Editors:
Gerhard Schleining, Diana Bogueva, Nicola Stanley, Anita Habershuber
GHI (Global Harmonisation Initiative)
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Forword by the President

Dear colleagues, GHI members, and professionals committed to food safety,

It is a great honor to welcome you to the 2nd World Congress of the Global Harmonization Initiative (GHI), a global gathering dedicated to tackling the urgent challenges of food security, safety, health, and sustainability.

The world's food systems face mounting pressure, with rising inequalities in food access, environmental degradation, and growing concerns over safety and nutrition. The time for action is now. Over the next three days, this congress in Rotterdam will serve as a platform for critical discussions, engaging scientists, policymakers, and industry leaders in interactive panels, debates, and solution-driven dialogues.

The congress will explore critical areas shaping the future of food systems, including a special panel discussion on food security and emergency preparedness, focusing on resilience and equitable access to safe nutrition. Sustainable food systems discussions will tackle food waste, environmental challenges, and resource optimization. Health and nutrition will be examined in relation to disease prevention and public well-being, while future foods and innovations - such as emerging technologies, alternative proteins, and novel solutions - will be a key focus. The role of artificial intelligence in food safety will be explored, highlighting its potential for quality control and predictive analytics. Additionally, food law, policy, and regulations will be analyzed to emphasize the importance of harmonizing global standards for transparency and safety across industry.

This congress is not just a conference - it's part of an ongoing movement to transform food systems worldwide. The discussions initiated here will continue beyond these three days, shaping policies, industry practices, and scientific collaboration.

Let today be more than a conversation - let it be a catalyst for progress. Your participation is vital in strengthening food safety frameworks, advocating for transparency, and driving innovation in our shared mission for a healthier, more sustainable future.

Thank you for being part of this journey. Welcome to the 2nd GHI World Congress!

Dr Diana Bogueva
GHI President

Editors:

Gerhard Schleining, Diana Bogueva, Nicola Stanley, Anita Habershuber

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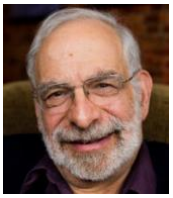

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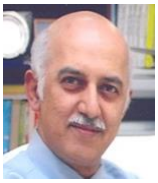


DR. VISH PRAKASH
Chair Best Poster Presentation Award

4. ORAL PRESENTATIONS

SESSION 1: SUSTAINABILITY OF FOOD SYSTEMS

CARLOS DAS NEVES: INVITED LECTURE: THE NEXUS OF FOOD, HEALTH, BIODIVERSITY, WATER AND CLIMATE: CONNECTING THE DOTS WITH A ONE HEALTH APPROACH

EFSA

No abstract

#470 RATU NABILLAH[1,2], AWUH, H.E.[3], FAWZI, N.I.[2,4], APRIANTI, S.E.[2,4], RIJANTA[2]: EXPLORING THE DYNAMICS OF SUPPLY CHAIN SUSTAINABILITY AND RESILIENCE IN THE COCONUT AGRICULTURE: THE CASE OF INDRAGIRI HILIR IN INDONESIA

1 Tay Juhana Foundation, North Jakarta (Indonesia)
2 Gadjah Mada University, Yogyakarta (Indonesia)
3 Utrecht University, Utrecht (Netherlands)
4 IPB University, Bogor, Indonesia
Contact: mailto:ratu@tayjuhanafoundation.org

Introduction, including Problems:

Global food security challenges, including sustainable production, socio-economic equity, resource efficiency, and environmentally friendly practices, require localized strategies for effective solutions. Local food systems encompass not only production-to-consumption chains but also intricate social and environmental networks. In Indragiri Hilir Regency, a key region on Sumatra's eastern coast, these complexities are heightened by suboptimal land conditions, with 86% peatland, and the reliance on water transportation for food production-to-consumption, posing additional challenges to efficiency and sustainability.

Methods, including Purpose:

This study utilizes a systems-thinking approach to examine the complexities of the local food system in Indragiri Hilir. The research adopts the Food and Agriculture Organization (FAO) framework, which highlights four key benefits of an effectively managed local food system: (1) increasing food supply, (2) creating income and employment opportunities, (3) providing social support, and (4) enhancing environmental sustainability. The study identifies several critical challenges through in-depth interviews and participatory Focus Group Discussions.

