data were retrieved for the period 2006–2025 using "food" as the notification type and "novel food" as the hazard category, resulting in 30 relevant cases. Most notifications were reported during 2006–2015 (60%), with the highest annual numbers recorded in 2010 and 2012 (6 cases). Another notable increase was recorded in 2019 (5), followed by a decline and no notifications reported in 2020–2022 or 2024. Dietetic foods, food supplements and fortified foods were the main food categories in which *E. longifolia* was reported (93.3%). The United States was the most common country of origin (48.5%), followed by Malaysia and the Netherlands (9.1% each). Information notifications predominated (76.7%), followed by border rejections (13.3%) and alerts (10%). Risk decisions were mainly classified as undecided (63.3%) and serious (16.7%).

These findings provide additional occurrence data that may be relevant for future scientific evaluations of food products containing *E. longifolia*. However, RASFF notifications do not represent a direct measure of market prevalence. Therefore, future research may build upon these findings through continued monitoring and integration of market surveillance and exposure data on *E. longifolia* occurrence.



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Sciforum-197896: *Hoodia gordonii* as an unauthorised novel food in food products: A RASFF-based analysis

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Hoodia gordonii (Masson) Sweet ex Decne. (Apocynaceae) has traditionally been used in Southern Africa to suppress appetite, which explains its frequent inclusion in weight-loss supplements. Due to the absence of a significant history of consumption as food in the European Union (EU) before 15 May 1997, *H. gordonii* is considered a novel food, but it has not been authorised for use on the EU market. Although a significant body weight-reducing effect has not been confirmed in clinical studies, cardiovascular and neurological adverse effects have been reported.

To evaluate the occurrence of *H. gordonii* in food products, data from the Rapid Alert System for Food and Feed (RASFF) database for the period 2006–2025 were analysed using “food” as the notification type and “novel food” as the hazard category.

A total of 65 cases concerning *H. gordonii* were identified. The notifications were nearly equally distributed across the two decades. The prominent peak in 2017 (30 cases) may be explained by the first EU-coordinated control plan targeting online food sales, during which four unauthorised novel foods, including *H. gordonii*, were specifically monitored. No notifications were recorded from 2020 onwards. Most cases (98.5%) were reported in the category of dietetic foods, food supplements, and fortified foods. The products mainly originated from the United States (45.7%) and the United Kingdom (17.1%). Information notifications accounted for the majority of cases (90.8%). Moreover, undecided risk decisions predominated (92.3%).

Therefore, the occurrence of this unauthorised novel food in food products, despite reported adverse effects associated with its use, highlights the need for stricter regulatory control and continued market monitoring to ensure consumer protection.



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Sciforum-198050: Monitoring Antibiotic Residues in Extensively Managed Raw Sheep Milk for Enhanced Food Quality and Safety

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Introduction: Extensive livestock grazing of native sheep breeds plays a vital role in rural sustainability and the production of traditional Idiazabal Protected Designation of Origin (PDO) cheese. However, these raw milk-based production systems are vulnerable to veterinary drug residues. Antibiotic residues in raw ewe milk pose a critical public health concern regarding antimicrobial resistance dissemination and threaten the dairy industry by compromising technological microbiota viability. Therefore, this study evaluates antibiotic residues at the farm level by combining commercial rapid screening assays with chromatographic confirmation.

Methods: A total of 51 raw ewe milk samples were collected from 26 extensive farms distributed across the Basque Country and Navarre (Southwestern Europe). Antibiotic residues were screened using the microbiological inhibition test Eclipse Farm^{3G} (Zeulab S.L., Zaragoza, Spain). Positive and doubtful samples were subsequently analysed by confirmatory LC-QqQ-MS/MS, as previously described (Santamarina-García et al., 2024).

Results and Discussion: Screening results showed that 10% of the samples tested positive and 2% were close to the detection limit. Following confirmatory LC-QqQ-MS/MS analysis, Penicillin G was quantified in a single sample at levels below 1 μg/kg, safely below the European Maximum Residue Limit (MRL) of 4 μg/kg. The discrepancy between techniques is attributed to the broader detection spectrum of the microbiological assay and the presence of active antibiotic metabolites undetected by specific chromatography. Despite being sub-MRL, these concentrations could still favour resistant bacteria development and affect cheesemaking.

Conclusions: This workflow demonstrates that while rapid assays are excellent frontline screening tools, continuous enhancement and combination of both techniques are required to ensure food quality and safety.



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Sciforum-198131: What's in Your Coffee? Ten Years of RASFF Safety Notifications

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Coffee is one of the most extensively traded agricultural commodities worldwide, and its complex production and distribution chain may introduce diverse chemical and biological hazards.

This study integrated coffee-related notifications from the European Union Rapid Alert System for Food and Feed (RASFF) for 2016–2025 with published evidence on contaminant occurrence, agricultural and processing factors, and dietary risk assessment to provide a more comprehensive characterization of coffee safety.

Seventy-one RASFF notifications were identified, with the highest annual numbers recorded during 2023–2025. Mycotoxins were the predominant hazard category (25 notifications), exclusively involving ochratoxin A (OTA), followed by novel food-related issues (12) and pesticide residues (11). Nearly half (45.1%) of notifications were classified as serious. However, notification numbers varied considerably among countries of origin and should not be interpreted directly as measures of contamination prevalence or consumer risk because they are influenced by trade volumes and surveillance intensity. Integration with published evidence identified OTA as the principal contaminant of concern, with occurrence strongly influenced by geographical, climatic, drying, and storage conditions. Although roasting can reduce OTA and pesticide residues, contamination is not eliminated. Recent risk assessments generally indicate low dietary concern for OTA and pesticide residues under typical coffee-consumption scenarios; nevertheless, localized OTA contamination hotspots, highly contaminated products, and worst-case exposure scenarios may substantially reduce margins of safety. Emerging multi-mycotoxin contamination and novel-food products introduce additional surveillance priorities.

Overall, RASFF data are most informative when interpreted alongside trade patterns, occurrence and exposure evidence rather than as direct indicators of health risk. Risk management should prioritize origin- and hazard-specific surveillance, improved drying and storage practices for OTA prevention, multi-mycotoxin monitoring, and targeted control of pesticide non-compliance and emerging novel-food products.



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Sciforum-198222: Beyond the Gluten-Free Trend: Attitudes and Knowledge Among the General Population

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One of the most common challenges faced by individuals on strict diets is social exclusion. In this context, increasing public awareness of the gluten-free diet (GFD) is especially important, given its role as the main treatment for gluten-related disorders like celiac disease (CD).

A prospective cross-sectional study was conducted using an online questionnaire distributed via the Internet among individuals from Serbia, Bosnia and Herzegovina, and Montenegro who did not follow a GFD. The study aimed to evaluate their awareness, knowledge, and attitudes toward the GFD.

A total of 1,467 participants were enrolled (1,160 females, 307 males), predominantly aged 21–35 years, with most having secondary (763) or university education (624). Food allergies were reported by 68 participants, while 19.0% had followed or were following a specific diet. Regarding GFD, 29.0% considered it unnecessary for themselves, 19.0% reported lack of time for meal preparation as a barrier, and 18.9% provided no particular reason for not following it. Knowledge of celiac disease was limited, with 32.1% of participants being unfamiliar with the condition and only 16.8% providing a completely correct definition. The most commonly recognized characteristics of CD were its autoimmune nature (775), chronic lifelong course (493), and occurrence across all age groups (422). Awareness of non-celiac gluten sensitivity was considerably lower, as 53.8% of respondents had never heard of the condition and only 1.7% correctly identified it. Furthermore, only one-third of participants recognized GFD as the primary treatment for CD. Nevertheless, a positive attitude toward social support was observed, with 60.2% of participants expressing willingness to adopt a GFD to support a family member or friend with CD.

Although awareness of gluten-related disorders and the GFD remains limited, widespread willingness to support affected family members provides a promising foundation for promoting greater social inclusion and understanding for those following this diet.

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Sciforum-198243: How Well Do You Know the Gluten-Free Products?

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A strict gluten-free diet (GFD) depends on the accurate identification of both gluten-containing and gluten-free products. Misconceptions regarding product suitability may compromise dietary adherence and increase the risk of inadvertent gluten exposure. This study aimed to evaluate the knowledge and perceptions of food and non-food product suitability among individuals following a GFD.

A prospective cross-sectional study was conducted using a structured 22-question online questionnaire administered to individuals adhering to a GFD in Serbia, Bosnia and Herzegovina, and Montenegro. Participants were stratified according to the reason for following a GFD into a medically indicated group (M-GFD) and a non-medically indicated group (NM-GFD).

Among the 210 respondents, 121 reported following a GFD for medically confirmed reasons, whereas 89 adhered to the diet without a formal medical diagnosis. Participants in both groups recognized the importance of verifying product suitability, although this practice was more pronounced among M-GFD respondents, suggesting greater dietary vigilance. In the NM-GFD group, product verification was most frequently reported for parapharmaceutical products (89.9%), cosmetics (84.3%), sausages (78.7%), spices (74.2%), and processed foods with complex ingredient lists (68.5%). Similar findings were observed in the M-GFD group, where the highest proportions were reported for spices (87.6%), parapharmaceutical products (86.0%), sausages (79.3%), and cosmetics (78.5%). Perceptions of foods suitable for a GFD were generally comparable between groups. In the NM-GFD group, chia seeds (69.7%), chickpeas (68.5%), millet (65.2%), quinoa (60.7%), buckwheat (59.6%), rice (59.6%), and rice cakes/crackers (51.7%) were most frequently identified as suitable. Likewise, M-GFD participants most commonly recognized rice cakes/crackers (58.7%), chickpeas (55.4%), and rice (54.5%) as appropriate gluten-free options.

Overall, respondents demonstrated awareness of the need to assess product suitability when following a GFD. However, verification efforts were predominantly focused on products with complex formulations, indicating persistent uncertainty regarding ingredient interpretation and the assessment of gluten-related risks.

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Sciforum-198254: Occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in Small Pelagic Fish from the Adriatic Sea: Evidence of PFOS Dominance

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Per- and polyfluoroalkyl substances (PFAS) are a large group of synthetic chemicals widely used in industrial applications and consumer products due to their exceptional chemical and thermal stability. Their persistence in the environment and tendency to bioaccumulate have resulted in global distribution and growing concern regarding potential adverse effects on human health. In response, Commission Regulation (EU) 2023/915 established maximum levels for perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and their sum in food of animal origin. According to the European Food Safety Authority (EFSA), fish and eggs are major dietary contributors to PFAS exposure in the general population.

Small pelagic fish, including European sardine (Sardina pilchardus) and Mediterranean sand smelt (Atherina hepsetus), were selected to investigate PFAS contamination in the Adriatic Sea. Specimens collected in 2024 were analyzed following extraction with acetonitrile and dispersive solid-phase extraction (dSPE) clean-up. PFAS concentrations were determined using ultra-high-performance liquid chromatography coupled with tandem mass spectrometry (UHPLC-MS/MS).

PFOS was detected in all samples and was the dominant compound in both species. Concentrations ranged from 0.177 to 0.537 μg/kg in Mediterranean sand smelt and from 0.269 to 0.675 μg/kg in European sardine. PFHxS and PFNA were detected only in a subset of samples, while PFOA was not detected. The sum of regulated PFAS ranged from 0.177 to 0.655 μg/kg in sand smelt and from 0.269 to 0.726 μg/kg in sardine. Several long-chain PFAS, including FOSA, PFDA, and PFUnDA, were also identified in both species.

PFOS was consistently detected in all samples, suggesting widespread environmental contamination in the Adriatic Sea. As small pelagic fish constitute key prey for higher trophic-level organisms, these findings may indicate a potential risk for PFAS transfer and biomagnification within the marine food web.



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Sciforum-198316: Digital Image Processing Coupled with Machine Learning for the Classification of Commercial Fruit Vinegars

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Fruit vinegars are highly appreciated for their unique aroma, flavor, organoleptic properties, and health benefits. Due to their high commercial value, they are particularly susceptible to fraud and adulteration. Since conventional quality control methods are often destructive, costly, and time-consuming, rapid and sustainable alternatives are needed. To address this, this study proposes validating an analytical methodology based on digital images, chemometrics, and machine learning to classify commercial fruit vinegars. A total of 79 commercial vinegars comprising apple (AV, n = 26), red wine (GV, n = 27), and white wine (WGV, n = 26) were analyzed. For model development, five images were acquired per sample, and four regions of interest (50 × 50 pixels) were selected per image, yielding 380 images and 1,520 image segments. Images were acquired under optimized conditions in a commercial photo studio (45 × 45 × 45 cm) with LED lighting, using a quartz cuvette at 8 cm with 100% light intensity. The images were processed using GIMP® and Chemostat® software. Color index histograms were used to build classification models, with variable selection performed via the variance inflation factor ($<$ 10). The dataset (N = 1,520) was split into training (70%; n = 1,064) and test (30%; n = 456) sets. The XGBoost model achieved 100.0% training accuracy and 98.0% in external validation. For the visually similar classes, F1-scores of 97.05% (AV) and 97.18% (WGV) were obtained, with a mean AUC of 0.998. These results demonstrate that chromatic information extracted from digital images provides highly discriminative features, highlighting the potential of this integrated approach for commercial vinegar authentication and quality control.