Results:

High transaction costs, driven by geographical constraints such as shipping and logistical expenses for agricultural inputs, pose significant barriers. Socio-cultural factors, including reliance on intermediaries, heavily influence farmers' decision-making, preferences, and purchasing power. Moreover, limited knowledge among farmers about sustainable land management practices—such as proper input application, seed quality, and pest and disease management—further hampers agricultural productivity. These challenges are compounded by the absence of robust formal and informal institutions to provide support and governance for farmers, highlighting the need for systemic interventions.

Conclusion:

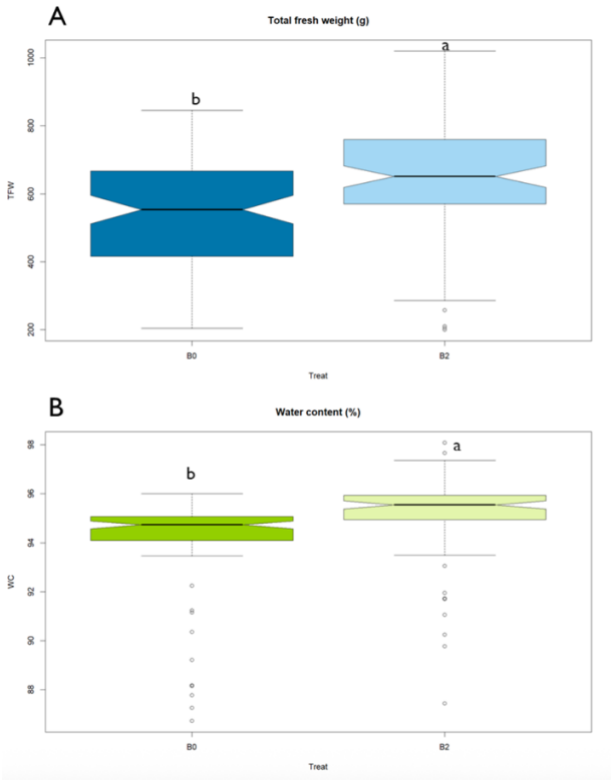
This study concludes that such problems collectively impede the ability of the local food system to achieve its intended benefits. Specifically, these factors undermine the competitiveness of local food supplies against non-local alternatives (2) and limit the capacity of farmers to adopt environmentally sustainable practices (4). Addressing these systemic issues is crucial for unlocking the full potential of the local food system and promoting its long-term sustainability.

#271 ELENA SÁNCHEZ, CARAZO, N., LONGHINI, F., MATAMOROS, V.: USE OF BIOCHAR TO IMPROVE THE SUSTAINABILITY OF THE AGRI-FOOD SYSTEM IN PERI-URBAN AREAS OF BARCELONA

Universitat Politècnica de Catalunya (Spain)

Soil, air and water contamination in peri – urban agriculture are reasons for decreasing production and presence of emerging contaminants in food, compromising the agri-food systems safety. The objective of this research was to study the effect of the use of biochar, a carbon rich product in a conventional farm on the production (total fresh weight (TFW, g) and water content (WC, %) of a lettuce crop for three growing cycles during 2023. These parameters were compared in a control soil without biochar (B0, 100 kg·ha$_{-1}$ nitrogen fertilizer) and a soil with biochar (B2, 10% v/v enriched biochar (70% v/v biochar, 30% v/v eco compost), 70 kg·ha$_{-1}$ nitrogen fertilizer). In addition, the presence of contaminants in irrigation water (composition of organochlorine products, volatile compounds and emerging contaminants) and their presence in lettuce leaves were analysed. Regarding production, B2 obtained a 19.4% increase in TFW and a 1.1% increase in WC, being significantly different compared to the control (p-value 7.4e-05 and 5.2e-09, respectively) (Figure 1). 19 contaminants were detected in the irrigation water, but only one was found above the detection limit, which was carbamazepine. In this case, the concentrations in the lettuces were 0.19 ± 0.11 ng/g fresh weight for B0 and 0.00 for B2. Therefore, biochar has generated an increase in lettuce productivity during the three crop cycles of the year, with a higher fresh weight and water content, and has served as a mitigator of the concentration of contaminant products in lettuces, consequently the use of biochar has improved food safety.

Figura 1. Total fresh weight (A, g) and water content (B, %) of the B0 and B2 treatments. Different letters means significant differences (p-value < 0,05) between treatments.



#366 SZYMON WOJCIECH LARA[1&2], TSIAMI, A.[1], RYAN, P.[2], CROSS, P.[1]: ENHANCING FOOD AND NUTRITION SECURITY THROUGH THE REINTRODUCTION OF FORGOTTEN CROPS INTO MODERN FOOD SYSTEMS: A HOLISTIC APPROACH

[1]*London Geller College of Hospitality and Tourism, University of West London, United Kingdo*
[2]*Royal Botanic Gardens, Kew, London, United Kingdom*

Introduction:

The homogenisation of global food systems has led to significant agrobiodiversity decline. Nearly 90% of today's global food production originates from just 15 crops and many of the minor-crops and traditional varieties have been lost or have diminished from consumer plates. On the contrary, there are at least 7,039 edible plant species, but only around 417 are considered food crops. Many of these *forgotten edibles* have great economic, societal, and sensory potential

and some could be exploited through various innovative gastronomic solutions for increasing food and nutrition security. Diversification of food value chains with forgotten crops is limited due to many value-chain bottlenecks.

Rationale:

Better understanding of the bottlenecks can help to improve sustainability and resilience of food supply chains. This research project is based on a multidisciplinary and holistic mapping of barriers and facilitators to the diversification of the food systems with forgotten edibles.

Methods:

This manuscript is part of a PhD research project run in collaboration with the University West London and the Royal Botanic Gardens Kew and is based on a mixed method approach:

- Archival Searches of UK seedbanks and other databases.
- Semi-structured interviews and document analysis of a UK business case study.

Protocol followed according to Yin, 2018.

- Sensory and Texture Analysis of selected forgotten (*Pisum sativum* L.) varieties and comparison with commercial grade cultivars. *BS ISO 8586:2012 & BS ISO 8586:2014*

Results:

Key areas of concern for reintroduction of forgotten crops include limited access to genetic material at seedbanks, lack of formal recognition by public sector, spontaneous sensory/textural characteristics, unique business models, communication between actors and culinary applicability.

Conclusions:

Appropriate recognition and alignment of unique characterises of forgotten crops by food systems actors is essential for feasible diversification of the food systems for food and nutrition security.

SESSION 2: FOOD SECURITY AND EMERGENCY PREPAREDNESS

#49 JENS KARSTEN: FOOD DEFENCE AND WEAPONISED FOOD

bxl-law (Belgium)

"Food Defence" refers to the measures taken to protect food from deliberate adulteration or tampering for criminal or terrorist purposes.

"Weaponised Food" refers to the deliberate use of food or food supply disruption as a tool of control, coercion, or harm - often in armed conflict, political, or economic contexts.

Food defence addresses the vulnerability of the food and water supply chains to deliberate acts of contamination, particularly by terrorists or criminals. It requires coordinated procedures by food authorities and food businesses to deter, detect, and respond to such threats, functioning as a counterterrorism extension of food safety principles ('Food Defence HACCP'). While the United States formalised food defence through the Bioterrorism Act of 2002, the EU's approach dates back to a 1978 case of food terrorism involving mercury-laced oranges. This event led to the creation of the Rapid Alert System for Food and Feed (RASFF). Despite this early action, food defence remains only partially integrated into EU law, with relevant provisions scattered across legislation on health threats, official controls, and general food law.

Geopolitical tensions and pandemics have renewed focus on food security, prompting, in the EU, the establishment of the European Food Security Crisis Preparedness and Response Mechanism (EFSCM). In March 2025, the "Preparedness Union Strategy" was presented by the European Commission. One of its key agenda points is the development of an "EU Stockpiling Strategy", which goes beyond standard contingency planning for food security and anticipates potential geopolitical conflicts.