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Sciforum-198365: Classification and Authentication of Flour by HPLC-UV and Chemometrics

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Flour is a fundamental ingredient in human nutrition and the food industry, providing energy and serving as the basis for numerous food products. It is obtained from different cereals or starch-rich foods, each providing different nutritional and technological properties, including varying levels of B-group vitamins essential for physiological function. Owing to its high economic value and widespread consumption, flour is highly susceptible to adulteration through lower-quality substitutions, mislabelling of botanical origin, and undeclared blending, compromising product quality. Therefore, advanced analytical methods are needed to accurately identify, characterize, and authenticate flours of different botanical and varietal origins, ensuring integrity, authenticity, and traceability.

This work presents an approach based on the combination of high-performance liquid chromatography with UV detection (HPLC-UV) and chemometric tools to obtain characteristic profiles of flours with multiple botanical origins (wheat, chickpea, corn, rye, buckwheat, oat, rice, and barley) based on the separation of B-group vitamins. Thus, an HPLC-UV method was developed to determine seven B-group vitamins (B1, B2, B3, B5, B6, B9, and B12), using a polar C18 reversed-phase column under a 20 min gradient elution with 40 mM KH_2PO_4 (pH 3.5) and methanol as mobile phase, with detection at 205 nm. A total of 71 flour samples were analysed and subjected to chemometric analysis, including principal component analysis (PCA), partial least squares discriminant analysis (PLS-DA), and soft independent modelling by class analogy (SIMCA), to evaluate classification according to botanical origin. PLS-DA provided sensitivities and specificities higher than 89% in calibration and 98% in external validation, whereas SIMCA achieved 100% sensitivity and specificity in both cases. Moreover, PLS-DA loading profiles revealed that chromatographic regions associated with vitamins B6, B3, B5, B9, and B2 were the main contributors to sample discrimination, demonstrating the suitability of B-group vitamin fingerprints for the authentication and classification of flours by botanical origin.



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Sciforum-198380: Impact of Subsurface Localized Irrigation on Physicochemical Quality and Postharvest Stability of Table Grapes

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The quality of table grapes at the consumer level depends on both cultivation conditions and their behaviour during the cold chain. This study evaluates how a new subsurface irrigation system (DRS) affects fruit quality attributes at harvest and during storage at 1 °C for three weeks. The DRS irrigation system draws water directly from the surface tube drip system and delivers it directly to the crop root zone, thereby minimizing water losses due to evaporation, typically associated with conventional drip irrigation, where surface-level wetting bulbs are directly exposed to the atmosphere, reducing water availability to the root zone. Grapes from 'Regal' cultivar grown under DRS were compared with those from a conventional drip irrigation system. At harvest, DRS-grown grapes showed greater firmness and more intense green coloration, along with an improved mineral profile (higher calcium, magnesium, and sodium in the pulp, and calcium and sodium in the skin). Fruit also showed a lower ripening index, with reduced sugar content (glucose and fructose) and higher retention of organic acids (citric, malic), as well as lower total polyphenol levels and their subfamilies (hydroxycinnamic acids, flavan-3-ols, and flavonols), suggesting lower physiological stress during development. After storage, DRS clusters retained better physical integrity, with reduced berry drop and less rachis browning and dehydration. In conclusion, field irrigation management is not only relevant to agricultural yield but also determines fruit chemical composition and cold storage capacity. Optimizing production systems such as DRS can improve produce stability, representing a key strategy to reduce food waste caused by inadequate management during cultivation and postharvest stages.



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Sciforum-198486: Genotoxicity and cytotoxicity screening of ethanol and water extracts of *Lonicera caerulea* leaf

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Lonicera caerulea L. (haskap) leaves represent an abundant agricultural by-product rich in bioactive phenolic compounds and secondary metabolites, yet their safety for food industry applications remains largely unknown. In this study, we evaluated the genotoxicity and cytotoxicity of ethanol and aqueous extracts of haskap leaves using the UMU-ChromoTest™, a bacterial SOS chromotest. A serial two-fold dilutions ranging from undiluted to 1:8192 were prepared for both extract types, and the assay was performed according to the EBPI UMU-ChromoTest™ procedure. Bacterial growth factor (GF) and β-galactosidase (β-Gal) induction ratio (IR) were calculated from absorbance readings at 600 nm and 420 nm, respectively. Results showed that for the ethanol extract, GF values ranged from 0.983 to 1.017 (mean 1.005 ± 0.011) and IR values from 0.983 to 1.017 (mean 1.006 ± 0.012). For the water extract, GF values ranged from 0.983 to 1.017 (mean 1.007 ± 0.011) and IR values from 0.977 to 1.023 (mean 0.993 ± 0.013). All values remained well within the established safety thresholds ($GF > 0.5$; $IR < 1.5$) across the entire dilution series. Neither extract exhibited a dose-dependent genotoxic or cytotoxic response. These findings demonstrate that both ethanol and water extracts of *L. caerulea* leaves are non-genotoxic and non-cytotoxic under the tested conditions, thereby supporting their potential as safe bioactive ingredients in food and pharmaceutical industries and offering a sustainable route to valorize an abundant agricultural byproduct.



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Sciforum-198532: Beyond Gluten Removal: Nutritional Perceptions and Deficiency Awareness in Gluten-Free Diet Followers

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As a gluten-free diet (GFD) remains the only established treatment for gluten-related disorders, understanding its nutritional implications is essential for appropriate dietary counseling. This study evaluated the knowledge and perceptions of adults following a GFD regarding the nutritional quality of processed gluten-free foods (GFFs) compared with gluten-containing products, and the risk of nutrient deficiencies associated with long-term adherence.

A cross-sectional online survey used targeted convenience sampling among adults following a GFD in Serbia, Bosnia and Herzegovina, and Montenegro via patient organizations, gluten-related social media, personal networks, and gluten-free product retailers.

Among 210 respondents, 121 reported following a GFD due to a medically diagnosed condition (M-GFD group). In individuals without a diagnosed medical condition (NM-GFD), processed GFFs were most commonly perceived as higher in simple carbohydrates (58.4%) and dietary fiber (53.9%) but lower in calories (62.9%), saturated fats (70.8%), sodium (61.8%), minerals (60.7%), and vitamins (56.2%) than gluten-containing products. Similar but more pronounced perceptions were observed in the M-GFD group, with GFFs regarded as higher in simple carbohydrates (63.6%) and lower in vitamins (71.9%), minerals (71.1%), dietary fiber (65.3%), sodium (64.5%), saturated fats (55.4%), and calories (50.4%). Both groups most frequently identified iron, calcium, magnesium, and zinc as potentially deficient nutrients. Regarding vitamins, NM-GFD respondents most commonly reported vitamins B12 and B1 (51.7% each) and folic acid (47.2%), whereas M-GFD respondents additionally highlighted vitamin D (52.9%).

These findings demonstrate substantial awareness of the nutritional limitations of GFFs and long-term GFD adherence. However, several perceptions were inconsistent with current evidence, highlighting the need for targeted nutritional education to correct misconceptions and promote nutritionally balanced GFDs.

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Sciforum-198569: *In vitro* and *in situ* antifungal activity of potential probiotic lactic acid bacteria from maize: evaluation of enzyme production and mycotoxin degradation.

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Introduction: The presence of toxigenic fungi in food, including cereals, presents a major health concern for humans and animals, particularly in developing countries. Biological detoxification strategies are being considered as alternatives to the conventional techniques due to their specificity, environmental friendliness, and ability to preserve the nutritional and sensory quality of foods. This study investigated the antifungal properties and enzyme production of bacterial cell and cell-free supernatants (CFS) of potential probiotic lactic acid bacteria (LAB) (*Enterococcus durans, Enterococcus faecium, Leuconostoc citreum, Pediococcus pentosaceus*, and *Weissella viridescens*) against toxigenic *A. flavus, A. ochraceus* and *P. verrucosum*. Methods: LAB isolates from maize were screened for antifungal, amylolytic, cellulolytic, lactonase and proteolytic activities using agar well diffusion, mould spot, and *in-situ* assays on maize grains. The ability of LAB to degrade AFB_1 and OTA was evaluated using ultra-performance liquid chromatography mass spectrometry. Results: Whole viable cells of all the tested LAB, as well as their CFS, efficiently inhibited growth of *A. flavus, A. ochraceus* and *P. verrucosum*. Neutralised CFS (nCFS) had little or no inhibitory effect on all tested fungi. The LAB prevented the growth of toxigenic fungi on maize grains for 7 days, except for *E. faecium* A04M, where growth was evident after 5 days. Furthermore, all the LAB showed cellulolytic and proteolytic activities. Amylolytic activity was observed in all isolates except *W. viridescens* A03M. *W. viridescens* A03M, *E. faecium* A04M and *P. pentosaceus* A021M exhibited lactonase activity. The LAB isolates completely degraded AFB_1, while OTA degradation ranged from 25% to75%. Conclusions: The production of hydrolytic enzymes and lactonase activity, along with other antifungal metabolites, by the LAB could provide them with a broad spectrum of direct and indirect antagonistic activities against mycotoxigenic fungi. These findings revealed the promising potential of LAB in effective mycotoxin detoxification strategies for cereal-based products.



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Sciforum-198572: Effectiveness of Sanitizers Applied During Poultry Chilling for Reducing *Campylobacter* Contamination on Chicken Meat: A Meta-Analysis

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Campylobacter contamination in poultry meat remains a food safety challenge for the industry. This study conducted a systematic review and meta-analysis to quantify the effectiveness of sanitizer-based interventions applied during poultry chilling for reducing *Campylobacter* concentrations on chicken meat. A PRISMA-guided Scopus search identified 4,080 records, of which 30 studies met the eligibility criteria and provided 137 effect-size observations. Random-effects meta-regression models estimated log reductions and evaluated moderators, including sample type, sanitizer type, sample weight, treatment duration, concentration, treatment temperature, and storage time. Overall, sanitizer-based interventions during chilling significantly reduced *Campylobacter* levels, with a mean estimated reduction of 0.692 log (SE = 0.176; $p < 0.001$). In univariate analyses, applied concentration ($p = 0.033$), sample weight, contact time, and treatment temperature (all $p < 0.001$) were significantly associated with reductions. After adjustment for multiple moderators, sample type and sanitizer type emerged as the main explanatory factors. Carcass rinses showed the largest reduction among sample types, with a mean decrease of 1.017 log (SE = 0.166; $p < 0.001$). Neck skin samples showed a lower but significant reduction of 0.506 log (SE = 0.157; $p < 0.001$), whereas thigh skin samples showed a smaller, non-significant reduction of 0.292 log (SE = 0.645; $p = 0.650$). Sanitizer type also influenced *Campylobacter* reduction. Acidified sodium chlorite (0.578 log; SE = 0.125; $p < 0.001$) and peroxyacetic acid (0.410 log; SE = 0.102; $p < 0.001$) were associated with the largest reductions. Sodium thiosulfate showed a negative estimated effect (-1.351 log; SE = 0.258; $p < 0.001$), requiring cautious interpretation, particularly if used as a neutralising agent rather than an antimicrobial treatment. These findings indicate that sanitizer-based interventions during poultry chilling can reduce *Campylobacter* contamination on chicken meat and may support control-measure selection in slaughterhouses, considering intervention conditions, sample type, regulations, and processing constraints.



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Sciforum-198580: Safety-by-Design of Functional Camel Milk Kefir Using Predictive Microbiology and Machine Learning for *Salmonella* Control

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Introduction: Camel milk is a traditional dairy matrix of growing global interest, and kefir fermentation represents a promising strategy for valorizing this resource as a functional dairy product. However, the microbiological safety of camel milk kefir under variable fermentation and storage conditions remains insufficiently characterized. This study aimed to develop an integrated predictive framework for *Salmonella* inactivation in camel milk kefir by combining classical predictive microbiology, response surface methodology, and machine learning.

Methods: Camel milk was collected in the Souss-Massa region of Morocco, pasteurized at 63 °C for 30 min, and fermented using locally sourced kefir grains. A Doehlert uniform shell design involving three factors and 16 experimental runs was applied to evaluate the effects of kefir grain concentration (1–10% w/v), fermentation time (18–30 h), and storage temperature (4–25 °C) on *Salmonella* survival. Samples inoculated at approximately 5–6 log CFU/mL were monitored during storage. Physicochemical parameters, including pH, titratable acidity, and *Salmonella* counts were measured throughout the experiment. Bigelow and Weibull models were used to describe inactivation kinetics, while Random Forest, XGBoost, and Support Vector Regression models were developed for data-driven prediction.