#1050 SYLVIA VETTER, TAYLOR, A., GREEN, R., LANCASTER, T, CORNELSEN, L., ARMSTRONG, B., SCHEELBEEK, P., BOYLE, N., BLAKE, M., DONAT, M., KOTZ, M., FALLOON, P., ENGLISH, A., BRINSDEN, H., TOBI, R., FERREE, T., AND SMITH, P.: CLIMATEFLATION: ADAPTATION TO CLIMATE-INDUCED FOOD PRICE SHOCKS IN THE UK

University of Aberdeen (UK)

In recent years, the impacts of climate change on food production have reached alarming levels, leading to devastating consequences globally. Crops essential to the agricultural economy, such as cocoa, olives, and sugar, have experienced unprecedented price surges, driven significantly by severe weather events. For instance, intense droughts and heavy rainfall have disrupted the growing cycles, creating instability in supply and pushing prices to record highs. In the UK, farmers faced a particularly challenging period in 2022, with the highest temperatures ever recorded, which topped 40 degrees Celsius in some areas, combined with extended drought conditions. This extreme heat was followed by the wettest 18-month period on record, characterized by flooding that disadvantaged crop recovery and led to soil erosion. These climatic extremes have severely impacted the harvest of crucial crops, including potatoes, wheat, and barley, as well as staple vegetables like cauliflower and broccoli. The growing season has been increasingly unpredictable, making it difficult for farmers to plan and secure a stable yield. Concurrently, food price inflation has reached crisis levels in the UK, with many households feeling the strain. Many are experiencing food insecurity, making it a challenge to afford nutritious food options.

The Climateflation project aims to assess, for the first time, the extent of recent climate-induced food price shocks on food supplies, prices, and production in the UK. It will utilize innovative methods to quantify the potential impacts of climate change in the future. This research will inform the necessary policies across agriculture, public procurement, and the broader supply chain, enabling better adaptation to these impacts. Ultimately, the goal is to build resilience and mitigate future effects on food prices.

#1607 CHIN-KUN WANG: UN GOODWILL AMBASSADOR MISSION: SAFEGUARDING ZERO HUNGER

Chung Shan Medical University (Taiwan)
International Society for Precision Health

In February 2024, Dr. Chin-Kun Wang, a globally renowned expert in nutrition and public health, was appointed as a United Nations Goodwill Ambassador to champion the UN's Sustainable Development Goal of Zero Hunger.

As the world population surpasses 8 billion, ensuring food security and nutritional well-being has become a critical global challenge. Dr. Wang has dedicated his mission to improving global health by addressing the root cause of poor health outcomes in underserved areas: food scarcity, rather than inadequate medication. Representing the UN, Dr. Wang has visited multiple countries and regions severely affected by hunger to better understand their food supply chains and needs. A key challenge he has tackled is the stringent food safety regulations in developed countries, which often lead to the rejection and destruction of imported foods that are safe for consumption under WHO standards but do not meet local regulatory thresholds. In collaboration with UN agencies, local governments, and stakeholders, Dr. Wang has facilitated the redistribution of such surplus food to regions in need, covering transportation costs through UN initiatives. To date, this program has successfully addressed food shortages in 15 cases, transforming wasted resources into lifesaving nourishment.

#? OKSANA TONKHA: FOOD SECURITY CHALLENGES AND STRATEGIC SOLUTIONS FOR UKRAINE'S EUROPEAN INTEGRATION

National University of Life and Environmental Sciences (Ukraine)

No abstract

#? BETTY FENG, EMERGENCY RESPONSE AND FOOD SECURITY

Purdue University (USA)

No abstract

#1435 INE VAN DER FELS-KLERX: RESILIENCE OF THE FOOD SUPPLY CHAIN TOWARDS FOOD SAFETY SHOCKS

Wageningen Food Safety Research, Wageningen University & Research (Netherlands)
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Introduction:

Worldwide, providing safe food a key topic on the agenda of food industry, policy makers and researchers. The safety of our food is threatened by the potential presence of microbiological, chemical and/or physical hazards. Unsafe food can lead to human health problems, economic losses, food waste and lower food security. Thus prevention and control of food safety is of utmost importance. Actors along the food supply chain have multiple systems in place to control food safety, such as Hazards Analysis Critical Control Points (HACCP) and Good Manufacturing Practices (GMP). However, food safety is constantly under pressure, due to the various drivers from within and outside the food supply chain having an potential impact on food safety. Examples of such drivers of change are: climate change, geopolitical changes and population growth. Finding feasible solutions to limit the impact of drivers of change on food safety is thus important for the global food supply chain to ensure a safe food supply. A recent way of thinking on how to improve the food safety performance of the food supply chain is via the strengthening the capacity of the chain to withstand disturbances, also called food safety shocks (i.e., unwanted disruptions related to the increasing presence or emergence of food safety hazards). A resilient supply chain that has the capacity to adapt and manage possible safety shocks is more suitable and practical than trying to achieve a state of zero food safety risks.