Results: The Weibull model outperformed the Bigelow model in 15 of the 16 runs, with R^2 values reaching 0.995 and lower AIC and RMSE values. RSM models adequately described the effects of processing factors on Weibull parameters, with higher factors levels associated with greater *Salmonella* inactivation. Among machine learning models, Random Forest showed the best predictive performance.

Conclusions: This integrated mechanistic and data-driven approach provides a promising safety-by-design framework for optimizing camel milk kefir fermentation and storage conditions to improve pathogen control.



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Sciforum-198648: Occurrence of 5-hydroxymethylfurfural in sweet commercial bakery products: focus on children's and health foods

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Introduction

5-Hydroxymethylfurfural (5-HMF) is a heat-induced compound formed during Maillard reactions and caramelization processes in foods rich in sugars and carbohydrates. Bakery products are considered one of the major dietary sources of 5-HMF due to high-temperature processing. Increasing consumer interest in health-oriented foods and products intended for children has led to a growing market of specialized bakery products; however, limited information is available regarding their 5-HMF content. Since excessive exposure to 5-HMF may raise toxicological concerns related to oxidative stress, cytotoxicity, genotoxicity and suggested carcinogenic potential, monitoring its occurrence in commercially available bakery products is important for food safety and quality assessment.

The aim of the study was to determine the content of hydroxymethylfurfural (HMF) in sweet bakery products, including products intended for children, products labelled as health foods and products without any specific labelling.

Methods

The content of 5-hydroxymethylfurfural (5-HMF) in the analysed samples was determined using high-performance liquid chromatography (HPLC) with UV-VIS detection at 285 nm. Separation was performed on a C18 column (Luna C18(2), 2 µm, 150 mm × 2.0 mm; Phenomenex, USA).

Results

The lowest 5-HMF concentrations were observed in products intended for children, ranging from 0.35 to 9.74 mg/kg (mean: 2.11 mg/kg). Higher levels were found in products labelled as health foods, with values between 0.45 and 15.13 mg/kg (mean: 4.76 mg/kg). The highest 5-HMF concentrations were detected in bakery products without additional labelling, ranging from 1.43 to 34.86 mg/kg (mean: 11.18 mg/kg).

Conclusions

Based on the acceptable daily intake (ADI) of 2 mg/kg of body weight, the 5-HMF concentration in a single manufacturer-recommended serving does not pose a health risk to consumers. However, due to potential cumulative exposure from other food products, monitoring of 5-HMF levels in food – particularly in products intended for children – should be considered.



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Sciforum-198658: Assessment of *Petiveria alliacea* L. Extract on the Shelf life and Residue Analysis of *Solanum lycopersicum* L. fruits.

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The widespread use of synthetic insecticides in crop production has raised concerns regarding residue accumulation in food products and associated environmental and health risks. Plant derived bioinsecticides offer biodegradable and environmentally friendly alternatives for sustainable pest management. *Petiveria alliacea* L. has been reported to possess insecticidal properties, however, information on its residue behavior and impact on postharvest fruit quality remains limited. This study evaluated the phytochemical composition of *P. alliacea* root extract and its effects on residue persistence and shelf life of tomato fruits.The experiment was conducted at the Crop Garden, Department of Crop Protection and Environmental Biology, University of Ibadan, Nigeria. Treatments consisted of 50%, 75%, and 100% concentrations of *P. alliacea* root extract and an untreated control. The study was arranged in a Completely Randomized Design with four biological replicates and repeated twice. Tomato fruits harvested at the breaker stage were stored at 22 ± 2°C and 90% relative humidity. Physiological weight loss, firmness, colour development, and total soluble solids were evaluated throughout storage. Phytochemical and residue analysis were performed using Gas Chromatography-Mass Spectrometry. GC-MS analysis identified phytol (3,7,11,15-tetramethylhexadec-2-en-1-ol), a diterpene alcohol, as the predominant constituent with a relative peak area of 30%. Other constituents detected included dibenzyl disulfide (11.3%) and dibenzyl trisulfide (7.1%). Compound identification was based on retention time and mass spectral matching with GC-MS library databases. The 75% extract concentration significantly improved postharvest quality ($p < 0.05$), resulting in higher fruit weight, enhanced firmness and color, longer shelf-life compared with the control and other treatments. The 50% concentration showed moderate effectiveness and did not differ significantly from the control ($p < 0.05$). The 100% concentration increased tomato fruit decay. Residue analysis detected benzaldehyde at a retention time of 34.5 min in fruits treated with the 100% concentration, suggesting residue accumulation and possible phytotoxic effects. These findings indicate that a 75% *P. alliacea* root extract concentration may effectively extend tomato shelf life while minimizing residue related risks



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Sciforum-198662: Tropane Alkaloid Determination in *Datura* stramonium L. and Toxicological Assessment using *Galleria mellonella* Larvae

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Tropane alkaloids (TAs) are toxic secondary metabolites produced by several Solanaceae species and represent an important food safety concern. *Datura stramonium* L. is a relevant TA-producing species frequently implicated in food contamination incidents. However, while information on TA occurrence across its organs and their toxicological significance remains limited, most analytical methods are primarily designed for contaminated food matrices rather than TA-rich plant materials. Therefore, this study aimed to optimize a methodology for TA determination in *D. stramonium* and to evaluate the toxicity of its extracts. Plant material was collected, homogenized, and subjected to extraction. QuEChERS-based methodologies reported in the literature were critically reviewed and adapted to develop an extraction protocol suitable for the high alkaloid content of *D. stramonium*. Different sample amounts (0.025–1.0 g) were tested while maintaining a constant solvent volume, and the influence of dispersive solid-phase extraction (dSPE) clean-up was investigated. TA profiles were determined by UHPLC-ToF-MS. Toxicological assessment was performed using *Galleria mellonella* larvae. The most suitable extraction conditions were achieved using 0.1 g of sample, whereas clean-up procedures did not significantly improve analytical performance. The predominant alkaloids detected in the seeds were atropine and scopolamine, with anisodamine and homatropine also being identified. Although no mortality was observed at the tested concentrations in the *G. mellonella* model, exposed larvae exhibited behavioral alterations and a statistically significant increase in hemocyte counts, suggesting sublethal effects under the tested conditions. These preliminary findings provide a methodological basis for TA determination in *D. stramonium* and may contribute to future risk assessment and source-tracing strategies for food contamination events involving TAs.



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Sciforum-198689: Optimizing fermentation time to improve the safety and quality of a Portuguese-style fish sausage

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Introduction: The growing demand for sustainable alternatives to traditional fermented sausages has stimulated the development of fish-based products. Since fish is highly perishable raw material, processing conditions must ensure microbiological safety while preserving product quality. Fermentation is a key step in achieving these objectives; however, information regarding the optimization of fermentation conditions for fish-based sausages remains limited. This study evaluated the effect of refrigerated fermentation time on the microbiological safety and physicochemical quality of a Portuguese-style fermented tuna sausage.

Methods: Experimental sausages were prepared using yellowfin tuna (Thunnus albacares) loin, fermented pepper, garlic paste, salt, monosodium glutamate, and sodium nitrite. Two refrigerated fermentation conditions were tested (24h and 36h at 4°C), followed by stuffing into vegetable casings, cold smoking, and dehydration until approximately 40% weight loss was achieved. Physicochemical parameters (pH and water activity, aw) and microbiological analyses follow ISO standards.

Results: Extending fermentation from 24h to 36h improved microbiological quality throughout processing. Enterobacteriaceae counts decreased by 0.8 log CFU/g after 36 h of fermentation compared with 0.4 log CFU/g after 24h, with final reductions of 2.1 and 1.2 log CFU/g, respectively. Lactic acid bacteria increased by 2.9 log CFU/g after 36 h of fermentation and by 3.5 log CFU/g in the final product, compared with increases of 2.5 and 2.9 log CFU/g under the 24h condition. Listeria spp., Clostridium perfringens, and Bacillus cereus remained below the detection limit ($<$50 CFU/g) throughout processing. Final products exhibited similar aw values (0.91), whereas pH was slightly lower after 36h of fermentation (5.78) than after 24h (5.87).

Conclusions: Extending refrigerated fermentation from 24h to 36h enhanced microbial stabilization, promoting greater growth of lactic acid bacteria and improved reduction of Enterobacteriaceae without adversely affecting physicochemical characteristics. These findings highlight fermentation time as a critical processing parameter to produce safe and high-quality fermented fish sausages.



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Sciforum-201142: Thermal Resistance of Selected Heat-Resistant Spore-Forming Bacteria in Philippine Shelf-Stable Foods at Different Syrup Concentrations

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Thermal resistance data are important in establishing appropriate thermal processes for shelf-stable foods. However, information on the thermal resistance of heat-resistant spore-forming bacteria in actual food systems, particularly Philippine shelf-stable products, remains limited. This study determined the thermal resistance of selected heat-resistant spore-forming bacteria in commercially processed white beans, chickpeas, and mango in syrup at different syrup concentrations.

Commercial sterility testing was conducted on mango, white beans and chickpeas in syrup. Surviving microorganisms were isolated and identified by 16S rRNA gene sequencing. *Bacillus subtilis* and *Bacillus cereus* were selected for Thermal Death Time (TDT) studies. Since no suitable heat-resistant spore-forming bacterium was isolated from mango in syrup, *Bacillus coagulans* ATCC 8038 was used as the reference microorganism. TDT studies were carried out at 80, 90, and 100 °C using food systems containing 10, 30, and 50 °Bx syrup. Decimal reduction times (D-values) and z-values were determined from survivor curves.

The D-values of all test microorganisms decreased with increasing temperature. For *B. coagulans* in mango in syrup, D-values ranged from 26.14–39.28 min at 80 °C, 6.18–8.95 min at 90 °C, and 1.60–2.40 min at 100 °C, with the highest thermal resistance consistently observed at 50 °Bx. The corresponding z-values ranged from 16.33 to 17.11 °C. Similar temperature-dependent trends were observed for *B. subtilis* and *B. cereus* in chickpeas and white beans. Among the microorganisms evaluated, *B. subtilis* consistently exhibited greater thermal resistance than *B. cereus* under comparable test conditions.

The thermal resistance parameters generated in this study provide reference data for selected heat-resistant spore-forming bacteria in Philippine shelf-stable foods. These data may be used in the development and validation of thermal processes for food products with different soluble solids concentrations.



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Sciforum-201230: Development of a simultaneous voltammetric method for amaranth and tartrazine employing a glassy carbon electrode modified with graphene/carboxymethyl-botryosphaeran

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The synthetic dyes amaranth (AMR; Bordeaux Red S, INS 123) and tartrazine (TTZ; INS 102) are widely used in the food industry to provide attractive colors to foods and beverages. Due to regulations that establish maximum permitted concentrations of 10 mg/100 g for these additives in commercial products, reliable analytical methods are required for their determination and quality control. In this work, a voltammetric method was developed for the simultaneous determination of AMR and TTZ using a glassy carbon electrode modified with a suspension of graphene in carboxymethyl-botryosphaeran (GR-βG/GCE). Voltammetric measurements were performed using an Autolab PGSTAT 101 potentiostat/galvanostat connected to an electrochemical cell containing the GR-βG/GCE as the working electrode, an Ag/AgCl (3.0 mol L^{-1} KCl) as reference electrode, and a platinum plate as the auxiliary electrode. AMR and TTZ presented well-defined oxidation peaks at 0.88 V and 1.10 V, respectively, allowing their simultaneous determination without peak overlapping. The supporting electrolyte selected for this determination was a phosphate buffer solution (pH = 2.0). The parameters of the SWV were optimized (f = 20 Hz, a = 30 mV and ΔEs = 5 mV) and used for constructing the analytical curves. The oxidation current was directly proportional to the concentration of AMR and TTZ from 336 to 805 nmol L^{-1} and 336 to 805 nmol L^{-1}, respectively, with limit of detection of 11,7 nmol L^{-1} and 11,3 nmol L^{-1}. The method was successfully applied to the determination of AMR and TTZ in soft drinks. The results demonstrate the applicability of the GR-βG/GCE for the simultaneous electrochemical determination of AMR and TTZ, providing a simple, sensitive, and low-cost analytical approach with potential application in food quality control.



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Sciforum-201903: Shelf-life evaluation of pasteurised Nocellara del Belice table olives produced by the Castelvetrano method

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Introduction

Table olives produced with the Castelvetrano method undergo limited fermentation and only partial acidification, which may affect stability during storage. Green Nocellara del Belice olives are treated with dilute NaOH and salt, without extensive washing, then refrigerated in brine for at least 14 days to achieve rapid debittering while preserving their bright green colour and mild flavour. Before packaging, the brine is acidified and the product pasteurised. Under these conditions, shelf-life cannot be defined solely in microbiological terms but must also account for changes in product quality.