Purpose:

Investigate and demonstrate the potential of the resilience concept to food safety management. In recent research, the concept of resilience has been applied to several case studies related to food safety shocks, including several microbiological cases and a chemical food safety case (Mu et al., 2024; Focker et al., 2024). In this presentation, the concept of drivers of change, as from the EU project HOLiFOOD (https://holifoodproject.eu/) as well as the resilience concept will be illustrated. Furthermore, the application and results to two cases studies will be shown.

References

Focker MF, Van Wagenberg C, Van Asselt ED, Van der Fels-Klerx HJ. 2024. The resilience of the pork supply chain to a food safety outbreak: The case of dioxins. *Risk Analysis* 44(4): 785-801. DOI: 10.1111/risa.14205.

Mu W, Van Asselt ED, Van Wagenberg C, Van der Fels-Klerx HJ. 2024. Building a Resilient Pork Supply Chain to *Salmonella* spp. *Risk Analysis* 44(1): 12-23. DOI: 10.1111/risa.14141.

#55 BASSEL DAHER: A SYSTEMS APPROACH TO RESILIENCE IN FRAGILE AGRIFOOD SYSTEMS

FAO & Texas A&M Energy Institute (USA)

Building resilience in fragile and conflict-affected agrifood systems requires moving beyond siloed responses toward an integrated, systems-based approach. Interconnected challenges, including climate change, resource scarcity, and socio-political instability, demand coordinated action across resource systems including water, energy, and food. This talk highlights the urgency of adopting a systems approach to address underlying vulnerabilities, minimize trade-offs, and foster synergies. It presents seven strategic action areas to guide policy and institutional reform, emphasizing cross-sectoral planning, inclusive governance, and evidence-based decision-making as essential components for enhancing food system resilience and achieving long-term sustainability in fragile contexts.

SESSION 3: NUTRITION & HEALTH

#60 EELCO FRANZ: INVITED LECTURE: ONE HEALTH CONTROL OF FOODBORNE DISEASE: OPPORTUNITIES FOR ALL

RIVM - National Institute for Public Health and the Environment Centre for Infectious Disease Control (Netherlands)

I will discuss the situational aspect of foodborne disease as a one health problem (bringing in the source attribution work).

Subsequently, I will present a type of roadmap on how to come to integrated control of foodborne disease in practice (bringing in organisational aspects as well as the techniques, including genomics and an example of a successful large outbreak investigation traced back to farms).

#436 BELEN BELTRAMO [1], BAST, A.[2], DILIËN, H.[3], DE BOER, A.,[1]: TO HARMONIZE OR TO NOT HARMONIZE? ASSESSING NUTRIENT CONTENT VARIABILITY TO SUBSTANTIATE NUTRITION AND HEALTH CLAIMS ON FRESH PRODUCE

[1] *Food Claims Centre Venlo, Campus Venlo, Faculty of Sciences and Engineering, Maastricht University, Venlo (Netherlands)*
[2] *Department of Pharmacology and Toxicology, Medicine and Life Sciences, Faculty of Health, Maastricht University, Maastricht (Netherlands)*
[3] *Sensor Engineering Department, Faculty of Sciences and Engineering, Maastricht University, P.O. Box 616, 6200MD Maastricht (Netherlands)*

Introduction:

Nutrition and health claims can help translate nutrition and health recommendations into easier-to-access messages at the point of sale. National food composition databases (FCDBs) are the main and most widely available source of nutrient information for unpacked foods, such as fruits and vegetables. While current policy-making is looking at harmonizing initiatives, using regional FCDBs could mask composition differences that could position some cultivars and regional foods over others when applying claims.

Purpose:

This paper outlines the variability of the nutrient content in fresh fruits and vegetables from FCDBs in the top eight European producers. All to analyze whether these variations would be translated into practical differences in the nutrition and health claims allowed in these European countries.

Methods:

We sampled national FCDB from the top 8 European producers. The analysis focused on macronutrients and micronutrients highly affected by external conditions, and that are subject to nutrition and health claims. We selected the vegetables these countries traded the most in Europe.

Results:

The results show that vitamins presented the highest variability, particularly vitamin C, and differences were prominent for vegetables (Figure 1). These differences also extended to the use of claims between countries, particularly for folate and vitamin C. Moreover, databases lack data on the cultivar, practices, seasonality, and production region. The lack of item representation at the cultivar level affected the regional representativeness of fresh produce varieties and derived use of nutrition and health claims.

Conclusions:

Widely available, and cost-efficient nutrient composition sources could economically benefit small and middle-scale producers to sustain nutrition and health claims on their products.

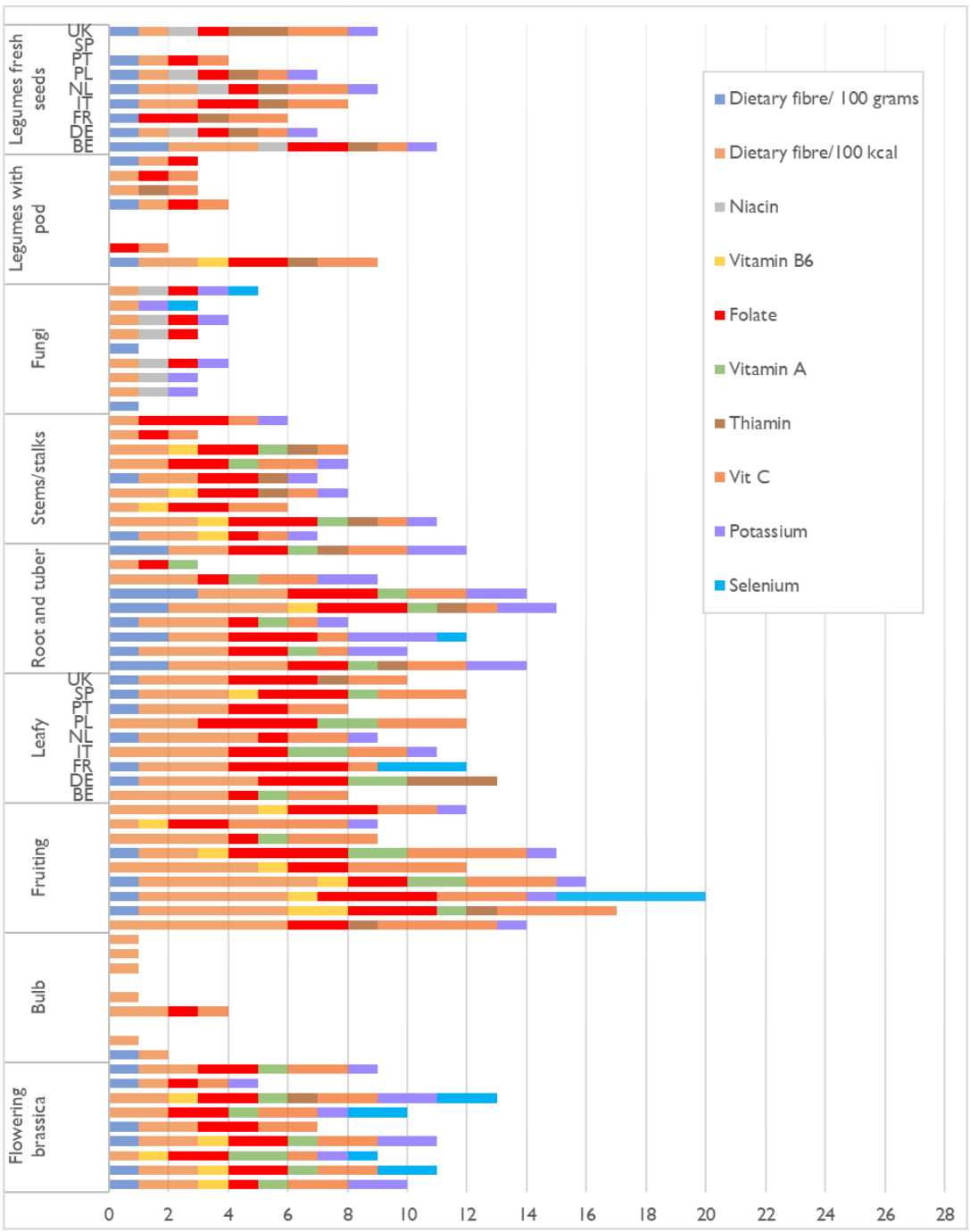

Figure 1. Number of vegetables allowed to bear 'source of' nutrition claims or health claims built based on 15% of Nutrient Reference Values and 'Source of' fibre claim in top European producer countries.