Methods

Pasteurised Nocellara del Belice table olives (60–63 PU), whole or pitted, were packaged in five commercial formats — tin cans and four glass jars (314, 327, 580 and 1062 mL) — and stored at 25 °C or 45 °C for up to 180 days, with all analyses performed in triplicate. Microbiological analyses were conducted alongside measurements of pH, water activity, salinity and free acidity. Colour was assessed via CIELAB parameters and total colour difference (ΔE), and sensory properties were evaluated by a trained panel. Multivariate analysis (PCA and hierarchical clustering) was performed to explore relationships among variables.

Results and Discussion

No microbial growth was detected during storage, confirming the effectiveness of pasteurisation, although clear changes occurred in physicochemical and sensory attributes, especially at 45 °C. Crispness and flavour balance declined progressively, while colour changes were less pronounced but still temperature-dependent. Pitted olives lost quality faster than whole olives, indicating greater structural susceptibility. Multivariate analysis confirmed temperature as the primary driver of product evolution, with olive format playing a secondary role and packaging having comparatively little influence.

Conclusions

The shelf-life of pasteurised Castelvetrano table olives is thus driven primarily by quality degradation rather than microbiological instability, with temperature and product format as key factors in preserving product quality during storage.



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Sciforum-202533: Study on plastic pollution in some Bulgarian agricultural soils

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Microplastics are widely abundant in terrestrial ecosystems, thus accumulating in food chains, threatening food security, food safety, and human health. Addressing this problem has not only fundamental scientific importance, but also a real practical-applied aspect, concerning both the safety of plant produce obtained from plastic-contaminated agricultural land, the safety of animal produce obtained from animals fed with contaminated feed, and the potential risk to human health and food security. The aim of the present study was to assess the degree of microplastic (MPs) contamination in some agricultural soils, collected from various regions of Bulgaria. Representative soil samples were taken from the selected agricultural lands at a depth of 0-40 cm and the content of plastics in soils was analyzed using Py-GC-MS. Characterization of the plastics contained in the studied agricultural soils included type, composition, fractions, quantity and potential origin/source of pollution. Data obtained revealed a clear relationship between agricultural practices and MPs pollution, as well as between soil type and MPs pollution. Most of the natural polymers found were cellulose and lignin (originated from crops), while the plastic polymers were presented by rubber (from tires), polypropylene (PP), polycaprolactone (PCL), nylon/polyamide 12 (PA12) and styrene-ethylene-butylene-styrene (SEBS). Such microplastics in an animal or human organism pose risks of a physical, chemical and microbiological nature. Physical risks are due to the small size of the particles, which can pass through biological barriers of intestines, blood-brain barrier, testes, etc., even placental tissues and cause direct damage. The presence of persistent, potentially dangerous contaminants is a cause of chemical risk, while microbiological risks are related to microorganisms attached to the surface of the plastic particles. This is why farmers and consumers are increasingly concerned about the dangers of plastic in food which in turns highlights the urgent need for more detailed scientific research in this area.



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Sciforum-202706: Accumulation of microplastics in tomato (Solanum lycopersicum L.)

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In recent years, it has been proven that microplastics penetrate seeds, roots, stems, leaves, fruits and plant cells, and the ability for translocation and bioaccumulation depends mainly on their size and type. The aim of this study is to track the bioaccumulation of microplastics in tomato (Solanum lycopersicum L.), which was chosen due of its global economic importance and widespread cultivation. Furthermore, commonly used mulching and drip irrigation practices are a significant source of microplastics in agricultural soils - a prerequisite of crop contamination. The biotesting was carried out under controlled conditions, using 0.1 L vessels, filled with standardized soil substrate, and three fractions (1 μm, 5 μm, 100 μm) of fluorescent polystyrene microplastics (0.01% v/w). After a period of 40 days, the penetration and accumulation of microplastics in all underground and aboveground organs of tomato – roots, stem, leaves – was proven. The amount of microplastics was higher in the underground biomass (root system) compared to the aboveground biomass (stem and leaves) in all experimental variants. Microplastics accumulated in plants have an impact on their growth and biomass synthesis, which is most pronounced in the finest of the studied fractions - 1 μm ($p<0.05$). Microplastics also have a suppressive effect on the biosynthesis of photosynthetic pigments, and hence - on the intensity of the photosynthesis process, again most pronounced in the fraction of 1 μm ($p<0.05$). It has been confirmed that the size of plastic particles is an important factor determining their ability to bioaccumulate and the degree of impact on the vital processes of plants. Future research should focus on the precise pathways through which microplastics are absorbed by plant roots and translocated to aerial tissues, as well as uncovering how plants respond at the transcriptomic, proteomic, and metabolomic levels when exposed to microplastics. Long-term field trials under real agricultural conditions are essential to overcome the limitations of laboratory experiments and to assess effects on crop yield, food safety, soil health, and agroecosystems over time.



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Sciforum-203107: Discrimination of Species in Raw Milk by Raman Spectroscopy and Principal Component Analysis

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Background

Milk quality and authenticity are fundamental for food safety and consumer confidence. Since milk composition varies among species, it affects nutritional, technological, and sensory properties. Conventional analytical techniques are reliable but time-consuming and unsuitable for rapid, non-destructive monitoring. Raman spectroscopy represents a promising alternative due to its rapidity, non-destructive nature, and minimal sample preparation. This study aimed to characterise raw bovine, ovine, and buffalo milk and explore their discrimination, including mixtures.

Methods

Raw milk samples included 10 bovine, 10 ovine, and 16 buffalo samples collected from different farms during two sampling periods (April and July). Pure samples and bovine-buffalo mixtures containing 50%, 60%, and 70% bovine milk were analysed. Samples were frozen, thawed for 24 h at 3 °C, and equilibrated to room temperature. Raman spectra were acquired using a fibre-optic probe (210 mW laser power, 10 s integration time; total acquisition time: 210 s per sample). Principal Component Analysis (PCA) was applied to evaluate spectral differences.

Results

Raman spectra showed characteristic bands associated with lipids, proteins, and lactose. Bovine milk exhibited stronger carbohydrate-related bands (887–1129 cm^{-1}), whereas ovine and buffalo milk showed higher intensity of the lipid-associated CH_2 bending band at 1440 cm^{-1}, consistent with their higher fat content. PCA revealed species-related clustering, with bovine milk showing the clearest separation, while buffalo and ovine milk exhibited partial overlap. PC1, PC2, and PC3 explained 45.26% of the total variance in April and 44.79% in July. No clear separation was observed between sampling periods or among mixed milk samples.

Conclusion

Raman spectroscopy combined with multivariate analysis shows potential for rapid, non-destructive milk authentication and traceability, with future applications in identifying undeclared species substitution and supporting food authenticity, quality control, and food safety. However, partial overlap between buffalo and ovine milk and the lack of clear discrimination among mixed milks represent limitations. Further studies using larger sample sets and validated classification approaches are needed to assess its applicability to milk adulteration detection.



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Sciforum-203246: Food Safety Education in Slovenian Primary Schools: Evaluation of an Innovative Learning Approach

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Introduction:

Foodborne diseases remain a significant public health concern worldwide, and consumers play an important role in preventing food safety risks. Developing food safety awareness at an early age may contribute to safer food-handling practices later in life. The aim of this study was to assess food safety knowledge among Slovenian lower secondary school students and evaluate the effectiveness of a game-based educational intervention.

Methods:

A structured questionnaire was developed and administered to 1,178 students attending grades 6–9 from primary schools across Slovenia. The survey assessed food safety knowledge, awareness, and information sources. In addition, an educational board game entitled *Safe Food – Our Shared Responsibility: From Farm to Fork* was developed as an innovative learning tool. The game was tested among students from a selected primary school, and knowledge levels were compared before and after participation in the intervention.

Results:

The findings revealed that students' food safety knowledge was generally insufficient. Female students demonstrated significantly higher knowledge levels than male students. The results also indicated substantial gaps in understanding food safety principles and preventive practices. Following participation in the educational game, students achieved significantly higher knowledge scores compared with their pre-intervention results. The game-based approach improved students' understanding of food safety concepts and increased their awareness of safe food handling.

Conclusions:

The study highlights the need for stronger food safety education in primary schools. Game-based learning represents an effective and engaging educational strategy that can significantly improve food safety knowledge among school-aged children. Integrating innovative educational tools into school curricula may contribute to long-term improvements in food safety awareness and behaviour.

Keywords: food safety; food safety education; primary school students; game-based learning; awareness



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Sciforum-203264: Evaluation of the Protective Potential of Chitosan-TPP Encapsulated *Tamarindus indica* Fruit Pulp Extract against Tartrazine-Induced Haematological and Biochemical Alterations in Female Wistar Albino Rats

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Tartrazine (E102), a synthetic azo dye widely used in beverages, confectioneries, processed foods, and pharmaceutical coatings, induces dose-dependent toxicity via oxidative stress-mediated cellular injury, with females showing heightened susceptibility to haematological, hepatic, renal, and metabolic disturbances. Tamarindus indica L. fruit pulp possesses antioxidant and anti-apoptotic properties, though poor bioavailability limits its therapeutic utility—a constraint nanoencapsulation may help to address. This study evaluated chitosan–tripolyphosphate (TPP)-encapsulated T. indica fruit pulp extract (N-TIFP) against tartrazine-induced toxicity in female Albino Wistar rats, comparing its effects against unencapsulated TIFP and vitamin E. Aqueous TIFP underwent phytochemical screening; N-TIFP was synthesized via ionic gelation, exhibiting a particle size of ~387.9 nm and zeta potential of +14.19 mV. Antioxidant capacity was assessed using DPPH, ABTS, FRAP, and TAC assays. Forty-eight rats were divided into eight groups (n = 6): Normal Control (distilled water, 5 mL/kg), TIFP (400 mg/kg), N-TIFP (equivalent to 400 mg/kg TIFP), Vitamin E (300 mg/kg in 0.01% Tween 80), Tartrazine (15 mg/kg), TIFP+Tartrazine, N-TIFP+Tartrazine, and Vitamin E+Tartrazine, administered orally for 28 days, followed by haematological and biochemical, antioxidant analysis. Data (mean ± SEM) were analysed by one-way ANOVA with Tukey's post-hoc test ($p < 0.05$). Phytochemical screening confirmed alkaloids, tannins, and saponins, with N-TIFP showing significantly higher antioxidant activity than TIFP across all assays. Tartrazine significantly reduced RBC, haemoglobin, MCV, MCH, and MCHC, while elevating RDW, platelets, lymphocytes, granulocytes, glucose, CRP, liver and kidney markers (ALP, bilirubin, ALT, AST, creatinine), CK-MB, LDL, and total cholesterol, with concurrent HDL and triglyceride reductions. N-TIFP co-administration produced significantly greater attenuation of these alterations than unencapsulated TIFP, with protective effects comparable to vitamin E. This enhanced efficacy is consistent with improved solubility and antioxidant availability via the chitosan–TPP system; bioavailability, cellular uptake, and sustained-release parameters were not directly evaluated. Overall, N-TIFP attenuated tartrazine-induced haematological and biochemical alterations, supporting further investigation of nano formulated T. indica extract against xenobiotic-induced toxicity.



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Sciforum-203300: Processing Contaminants in Foods: A Quarter of a Century of RASFF Notifications Reveal Persistent Food Safety Challenges

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Processing contaminants remain a major food safety concern owing to their widespread occurrence across food groups, limited controllability during processing, and adverse health effects, including nephrotoxicity, genotoxicity, and carcinogenicity.

This study investigated the occurrence and distribution of processing contaminants reported through the EU Rapid Alert System for Food and Feed (RASFF) over the past 25 years to evaluate temporal trends, contamination patterns, and the effectiveness of current regulatory and mitigation measures.

The analysis revealed a marked increase in notifications during the last five years, with acrylamide, 3-monochloropropane-1,2-diol (3-MCPD) esters, glycidyl esters, and mineral oil hydrocarbons accounting for the majority of reported cases. Acrylamide (98 notifications since 2009) was predominantly associated with thermally processed foods, particularly bakery products, snacks, and coffee, whereas 3-MCPD esters (218 notifications, including 48 co-reported with glycidyl esters) occurred mainly in soups, broths, condiments, and refined fats and oils. Mineral oil hydrocarbons (212 notifications since 2006) were most frequently detected in fats and oils, followed by cereals and bakery products. In contrast, polycyclic aromatic hydrocarbons, nitrofuran metabolites, ethyl carbamate, and hydroxymethylfurfural were reported infrequently and were largely confined to expected food categories, suggesting sporadic rather than systematic contamination. The geographical distribution of notifications broadly reflected global production and trade networks, with India, Belgium, Spain, the Philippines, Thailand, Vietnam, Ukraine, China, Germany, Türkiye, and the Netherlands representing the principal countries of origin.

Despite established EU regulatory frameworks and mitigation measures, processing contaminants remain a significant challenge throughout the food chain, underscoring the need for continuous surveillance, targeted monitoring, and further optimization of mitigation strategies.



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Sciforum-206874: Contamination and Nutritional Quality in Date-Derived Natural Sweeteners from Algeria and Tunisia

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Natural sweeteners from dates (*Phoenix dactylifera* L.) have gained interest as alternatives to refined sugar due to their technological functionality, nutritional value, and richness in bioactive micronutrients. However, organic contamination, including plasticizers and bisphenols (BPs), may affect product safety. This study aimed to provide an evaluation of the contamination profile and nutritional quality of commercial date-derived sweeteners from Algeria and Tunisia. Thirty-two samples, including syrups, pastes, and powders, were analyzed for physicochemical properties, nutritional sweetening index (NSI), proximate composition, vitamin E, minerals and total phenolic content (TPC). In parallel, product contamination from plasticizers and BPs was assessed. Date syrups exhibited the highest soluble solids content (70.8–81.4 °Brix) and NSI, whereas powders showed greater TPC, dietary fiber, proteins, and minerals. Moisture content decreased from syrups to powders, while TPC and fiber increased, likely due to dehydration-induced concentration effects. Plasticizers such as dibutyl phthalate (DBP) and di(2-ethylhexyl) phthalate (DEHP) were detected in all samples at concentrations ranges of 25.43–63.54 µg/kg and 18.76–61.28 µg/kg. Whereas bis(2-ethylhexyl) terephthalate (DEHT) was found in 97% of products at concentrations from 33.28 to 94.36 µg/kg. Among BPs, BPA and BPS were detected in 78% and 66% of samples and exhibited concentration ranges of 3.18–13.06 µg/kg and 1.54–6.12 µg/kg, respectively. Statistical analysis showed that product type was the main factor affecting compositional variability, while geographical origin had a limited influence. This evidence suggests that contamination patterns may be due to product processing, although environmental sources at multiple stages along the agri-food chain may also play a role. Overall, date-derived sweeteners represent promising alternatives to refined sugar. However, improved monitoring strategies, stricter control on food contact materials, and harmonized safety regulations are needed particularly in Algeria and Tunisia, where regulatory frameworks governing endocrine-active chemicals remain less stringent than those established in the European Union.



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Session H. Food Packaging & Storage Technology

Sciforum-177629: Sodium Pyrithione-Modified PCL/PLA Blends as Active Antimicrobial Biodegradable Packaging Materials

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IntroductionThe development of biodegradable polymers with antimicrobial properties is an important direction in sustainable food packaging. Poly(ε-caprolactone) (PCL) and poly(lactic acid) (PLA) are widely used due to their biodegradability and favorable properties. This study aimed to develop PCL/PLA blends modified with sodium pyrithione as active packaging materials to improve food safety by inhibiting microbial growth.

MethodsComposite films based on PCL and PLA containing different concentrations of sodium pyrithione were prepared and evaluated for antimicrobial activity. Tests were performed against *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* according to PN-EN ISO 20645, and against a mixed fungal culture according to PN-EN ISO 846. Bacterial tests were conducted after incubation at 37 °C for 24 h, while antifungal tests were performed after incubation at 22 °C for 28 days. Antimicrobial activity was evaluated according to the criteria specified in the respective standards. All experiments were performed in duplicate.

ResultsControl samples showed intensive microbial growth without inhibition. All sodium pyrithione-modified films demonstrated strong inhibition of bacterial growth against *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*. According to the PN-EN ISO 20645 evaluation criteria, all tested variants exhibited a pronounced antibacterial effect, regardless of sodium pyrithione concentration. No clear concentration-dependent differences were observed among the tested formulations. Antifungal testing confirmed sustained inhibitory activity throughout the 28-day incubation period. Clear zones of fungal growth inhibition were maintained around the modified films during the entire incubation period, indicating strong and persistent antifungal effectiveness.

ConclusionsPCL/PLA blends modified with sodium pyrithione exhibited broad-spectrum antimicrobial activity against both bacteria and fungi. The obtained results demonstrate the potential of these materials for application in active biodegradable food packaging. Further studies are required to optimize the additive concentration and to better understand the mechanisms responsible for the antimicrobial activity.

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Sciforum-195429: Food-Processing Metabolomics Reveals Nutrient-Derived Adduct Formed by Ethylene Oxide Fumigation

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Introduction: Ethylene oxide (ETO) is a highly reactive sterilizing agent classified as a carcinogen, and its use in foods is prohibited in many countries. Current regulatory monitoring relies on detection of ETO and/or 2-chloroethanol (2CE), a reaction product formed with chloride ions. However, ETO is highly volatile and difficult to detect directly, and 2CE may occur naturally or arise from non-food-related sources, raising concerns regarding its specificity as a fumigation marker. This study applied a food-processing metabolomics strategy to identify novel chemical markers generated through reactions between ETO and endogenous food constituents.

Methods: A metabolomics-based analytical approach was applied to investigate chemical changes induced by ETO fumigation of cumin (*Cuminum cyminum* L.) seeds. Polar metabolites were extracted and derivatized, followed by GC–MS-based metabolomic profiling. Principal component analysis (PCA) was used to discriminate fumigated and non-fumigated samples. A fumigation-specific compound was further characterized by high-resolution GC–QTOF–MS.

Results and Discussion: PCA clearly discriminated fumigated from non-fumigated samples based on metabolomic profiles. A characteristic metabolite was consistently detected only in fumigated samples. Accurate mass and fragmentation analyses indicated that the metabolite corresponded to a malic acid–ETO adduct. *In vitro* fumigation of authentic malic acid reproduced identical chromatographic and spectral features, confirming its formation. Furthermore, malic acid–ETO adduct was detected in a variety of other ETO-treated spices.

Conclusions: This study provides direct evidence that ETO fumigation induces formation of a nutrient-derived adduct in foods. The identified malic acid–ETO adduct represents a promising new marker for verifying ETO fumigation, offering an alternative approach beyond conventional 2CE-based monitoring. The proposed marker provides a complementary approach to conventional residue monitoring based on ETO and 2CE.

Reference: Nakamura, K. et al. Identification of a chemically modified nutrient for direct evidence of ethylene oxide fumigated foods, Food Hygiene and Safety Science, in press.



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Sciforum-195498: Effect of *Schinus molle* leaf extract incorporated into starch-based active coating on the preservation of fresh tomatoes

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The preservation of fresh fruits remains a challenge for the food industry due to quality loss and deterioration during storage. In this context, active coatings have emerged as a sustainable alternative because they act as semipermeable barriers that reduce moisture loss and delay spoilage. Furthermore, the leaves of *Schinus molle* ("Pirul") contain phenolic compounds with antimicrobial properties, making them a promising source of bioactive ingredients for food preservation applications.

Therefore, the aim of this study was to evaluate the effect of different concentrations of *S. molle* leaf extract incorporated into starch-based active coating on the preservation and shelf life of fresh tomatoes. Pirul leaves were dehydrated at 40 °C until reaching approximately 5% moisture content, then ground into powder. Bioactive compounds were extracted by ultrasound-assisted extraction at 40 °C for 10 min using a 40% hydroalcoholic solution at a solid-to-liquid ratio of 1:20. Active coatings were formulated with starch (8%), glycerol (4%), and vinegar (4%), incorporating *S. molle* extract at concentrations of 2% and 4%. Tomatoes with similar size, color, and maturity were coated by immersion and stored at 26 °C for eight days.

After storage, coated tomatoes exhibited lower weight loss than the control treatment. The active coatings containing 4% extract showed the lowest weight loss (1.99 ± 0.4%), followed by the 2% treatment (3.62 ± 0.06%), whereas the control exhibited the highest weight loss (6.67 ± 0.18%). In addition, the 4% extract treatment showed the greatest antimicrobial effect, exhibiting only slight microbial growth according to the simplified fungal index scale for saladette tomatoes, while the control showed severe deterioration. These results demonstrate the potential of *S. molle* extract as a functional ingredient in starch-based active coatings to extend the shelf life of fresh tomatoes while contributing to Sustainable Development Goal (SDG) 12 on Responsible Consumption and Production.



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Sciforum-196563: Effect of Biodegradable PLA–Chitosan–Pomace Extract Films as Slice Separators on the Quality and Shelf Life of Gouda Cheese

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The increasing demand for sustainable food packaging has promoted the development of biodegradable materials with enhanced preservation properties. This study evaluated the shelf life of sliced Gouda cheese stored at 4 °C for 10 days using different separators materials between cheese slices. Four separator films were assessed: commercial polypropylene (PP), polylactic acid (PLA), 92.5% PLA, 4.5 wt.% oligomeric lactic acid and 3 wt.% chitosan (PLA-CS-OLA), and 89.5% PLA, 7.5% premix and 3% olive pomace extract (PLA-CS-OLA-PE). Lipid oxidation using the TBARs assay, pH, moulds and yeast counts, and Enterobacteriaceae were monitored throughout storage time. Lipid oxidation values remained low in all treatments, ranging from 0.14 to 0.17 mg malondialdehyde/kg sample at the end of storage period with no statistical differences ($p > 0.05$) between samples. Regarding pH, cheese samples separated with biodegradable films did not show statistical differences ($p > 0.05$), at the end of storage period with PP used as control with values ranged between 5.59 and 5.75. Microbiological analyses revealed a progressive increase in mould and yeast counts during storage for all treatments. However, the PLA-CS-OLA-PE film resulted in the lowest microbial growth at the end of storage (5.82 log CFU/g), compared with PP (6.48 log CFU/g), PLA (6.01 log CFU/g), and PLA-CS-OLA (6.26 log CFU/g) whilst Enterobacteriaceae were not detected in any sample throughout the storage period. These results indicate that biodegradable PLA-based films, particularly those containing chitosan and pomace extract, can effectively preserve the physicochemical and microbiological quality of sliced Gouda cheese and represent promising sustainable alternatives to conventional polypropylene separators.



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Sciforum-197202: Active packaging as a growing trend in food industry: antimicrobial compounds in biodegradable films.

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Plastic waste remains a major environmental challenge due to its environmental persistence and the release of microplastics, which may negatively affect human health, wildlife, and ecosystems. Consequently, increasing attention is being paid to the development of biodegradable materials for active food packaging. Active packaging systems are designed to extend the shelf life of food products and maintain their quality by releasing or absorbing selected compounds within the package environment. Such systems may also help reduce the growth of foodborne microorganisms responsible for food spoilage and potential safety risks.

The aim of this study was to develop biodegradable antimicrobial films containing selected antimicrobial agents, including nisin, natamycin and the conventional preservative potassium sorbate (E202). Antimicrobial systems were prepared using polycaprolactone (PCL), polylactide (PLA), and alginate-based hydrogels as carrier matrices functionalized with these compounds. The materials were evaluated for antimicrobial activity, inhibition of biofilm formation, mutagenic potential, phototoxicity and biodegradation under soil conditions. The developed systems showed strong antibacterial activity and limited antifungal effects. Significant inhibition of biofilm formation confirmed their antimicrobial functionality. No mutagenic potential was detected, suggesting a favorable safety profile. Biodegradation studies revealed matrix-dependent behavior, with alginate-based materials degrading considerably faster than PCL-based systems. These findings demonstrate the potential of antimicrobial-agent-functionalized biodegradable materials as sustainable active packaging solutions. Their selective antimicrobial activity, safety, and biodegradability make them promising candidates for future food-packaging applications. However, further in vivo studies are required to assess cytotoxicity and support practical implementation.

Results for potassium sorbate-containing materials are still ongoing; nevertheless, preliminary data indicate promising antimicrobial activity and acceptable phytotoxicity profiles.

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Sciforum-197209: From Citrus Processing Residues to Functional Edible Coatings: Waste-Derived Pickering Systems for Sustainable Food Packaging and Fresh-Cut Fruit Preservation.

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Fresh-cut fruits are highly susceptible to moisture loss, microbial contamination, and rapid quality deterioration during storage, creating an increasing demand for sustainable packaging technologies that can enhance product stability while reducing reliance on synthetic materials. In this study, citrus processing residues, including orange peels and fruit pomace, were valorised as a source of pectin for the development of plant-based Pickering emulsions designed for edible coating applications. Extracted pectin was modified using high-power ultrasound to tailor its physicochemical characteristics and improve its interfacial functionality. The treatment enhanced the amphiphilic nature of the biopolymer, favouring its adsorption at oil–water interfaces and enabling its use as an effective particle-stabiliser.

Modified pectin was combined with varying concentrations of zein to generate polysaccharide–protein complexes capable of stabilising concentrated oil-in-water Pickering emulsions. The influence of zein incorporation on interfacial behaviour, microstructure, antioxidant activity, colloidal stability, and rheological properties was systematically investigated. The resulting complexes promoted the formation of more homogeneous emulsion systems with improved droplet stabilisation, enhanced resistance to creaming, increased emulsifying performance, and greater antioxidant capacity. Microscopic observations revealed the formation of dense protective layers surrounding oil droplets, while rheological analyses demonstrated viscoelastic and shear-thinning behaviour indicative of stable, interconnected structures.

Selected emulsions were subsequently applied as functional edible coatings to fresh-cut pineapple for evaluating shelf-life extension and fruit quality maintenance. Coated samples exhibited lower weight loss, reduced microbial growth, and delayed quality deterioration compared with uncoated controls, successfully extending shelf-life by up to four days and demonstrating their potential as active packaging systems for fresh-cut produce.