#77 IULIANA VINTILA: THE ASSESSMENT OF NUTRITION AND ENVIRONMENTAL IMPACT OF CATERING ACTIVITIES

University "Dunarea de Jos" Galati (Romania)
Chair of Global Harmonization Initiative Nutrition Working Group
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The significant environmental impact of agro-food chain on global climate change conduct to important transformation of national and regional ecological policies and updating action plans applied in food industry, catering and hospitality industry [1,2,3].

The scientific assessment of the nutritional and environmental impact of outlet catering daily menu's production and serving procedures reflect the fact that the optimal ecological footprint of catering activities were obtained via better nutritional menu's design and depends on menu's type, catering units serving capacity, the complexity of dishes recipes and the nature of food ingredients. More nutritional daily menu's creation provide the best sustainable base for optimal ecological footprint of circular resources used in catering activities with optimal environmental impact.

The non-processed and local ingredients, such the plant- based foods, crude vegetables (mushrooms, salad, carrot, onion, etc.) and seasonal fruits (orange, grapes) have the optimal ecological footprint impact and are recommended in the eco-friendly menus.

The intensive industrial transformed ingredients and culinary preparate dishes, the complex menu's item recipes with more than four refined ingredients, beside the presence of intensive processed food ingredients such as flour, cream, butter, chocolate, due to more than doubling the catering menu's ecological footprint impact [4.]

The catering circular economy policies could offers optimal solutions for nutritional and eco-friendly daily meals, both in case of delivery systems as well as in case of social & commercial catering services from schools, universities, hospitals or restaurants, bars, events.

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#971 SVETLA DANOVA[1], DOBREVA, L.[1], ATANASOVA, N.[1], KRSTEVA, K.[1], DONCHEV, P.[1], ABRASHEV, R.[1], KRUMOVA, E.[1], NAYDENOVA, G.[2], APOSTOLOV, A.[2], YANKOV, D.[2]: FROM TRADITIONAL BULGARIAN FOODS TO FOOD SAFETY AND THE BENEFITS FOR THE HUMAN MICROBIOME AND HEALTH

[1]Stephan Angeloff Institute of Microbiology, Bulgarian Academy of Sciences, 26, Acad. G. Bontchev str. 1113 Sofia (Bulgaria)
[2] The Institute of Chemical Engineering, Bulgarian Academy of Sciences, Sofia (Bulgaria)
Contact: stdanova@yahoo.com

Traditional dairy products that have been consumed for centuries in Bulgaria are among the recognized functional foods in the focus of modern biotechnology. Their lactic acid microbiota (LAB) has probiotic (*pro-for; and bio-life*) properties. In an effort to clarify the beneficial role and possible applications of the food microbiota, intensive research has been carried out at Laboratory of "Lactic Acid bacteria and Probiotics" – Stephan Angeloff Institute of microbiology-BAS. Metagenomics analyses of Bulgarian white brine cheese and katak (a unique Bulgarian fermented milk product, with a long shelf-life) showed a dominance of probiotic bacteria, including unclassified taxa. Novel strains capable of inhibiting the development of pathogens and microorganisms, responsible for food spoilage were isolated and characterized. The dominant role of *Lactoplantibacillus plantarum* species in white brine cheese (sirene), determines new perspectives for the inclusion of *L. plantarum* as bioprotective and probiotic supplements and/or starters. The nature of the produced postbiotics of lactobacilli, isolated from different artisanal products with potential as bio-preservatives for modern food technologies and new biotics was evaluated. Our *in vitro studies* have identified them as microorganisms fulfilling EFSA's

criteria for probiotic functionality and safety. Recent research has focused on evaluating the positive role and potential of food-associated LABs and newly isolated strains with human origin on the structure, composition, and function of the gut microbiome, with probiotic potential and health benefits. A possible implementation in new functional food and or active biotics is under discussion.