Overall, this work presents an innovative approach for transforming fruit processing by-products into high-value coating materials that simultaneously contribute to food waste valorisation, packaging sustainability, and shelf-life extension. The developed Pickering emulsions offer a promising strategy for advancing circular food packaging solutions within sustainable food systems.



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Sciforum-197259: Edible Coatings Enriched with Extracts from *Fucus spiralis* and *Limnospira* sp. for Sustainable Postharvest Preservation of Strawberries

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The development of sustainable preservation technologies is increasingly important for reducing postharvest losses of highly perishable fruits. This study investigated alginate-based edible coatings enriched with bioactives extracted from the marine macroalga *Fucus spiralis* and the microalga *Limnospira* sp. and evaluated their effectiveness in maintaining strawberry quality during refrigerated storage at 10 °C over 10 days. The coatings (2% w/v alginate) incorporated bioactive-rich extracts (0.25% w/v) combined with polysaccharide- or protein-rich fractions (0.5% w/v), obtained through environmentally friendly extraction processes (e.g. 90% hydroethanolic maceration assisted by ultrasound, and 300 W microwave hydrodiffusion and gravity-assisted extraction). Quality parameters including weight loss, color stability (hue and chroma), antioxidant capacity (ABTS and DPPH assays), total phenolic content (TPC), antimicrobial activity, and overall fruit deterioration were monitored throughout storage.

Both algae-derived formulations contributed to delaying quality degradation compared with uncoated fruit. Antioxidant activity in coated strawberries declined during storage but remained measurable throughout, with ABTS values decreasing from 20.78±2.04 to 13.24±0.57 μmol TE/100 mg DW for *Limnospira* and from 21.43±0.90 to 12.88±0.39 μmol TE/100 mg DW for *Fucus spiralis*, and DPPH values declining from 7.12±0.05 to 4.07±0.22 μmol TE/100 mg DW for *Limnospira* and from 9.18±0.66 to 4.76±0.48 μmol TE/100 mg DWfor *Fucus spiralis* over 10 days, despite a general reduction in TPC of 21.2% for *F. spiralis* and 29.8% for *Limnospira*. Microbial analyses revealed that coatings containing *Fucus spiralis* or *Limnospira* sp. extracts offered only moderate protection against spoilage fungi, yeasts, and bacteria, with performance varying between formulations; in some cases, microbial proliferation was not fully suppressed.

Although the preservation performance differed between the algae-derived formulations and a comparator exhausted olive pomace-based coating, the incorporation of *Fucus spiralis* and *Limnospira* sp. extracts demonstrated the potential of marine biomass as a renewable source of functional ingredients for edible coatings. These findings support the valorization of algal resources in sustainable food-packaging and in extending the shelf life of fresh produce.



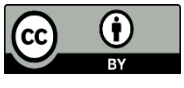
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Sciforum-197551: Valorization of Mediterranean Aromatic Plants for the Production of Functional Films for Food Applications

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The growing concern about the environmental impact of petroleum-based plastics has intensified the search for sustainable alternatives in food packaging. In this context, active biodegradable films incorporating plant-derived bioactive compounds have attracted considerable attention as materials to improve food quality. This study investigated the potential of using extracts from six Mediterranean Diet herbs – mint, coriander, rosemary, basil, thyme, and oregano – in functional food packaging films. Extracts were prepared using a natural deep eutectic solvent (NADES) of choline chloride and lactic acid (1:2) and compared with methanol. The extracts were evaluated for total phenolic and rosmarinic acid contents and antioxidant capacity using ORAC and ABTS assays. In parallel, the film-forming performance of various biopolymers, including sodium alginate, chitosan, methylcellulose, carboxymethylcellulose, hydroxyethylcellulose, hydroxypropylcellulose, gelatin, soy protein, and carob germ, was evaluated. The resulting films were characterized in terms of their optical properties, water swelling behaviour, puncture resistance, rheological properties, and antioxidant capacity. NADES was consistently more efficient than methanol, yielding 1.4- to 6.6-fold higher total phenolic contents. Oregano showed the highest values, reaching 90.11 ± 1.67 mg_{GAE}/g_{DW}, with antioxidant capacities of 132.71 ± 1.10 and 371.73 ± 1.53 mg_{TE}/g_{DW} by the ABTS and ORAC assays, respectively. Among the biopolymers evaluated, hydroxyethylcellulose exhibited the best overall performance, producing transparent, flexible, and structurally stable films. Incorporation of plant extracts into hydroxyethylcellulose films increased antioxidant capacity in a concentration-dependent manner, reaching a 3.8-fold enhancement at 50% (w/w, based on dry polymer weight), without significantly compromising mechanical behaviour. These findings highlight NADES-assisted extraction of Mediterranean herbs combined with hydroxyethylcellulose as a promising and environmentally friendly strategy for developing active food packaging materials. Future studies will evaluate the antimicrobial efficacy and performance of these films in real food systems to assess their potential for extending shelf life.



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Sciforum-197637: Waste to packaging: Novel Edible Films from Whey-Derived Microbial Protein incorporated with cellulose

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The development of sustainable packaging materials from renewable resources has attracted increasing attention as an alternative to conventional petroleum-based plastics. In this study, single-cell protein (SCP) obtained through the biotechnological valorization of cheese whey, the major byproduct of the dairy industry, was utilized as the primary biopolymer for the production of novel edible films. To enhance the physicochemical properties of the films, cellulose was incorporated at concentrations of 0.3, 0.5, 0.7, and 1.0% (w/w).

The effect of cellulose addition on film properties was evaluated through physicochemical and mechanical characterization. Results demonstrated that cellulose significantly influenced film performance. In particular, elongation at break increased substantially with cellulose incorporation, reaching values up to eight times higher than the control at 0.7% cellulose, indicating improved flexibility and mechanical behavior. Furthermore, the incorporation of 0.3% cellulose significantly reduced water vapor permeability, suggesting enhanced barrier properties against moisture transfer. These findings indicate that cellulose incorporation can effectively tailor the functionality of SCP-based films and improve their suitability for food-packaging applications.

The most promising formulations will be further evaluated as packaging materials for bakery products. Ongoing studies include the assessment of biodegradation behavior under soil conditions and the monitoring of gas composition (O_2 and CO_2) within packaged food systems in order to investigate package performance and environmental sustainability. Overall, the proposed approach combines dairy byproduct valorization with the development of biodegradable packaging materials, contributing to circular economy strategies and sustainable food packaging solutions.



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Sciforum-197857: Translational Application of Chia (*Salvia hispanica*) and Nopal (*Opuntia ficus-indica*) Mucilage-Based Edible Coatings for the Postharvest Preservation of Cherry Tomato and Carrot

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Introduction: Postharvest losses (~23%) arise from physicochemical and microbial decay. Edible biopolymer coatings offer sustainable alternatives to synthetic waxes, yet their efficacy depends critically on water-vapor permeability (WVP) and water activity (aw). This translational study formulated coatings from chia and nopal mucilages, with/without Isomalt as a matrix modifier/aw reducer, for climacteric (cherry tomato) and non-climacteric (carrot) produce. Methodology: Five groups (control, Chia, Chia+Isomalt, Nopal, Nopal+Isomalt) were stored at 25±1 °C/65±5% RH for 15 days. Films were characterized for barrier properties; weight loss (WL), TSS (°Brix), pH, and titratable acidity (TA) were monitored every 3 days and analyzed via two-way ANOVA/Tukey's ($p < 0.05$). Results: Isomalt reduced nopal film WVP by 32% ($p < 0.05$) via hydrogen-bond networking, unlike chia films which exhibited structural micro-fractures and higher hygroscopicity. In vivo, Nopal+Isomalt outperformed all treatments, restricting tomato WL to 5.2±0.3% (control: 15.7±0.6%), maintaining TA (0.48±0.02% vs. 0.31±0.03%) and pH (4.1±0.1). For carrots, WL was 8.3±0.4% (control: 22.5±1.1%), with stable pH (6.1±0.1). TSS remained stable at 5.9±0.2 °Brix (tomato) and 7.2±0.3 °Brix (carrot), versus control fluctuations $>$±2.0 °Brix ($p <$ 0.05). This high stability indicates an effective reduction in the respiration rate and metabolic carbon consumption of the treated tissues. Synergy arises from nopal's galacturonic acid (enhancing continuity) and Isomalt's aw-depression, improving moisture/O2 barriers without sacrificing transparency. Conclusion: Tailoring nopal mucilage with Isomalt effectively delays senescence and moisture loss across distinct metabolic models, validating its scalability as an eco-friendly postharvest technology with translational supply-chain applications. Furthermore, these bio-polymeric systems demonstrate an outstanding potential to replace commercial synthetic coatings, representing a viable, high-throughput, and cost-effective strategy to mitigate agricultural economic losses while strictly preserving fresh-like organoleptic attributes during retail distribution.



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Sciforum-197894: From Laboratory Films to Food-Contact Packaging: A PRISMA 2020 Systematic Review and Translational Maturity Assessment of Bacterial Cellulose/Nanocellulose

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Introduction: Bacterial cellulose and bacterial nanocellulose (BC/BNC) are increasingly investigated as functional components for active and sustainable food packaging, as reinforcing phases, coatings, barrier layers, and carriers of antimicrobial, antioxidant, or freshness-indicator compounds. However, sustainability claims based on bio-based origin, biodegradability, or waste-derived substrates do not demonstrate food-contact safety, scalability, or regulatory readiness. This review asked which evidence domains remain missing for BC/BNC systems to progress from laboratory films to transferable food-packaging technologies.

Methods: A PRISMA 2020 systematic review was integrated with bibliometric mapping and translational maturity assessment. English-language Scopus records published between 2015 and 2025 were screened using terms related to bacterial cellulose, bacterial nanocellulose, food packaging, active and intelligent packaging, films, coatings, and food-contact safety. Original articles supported the technical-evidence synthesis, while reviews informed contextual mapping and gap interpretation. The assessment considered thematic prominence, patent-family links, policy citations, Sustainable Development Goal labels, and validation gaps.

Results and Discussion: The corpus comprised 383 documents: 325 original articles and 58 reviews. Research was dominated by active films and coatings, antimicrobial/antibacterial activity, antioxidant capacity, barrier performance, freshness indicators, and shelf-life extension. In contrast, translational evidence was limited. Among 190 publications in journals ranked in the top 10% by CiteScore, only 19 were linked to patent families and 6 were cited in policy documents. Underreported domains included migration, non-intentionally added substances, substrate-derived contaminants when waste feedstocks are used, residual processing aids, oral-exposure safety, real-food storage under relevant humidity or temperature conditions, heat sealability, life-cycle assessment, techno-economic evaluation, pilot-scale processing, and industrial validation.

Conclusions: BC/BNC is functionally promising at laboratory scale, but not yet translation-ready as a food-contact packaging technology. Future studies should report a structured core translational evidence package integrating migration, safety, real-food performance, quantified sustainability, cost, scalability, substrate traceability, and regulatory acceptance.



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Sciforum-198034: Storage Stability Assessment of Apple (*Malus domestica* L.) in Response to Different Edible Coatings

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Post-harvest losses remain a major constraint affecting the marketability of the fresh apples. The present study was undertaken to check the efficacy of various edible coating formulations in storage stability assessment of apple fruits. The fruits were coated with gelatin-Aloe vera, chitosan-carnauba wax, and Fomesa wax at different levels. Coated Fruits along with uncoated fruits as control were kept at ambient temperature (25 ± 1 °C) and subsequently evaluated for their physico-chemical & physiological attributes at regular intervals. The vital quality parameters, such as weight loss, surface fracture, firmness, colorimetric values, pH, total soluble solids, titratable acidity ascorbic acid, total phenolics, total flavonoids, DPPH radical scavenging activity, respiration rate, and ethylene production were determined during the course of three months. The control fruits showed rapid deterioration and poor storage stability as compared to coated fruits. Coated fruits delayed the onset of senescence at varying degrees during storage. Overall results showed Fomesa Wax application found to be premium choice due to optimal shelf life extended upto 90 Days. Fruits coated with Fomesa wax effectively preserved fruit firmness (6.95 N), colour characteristics (L*75.02, a*11.22,b*21.45), titratable acidity (0.7 %), total soluble solids (12.72 ^{o}brix) and Radical scavenging activity (46.64 %) . It also maintained lowest weight loss (3.56 %), respiration rate (20.68 mg CO_2 kg^{-1} s^{-1}) and ethylene production (9.02 µLC_2H_4 kg^{-1} h^{-1}) till the end of storage. In addition, considerable retention of above mentioned physico-chemical attributes were also found in chitosan-carnauba wax and gelatin-aloe vera coated fruits which stayed edible upto 84 Days. The extended storage life in coated fruits is attributed to their associated barrier properties which reduced weight loss, respiration rate and ethylene production. Edible coating application is found to be low-cost, environmentally friendly and can easily be disseminated at farmer-door steps to reduce post harvest losses.



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Sciforum-198121: Development of Natural-Source Antimicrobial Systems for Extending the Shelf Life of Table Olives During Packaging

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The OLIVEPACK project aims to develop a new packaging for table olives that ensures microbiological safety under reduced sodium chloride content without chemical preservatives while extending shelf life. To achieve this, sustainable materials and natural bioactive compounds are integrated into functional inserts designed for the gradual release of natural antimicrobial agents during packaging.

Among the compounds evaluated, hydroxytyrosol was selected due to its superior performance. This bioactive phenolic compound, obtained from olive processing wastewater, was chosen for its strong antimicrobial activity, natural origin, and suitability for direct food-contact applications. In addition, naturally occurring aluminosilicate clay halloysite nanotubes were selected as carrier systems due to their tubular morphology, high specific surface area, and intrinsic ability to encapsulate and provide sustained release of active compounds. Hydroxytyrosol-loaded halloysite nanotubes were incorporated into cellulose-based bionanocomposite foams, serving as sustainable active packaging inserts. The renewable and biodegradable cellulose matrix supports the integration of the nanocarriers and the controlled release of hydroxytyrosol, creating a material for active food packaging applications.

Subsequently, this methodology was evaluated to characterize its antimicrobial efficacy both *in vitro*, using agar-contact assays and bacterial viability measurements, and in packaged table olives through microbial challenge tests against spoilage and foodborne bacteria. The foam effects were fitted using nonlinear regression methods. Hydroxytyrosol-loaded foams exhibited significantly enhanced antibacterial activity *in vitro* compared with unloaded cellulose foams. Foam-treated samples reduced bacterial populations to below 1 $\log_{10}$ CFU after 48 h, whereas untreated controls remained at approximately 1.3–3.3 $\log_{10}$ CFU, depending on the microorganism. Although the antimicrobial effect varied with the formulation and target microorganism, further optimization is required. In particular, reducing antimicrobial reagents during foam preparation is necessary because their inherent antimicrobial activity masks the specific contribution of hydroxytyrosol, limiting the assessment of its full potential as a natural protective compound.



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Sciforum-198134: Evaluating the storage stability of snail meat powders from *Cornu aspersum*

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Snail meat is a cherished delicacy in both African and European cuisines, known for its unique flavor, high protein, and low fat content. The utilization of snail meat powder broadens the field of food applications potentially boosting the acceptability and widening the market by increasing product's shelf-life. However, traces of lipids and chemical composition may induce chemical destabilization during storage and affect its final quality. Therefore, this study aims at assessing the influence of storage temperatures on the chemical stability of freeze-dried meat of *Cornu aspersum*, a species frequently consumed in the Mediterranean region.

Fourier transform infrared (FTIR) spectroscopy, combined with generalized-2D correlation (g-2D-COR) analysis, determination of TBARS values and fatty acid profile were employed to investigate time-induced changes in freeze-dried snail meat (SM) and freeze-dried snail meat without mucus (SMWM) during a 3-month storage period at -18, 4, and 25 °C. Even though both preparations had low fat contents, vibrations associated with lipid oxidation were successfully unveiled using g-2D-COR. The region around 1711–1739 cm^{-1} (carbonyl ester bonds/peroxidation products), initially absent in standard FTIR spectra, was revealed to change dynamically across all samples. Storage triggered an increase in TBARS values and a decrease in polyunsaturated fatty acids. The observed degradations were more pronounced at 4 °C and -18 °C than at 25 °C. Throughout the study, SM exhibited drastically higher susceptibility to oxidation, whereas SMWM demonstrated exceptional oxidative stability across all conditions, indicating the need of prior mucus removal. While SM experiences significant polyunsaturated fatty acid degradation and elevated TBARS values, particularly at 4 °C and -18 °C, SMWM remains highly resistant to lipid oxidation under all conditions. Furthermore, the integration of FTIR spectroscopy with g-2D-COR analysis successfully unmasked subtle, time-induced lipid transformations, proving to be a highly sensitive methodology for quality control in high-added-value dehydrated food matrices.



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Sciforum-198180: Performance of Novel Bio-based Absorbent Pads for Meat Packaging Applications

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Introduction - The accumulation of exudate in fresh meat packaging promotes deterioration and reduces product acceptability. This study aimed to develop bio-based absorbent pads incorporating grape stem extracts (GSE) and evaluate their exudate absorption performance in preserving meat quality during refrigerated storage.

Methods - GSE was obtained by ultrasound-assisted extraction (4 g/20 mL, ethanol:water 50:50, 15 min, 25 °C), followed by solvent removal and freeze-drying. Absorbent pads were produced from microcrystalline cellulose using a NaOH/glycerol system, resulting in final cellulose, NaOH, and glycerol concentrations of 5, 8, and 0.5 g/100 g, respectively. The pads were enriched with GSE by surface application (0.5 g/pad), followed by storage at 4 °C for 24 h and subsequently washed to remove non-incorporated extract residues. Chicken breast samples (≈20 g) were packaged in plastic trays with pads (with and without extract), sealed with film, and stored at 4 °C for 9 days. Mass transfer was evaluated through weight variation of meat and pads, while colour parameters (L*, a*, b* and and ΔE) were determined using a colorimeter on the meat surface in direct contact with the absorbent pad.

Results and Discussion - GSE-enriched pads retained exudate throughout storage, reaching a weight gain of 8.30% at day 9. In addition, samples with GSE-enriched pads showed improved colour stability, with lower b* (18.44 vs. 20.03) and ΔE (8.70 vs. 10.09) values than samples without extract. These effects may be attributed to the presence of phenolic compounds, which have been widely associated with the inhibition of oxidative reactions in meat systems.

Conclusions – The exudate retention and improved colour stability observed in GSE-enriched pads may contribute to meat quality preservation. These findings demonstrate that agricultural by-products can be successfully integrated into absorbent pads, enhancing the functionality of sustainable packaging materials.



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Sciforum-198195: Impact of Bioactive Absorbent Membranes on Spoilage Indicators and Shelf-Life of Refrigerated Meat

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Introduction - Active packaging systems incorporating natural bioactive compounds have emerged as a promising strategy to control microbial growth and delay spoilage in fresh meat products. This study aimed to evaluate the effect of cellulose-based absorbent pads enriched with grape stem extract (GSE) on microbial growth and spoilage indicators of refrigerated poultry meat.

Methods - Grape stem extract (GSE) was obtained by ultrasound-assisted extraction (4 g/20 mL, ethanol:water 50:50, 15 min, 25 °C), followed by solvent removal and freeze-drying. Absorbent pads were produced from microcrystalline cellulose using a NaOH/glycerol system, resulting in final cellulose, NaOH, and glycerol concentrations of 5, 8, and 0.5 g/100 g, respectively. The pads were enriched with GSE by surface application (0.5 g/pad), followed by storage at 4 °C for 24 h and subsequently washed to remove non-incorporated extract residues. Chicken breast samples (≈20 g) were packaged in plastic trays with pads (with and without extract), sealed with film, and stored at 4 °C for 9 days. Spoilage was monitored through pH, total aerobic mesophilic counts, and total volatile basic nitrogen (TVB-N) analyses.

Results and Discussion - GSE-enriched pads reduced spoilage development during storage, resulting in lower TVB-N values at day 9 (20.26 vs. 29.07 mg/100 g) and a lower pH (5.99 vs. 6.22) than cellulose pads. While no significant differences were observed in mesophilic counts at the end of storage, the reduced accumulation of volatile nitrogen compounds suggests that grape stem phenolics delayed spoilage-related biochemical changes in poultry meat.

Conclusions – The incorporation of grape stem extract into cellulose-based absorbent pads contributed to delaying spoilage of refrigerated poultry meat. These findings demonstrate the potential of agro-industrial by-products as functional ingredients in sustainable active packaging systems.



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Sciforum-198312: Effect of chitosan coatings with putrescine on the postharvest quality of oranges during storage at chilling temperatures

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The application of edible coatings (EC) is an important area of postharvest research aimed at controlling the ripening and senescence of fruit and vegetables. Citrus fruits are among the most important crops worldwide; however, their quality deteriorates during postharvest and they are susceptible to developing chilling injury (CI) when stored at 2 °C. At present, the combination of chitosan (CTS) with putrescine (PUT) has not been evaluated as an alternative strategy to delay quality losses in 'Valencia Late' oranges during 90 days of storage at 2 °C followed by 2 days at 21 °C. Specifically, the effect of postharvest application of different EC based on 1% CTS and PUT at two concentrations (0.1 and 5 mM) was assessed on weight loss, respiration rate, ethylene production, physicochemical quality, CI incidence, and total phenolic content in both peel and juice. The results showed that the EC containing CTS + PUT 0.1 mM significantly delayed weight loss and fruit softening from 30 and 60 days of storage, respectively. In addition, this coating significantly reduced respiration rate, ethylene production, and CI incidence. At a functional level, oranges treated with CTS + PUT 0.1 mM exhibited significantly higher total phenolic content in both peel and pulp compared with the other treatments evaluated. Furthermore, all coatings based on CTS and PUT delayed colour loss after 90 days of storage compared with the control. Total soluble solids content was significantly lower in treated oranges compared with the controls, although total acidity was significantly increased by these treatments. However, oranges treated with CTS + PUT 5 mM showed the greatest weight loss, as well as a significant increase in respiration rate and CI incidence scale. In conclusion, the CTS + PUT 0.1 mM coating could be an effective postharvest tool to delay quality losses in oranges during cold storage.



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Sciforum-198521: Front-of-Package Nutrition Labelling for Child-Targeted Foods: A Systematic Review of Caregiver-Mediated Decision Outcomes and Evidence Certainty

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Introduction: Front-of-package nutrition labelling (FOPL) aims to support healthier food choices, but its effectiveness for foods and beverages marketed to children remains uncertain because purchasing and feeding decisions are largely caregiver-mediated.

Methods: This systematic review followed PRISMA 2020 and a registered protocol (PROSPERO CRD420251117263). Five databases and BASE were searched to 31 July 2025. Eligible studies assessed interpretive or non-interpretive FOPL for packaged foods/beverages marketed to or selected for children aged 0-12 years and/or caregivers. Risk of bias was appraised with JBI tools; certainty was assessed using GRADE and GRADE-CERQual. Because of heterogeneity, findings were synthesized narratively and by direction of effect.

Results and Discussion: Thirty-nine studies were included: 18 RCTs, 5 quasi-experimental, 6 cross-sectional and 10 qualitative studies. Evidence was most consistent for perceived healthfulness and intention-related outcomes. In FOPL versus no-label comparisons, all classifiable effects favoured FOPL for product purchase (6/6), product selection (11/11), perceived healthfulness (14/14), purchase intention (4/4), intention to serve/consume (5/5), label attention (2/2) and comprehension (1/1), whereas nutritional-profile outcomes were less consistent (7/9). Warning labels showed the clearest pattern, particularly for discouraging selection or intended purchase of less healthy products. Comparisons between label formats suggested advantages for more interpretive or warning-based formats, but heterogeneity limited claims of universal superiority. Educational components tended to favour FOPL conditions, although certainty was very low. Qualitative evidence indicated that FOPL can act as a simple heuristic for caregivers but is shaped by comprehension, price, time constraints and marketing cues.

Conclusions: FOPL may support early stages of caregiver-mediated food-choice pathways, especially healthfulness judgement and purchase intention, but sustained nutritional impact remains uncertain. Child-relevant labelling policies should prioritize interpretive clarity, contextual fit and real-world longitudinal evaluation.

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Sciforum-198550: Sustainable Packaging for Extra Virgin Olive Oil: A Comparative Shelf-Life Study

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The ability of ultraviolet-absorbing glass (UVAG) and 100% recycled green polyethylene terephthalate (rPET) bottles to preserve the quality of six blended Italian extra-virgin olive oils (EVOOs) was investigated over 12 months of simulated commercial storage (25 °C, 12 h/day light exposure). Samples from both UVAG and rPET bottles were collected at 30-day intervals and analysed for regulatory quality indices (free acidity, peroxide value, K_{232}, K_{270} and ΔK), antioxidants, volatile compounds and sensory characteristics. The resulting chemical and sensory dataset was further explored using multivariate statistical analysis. At the start of storage, all EVOOs met the regulatory standards for the "extra-virgin" category. Free acidity remained substantially unchanged throughout 12 months, whereas K_{232} values consistently remained below the legal limit. In contrast, K270 and ΔK, markers of secondary oxidation, increased progressively, although regulatory thresholds were exceeded earlier in EVOOs stored in rPET than in UVAG bottles. Storage also induced a gradual depletion of total hydrophilic phenols and α-tocopherol, together with significant changes in the volatile profile, including a decrease in lipoxygenase-derived C_5–C_6 aldehydes and alcohols, responsible for fruity and green sensory notes, and an increase in oxidation-related C_7–C_{10} aldehydes, associated with rancid off-flavour. Multivariate statistical analysis showed that EVOO compositional differences were the primary source of variability, followed by storage time, while the effect of packaging became more evident as storage time increased. Overall, these findings highlight the potential of 100% recycled green rPET for EVOO packaging as a sustainable solution combining preservation performance comparable to UVAG glass with improved environmental and economic sustainability.



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Sciforum-200313: Risk-Based Assessment of PFAS in Food Contact Packaging Using Packaging Component and Supplier Risk Indicators

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The implementation of PFAS restrictions under the Packaging and Packaging Waste Regulation (PPWR) in Europe requires manufacturers, retailers, and packaging suppliers to assess large numbers of food contact packaging materials within short timeframes. As comprehensive analytical testing of all packaging components is not feasible, risk-based approaches are needed to prioritise testing and compliance efforts.

This study builds on a previously published PFAS risk assessment methodology (Wack et al., 2026; Foods 15, 1183) and extends it by integrating supplier-based risk indicators, a generic analytical testing strategy, and an updated risk ranking of packaging components. The approach was applied to a dataset of commercial food packaging systems covering different materials, formats, and components.

Packaging components were classified into risk categories based on PFAS-related applications, functional requirements, material composition, and manufacturing processes. Supplier-related indicators included compliance documentation, PFAS declarations, analytical data, supply-chain transparency, geographical sourcing, and previous compliance information. A tiered testing strategy aligned with European Commission principles links risk categories to verification levels ranging from documentation review to targeted PFAS analysis, total fluorine screening, and confirmatory testing, ensuring prioritisation of high-risk systems.

The results demonstrate that PFAS-related risks in packaging systems are influenced by both material-specific characteristics and supply-chain-related factors. Significant differences in PFAS risk potential were identified among packaging components, with the highest risk categories associated with recycled materials, grease-resistant and barrier-treated paper and board materials or coatings and selected functional additives. However, a purely material-based classification is insufficient to fully capture the overall PFAS risk of a packaging system. While material properties and intended applications provide important indicators of potential PFAS relevance, the actual risk is also influenced by raw material origin and composition, manufacturing processes, use of additives and processing aids, and implemented quality control measures. Supplier- and supply-chain-related information therefore represents a critical complementary dimension, as differences in transparency, compliance documentation, PFAS declarations, analytical data, and material traceability can lead to different risk profiles for comparable materials.

Overall, the findings demonstrate that combining material- and supplier-specific information improves the identification of packaging systems requiring analytical verification and supports efficient PFAS risk management under PPWR through prioritised testing and targeted resource allocation.



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Sciforum-200907: Shaping the Future of Food Packaging: Behavioral Insights into Plastic Packaging Decisions in the UK Fast-Moving Consumer Goods (FMCG) Sector

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Plastic packaging remained one of the most significant environmental challenges in the UK. Sustainable packaging research had advanced alongside growing environmental awareness and increasingly stringent regulatory initiatives. Despite consumers' willingness to reduce waste and support recycling, the majority of products continued to be packaged using fossil-based plastics. This study investigated the factors contributing to this gap by examining how consumers made decisions regarding food packaging. A purposive sample of 200 UK consumers was recruited for the study. Data were collected through semi-structured interviews to explore the influence of price, information availability, taxation, and product accessibility on packaging choices. Participants provided informed consent prior to participation, and data confidentiality was maintained throughout the research.

The study further explored the reasons consumers gave for adopting or avoiding sustainable food packaging alternatives. The reasons supporting adoption included environmental responsibility, social influence, long-term cost savings, and perceived product quality. In contrast, the reasons against adoption included higher costs, inconvenience, limited availability, and scepticism towards environmental claims. The findings identified the key factors influencing sustainable food packaging decisions, as well as the barriers that hindered their adoption. These findings provided practical recommendations for policymakers and manufacturers to develop effective strategies that promote sustainable food packaging and support the UK's transition towards more environmentally responsible packaging practices in the fast-moving consumer goods sector.



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Sciforum-201559: Effect of Packaging Material on the Color Stability of Refrigerated Mandarin Juice During Storage

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Introduction: Color is a key quality attribute of mandarin juice, influencing consumer perception of freshness and product acceptability. The bright orange color is mainly associated with carotenoid pigments, which can be affected by storage conditions and packaging barrier properties. This study evaluated the effect of different packaging materials on the instrumental color stability of refrigerated mandarin juice during storage.Methods: A batch of 100 packaging units per treatment was used. Mandarin juice was packed in three non-transparent multilayer cartons with contrasting inner barrier layers (aluminum foil or ethylene vinyl alcohol copolymer, high to intermediate oxygen barrier) and in a transparent, light-permeable PET bottle (lower barrier), and stored at 4°C for 6 days, consistent with the shelf life reported for non-thermally treated refrigerated citrus juice. Instrumental color (L*, a*, b*, C*, hab) was measured periodically during storage (six replicates), and visible reflectance spectra (400-700 nm) assessed yellow-orange-red region changes. Data were analyzed by ANOVA and Tukey's test ($P<0.05$).Results: Packaging material significantly affected ($P < 0.05$) the chromatic stability of refrigerated mandarin juice. All samples showed a progressive decrease in L*, a*, b* and C* values, indicating darkening, loss of reddish-orange intensity, and reduced vividness. High-barrier cartons showed significantly better preservation of the initial orange color than lower-barrier materials. Transparent, light-exposed PET showed the greatest deterioration, with the lowest L* and C* values and a higher total color difference (ΔE*) than the best-performing carton by the end of storage. Reflectance spectra confirmed a greater loss of color intensity in the orange-red region for juices packed in less protective materials.Conclusions: Packaging material selection is critical for maintaining color quality in refrigerated mandarin juice. High oxygen- and light-barrier packaging (e.g., aluminum-foil-lined cartons) best preserved the bright orange color and reduced chromatic degradation during storage.



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Sciforum-202728: Effects of storage temperature and packaging type on the postharvest quality of finger lime (*Citrus australasica*)

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Finger lime (*Citrus australasica* F.Muell) is a native Australian citrus species with increasing commercial value because of its unique sensory and nutritional properties. However, like other citrus species, it is highly perishable and susceptible to postharvest quality deterioration. Despite its growing importance, limited research has examined how commercial packaging and storage temperature affect its quality. Therefore, this study investigated the cumulative impact of three commonly used types of packaging (net bags, recycled polyethylene terephthalate (rPET) punnets, and moulded cardboard clamshells) and three storage temperatures (room temperature ((RT), ~25 °C), 8 °C, and 4 °C) on finger lime quality over 56 days. Quality parameters, including weight loss, firmness, colour, visual appearance and overall marketability, total phenolic content, total flavonoid content and antioxidant capacity, were examined. Packaging and temperature both significantly affected fruit marketability. At room temperature, no visible fungal growth was observed; however, all fruit became unsaleable after approximately 10 days due to shrivelling and desiccation. Fruit stored at 4 °C retained firmness, colour, contents of phenolics and flavonoids, and antioxidant capacity better than fruit stored at 25 or 8 °C; however, chilling injury and fungal growth developed and approximately 20% of the fruit in each packaging treatment were unsaleable by week 8. At 8 °C, no chilling injury, visible fungal growth, or shrivelling was observed, but approximately 60% of fruit in cardboard clamshells and net bags were classified as unsaleable due to loss of freshness, whereas approximately 80% of fruit in punnets remained saleable until the end of the trial. Overall, storage at 8 °C in rPET punnets provided the best balance between quality retention and marketability compared to the other combinations of packaging types and storage temperatures examined in this study.



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Sciforum-202808: Store to preserve: The impact of different packaging methods on the quality of hazelnuts

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Hazelnuts are rich in unsaturated fatty acid, making them highly susceptible to oxidation, colour deterioration and sensory changes during storage. The effectiveness of preservation depends largely on the package used. This study intended to evaluate the effect of two types of packaging (vacuum-VP, and industrial package-IP), and without packaging (WP), on several physicochemical and sensory properties of three hazelnut cultivars (Grada de Viseu, Tonda di Giffoni, and Butler) through 12 months of storage at 25 °C and 75% relative humidity. Vacuum-sealed packaging was used, and the industrial packaging was carried out at a hazelnut processing company.

The three hazelnut cultivars were collected from the same orchard located in Viseu, Portugal. Physicochemical (colour, water activity, fatty acid composition, and specific extinction coefficients) and sensory analyses by consumers (n = 30) were performed using internationally recognised methods.

For all types of packaging and for the three cultivars, after 3 months of storage, water activity was higher than 0.60, being the samples WP the ones with higher values ($a_w > 0.70$). For the three cultivars, the extinction coefficients at 232 nm (k_{232}) exceed 2.5 (limit associated with rancidity) starting at 6 months for the samples WP, being this observed at 9 and 12 months for IP and VP, respectively. For IP and VP, the fatty acid content remained stable throughout the 12 months of storage, but for the samples WP, at 6 months of storage, it was observed a decrease in linoleic acid. After 9 months, L* decreased for storage WP and the samples stored WP had an unpleasant odour, being this observed for the three cultivars. Furthermore, after 12 months of storage, Tonda di Giffoni samples stored WP were completely spoiled.

Vacuum packaging showed better results, minimizing lipid oxidation, preserving sensory quality, and extending shelf life. The behaviour of the three cultivars was similar for the three packaging materials after one year, with the exception of Tonda di Giffoni at 12 month stored without packaging.



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Sciforum-203195: Packaging evaluation for storage of biscuits with high Jerusalem artichoke content

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Biscuits adequate packaging helps to protect food from humidity, light and oxygen, which can cause degradation, oxidation and rancidity processes that shorten the shelf life of baked products. Jerusalem artichoke is considered as a functional ingredient due to its inulin content, and its incorporation into biscuits can improve their nutritional properties. In this study, the shelf life of biscuits containing 45% Jerusalem artichoke flour (JAF), 5% amaranth flour and 50% whole wheat flour was analyzed. The biscuits were stored in two different packages: polypropylene (PP) and low-density polyethylene (LDPE), at 29±2.6 °C and 40.8±6.5% relative humidity for 14 weeks. The surface density and transmittance (UV-Vis spectrophotometer) of the polymers was analyzed. Biscuits were periodically removed from storage, and humidity, inulin, total phenolic content (TPC) and peroxide values (PV) were determined. The surface density of the polymers was 112.5±0.8 g/m^2 for LDPE and 55.2±1.4 g/m^2 for PP; thus, LDPE was thicker. The maximum transmittance was 91% for PP and 82% for LDPE (700 nm), indicating that PP showed greater transparency than LDPE. The humidity content of the biscuits did not show significant (α=0.05) fluctuations during the study period (4.87±0.44 for LDPE and 5.01±0.61 for PP), indicating proper physicochemical stability. TPC and inulin content decreased during storage, although the decrease was greater for TPC than for inulin. LDPE showed significantly better TPC retention than PP. The PV of the biscuits increased during storage. PP samples (3.31±1.34 mEq peroxide/kg fat) showed significantly higher peroxide values than LDPE (1.21±0.75 mEq peroxide/kg fat). Thus, it can be inferred that LDPE acted as a more efficient barrier to light and oxygen, given its higher surface density and lower transmittance compared to PP. It can be concluded that LDPE packaging can improve the TPC retention and oxidative stability in biscuits containing JAF, under the evaluated storage conditions.



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Sciforum-203284: Smart Spectroscopic and Multivariate Data Analysis Tools for Real-Time Monitoring of Extra Virgin Olive Oil Quality during Storage

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Maintaining the quality of extra virgin olive oil (EVOO) during storage is essential for preserving its nutritional, sensory, and commercial value. This study evaluated the storage stability of 192 EVOO samples from twelve cultivars harvested at green and ripe maturity stages and stored under ambient (25 °C) and accelerated (40 °C) conditions for up to twelve months. Quality evolution was assessed using conventional physicochemical analyses, sensory evaluation, and near-infrared (NIR) spectroscopy (1100–2498 nm) combined with chemometric approaches, including principal component analysis (PCA), ordinary least squares (OLS), and stepwise decorrelation of the variables (SELECT), to identify informative wavelengths and develop predictive models for quality monitoring. Storage significantly affected oxidation indices, phenolic compounds, pigments, and sensory attributes, with deterioration occurring more rapidly under accelerated conditions. Phenolic-rich cultivars, including Royuela, Picual, and Koroneiki, exhibited greater oxidative stability than Hojiblanca, Manzanilla, and Arbequina. The developed NIR models accurately predicted key quality parameters, with R^2 values ranging from 0.94 to 0.98, while successfully discriminating oils according to cultivar, maturity stage, and storage conditions. The spectral region around 2354 nm was identified as a key marker of oxidation, showing progressive absorbance changes associated with peroxide formation and quality deterioration during storage. These results demonstrate that NIR spectroscopy coupled with advanced chemometric analysis provides a rapid, non-destructive, and reliable approach for real-time monitoring of EVOO quality, freshness, and shelf-life, supporting efficient quality control and sustainable olive oil production.



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