Acknowledgements *The authors express their gratitude for the financial support to Project PVU – 63 /BG-RRP-2.017-0047-C01 "Novel approaches for the selection and integration of BIOTICS (pro/post and metabiotics) into functional formulations for dietary supplements with high biological potential based on agro and industrial wastes", founded by European Union – NextGenerationEU.*

#1094 AMIN MOUSAVI KHANEGHAH: INVITED LECTURE: CLIMATE CHANGE AND FOOD SAFETY: NEW THREATS OF CONTAMINANTS AND THEIR EFFECTS ON THE GLOBAL POPULATION

ITMO University (Russia)
Contact: mousavi.amin@gmail.com

Climate change is one of the most pressing issues affecting food safety today, as it impacts the generation, distribution, and persistence of contaminants. Increasing temperatures, changing precipitation patterns, and extreme weather events are transforming ecosystems in a way that favors the growth of foodborne pathogens, mycotoxins, heavy metals, and pesticide residues. These changes exacerbate public health risks worldwide by increasing the likelihood of people being exposed to hazardous contaminants through contaminated food. The complex interrelationship between climate change and food contamination, with emphasis on the emerging risks, was investigated. We explain how temperature fluctuations and varying humidity levels impact fungal development and mycotoxin production, how changes in precipitation lead to the mobilization of heavy metals in agricultural soils, and how the use of chemical inputs increases in response to climate-induced agricultural stress. Furthermore, we examine the implications of these risks for food safety and regulations, emphasizing the importance of coordinated global policies to mitigate contamination risks. Based on the current scientific evidence and risk assessment tools, we stressed the importance of developing adaptive measures to ensure food safety in a changing climate. Climate-resilient agricultural practices, enhanced monitoring mechanisms, and collaboration are crucial to ensuring food security and human health. This paper presents a multidisciplinary approach to addressing the growing challenges of climate change and food safety and recommends preventive and adaptive measures.

#449 GIOVANNI SOGARI, ANDREANI, G., WONGPRAWMAS, R., MENOZZI, D., MORA, C.: THE EFFECT OF NUTRITION FRONT-OF-PACK LABELS ON CONSUMERS' SENSORY EVALUATION OF TRADITIONAL AND PLANT-BASED TUNA

Università of Parma (Italy)

Introduction and method:

Given the increasing interest in plant-based alternatives and in front-of-pack (FOP) nutrition labels to support healthier food choices, this study aimed at exploring consumer sensory perception and response to plant-based and traditional tuna and investigating the influence that front-of-pack (FOP) nutrition labels can have on the sensory evaluation of both products. This research was conducted in Italy with 210 young adults. Using a between-subjects design, participants were assigned to one out of three groups: a control group with no label exposure, a Nutri-Score label group, and a NutrInform label group. All participants assessed both the plant-based and the traditional tuna under three conditions: Blind (with tasting, without the product information – i.e., whether it was plant-based or traditional tuna), Expected (with the product information, without tasting), and Actual (with both the product information and the tasting experience). Additionally, the study incorporated a survey to collect socio-demographic data, attitudinal measures, and opinions on policy support for adopting the Nutri-Score and Nutrinform labeling systems.

Results and Conclusions:

By analyzing the relationship between sensory evaluation and FOP labeling, this research aims to deepen understanding of how FOP labels influence consumer expectations, actual experiences, and attitudes toward plant-based and traditional food products. Data analysis is currently ongoing, with results expected to offer insights into the potential of labeling systems to guide healthier and more sustainable dietary choices.

Acknowledgements*: Project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.3 - Call for proposals No. 341 of 15 March 2022 of Italian Ministry of University and Research funded by the European Union – NextGenerationEU*

SESSION 4: EDUCATION & TRAINING

#63 ADEWALE OLUSEGUN OBADINA: INVITED LECTURE: FROM ROOT TO PLATE: EDUCATING FARMERS AND PROCESSORS ON SAFE CASSAVA HANDLING

Federal University of Agriculture (Nigeria)

Cassava is a vital food crop for millions across Africa, yet its safety is compromised by the presence of cyanogenic glycosides, which can cause acute and chronic health issues if not properly removed during processing. This presentation highlights a holistic approach to improving food safety along the cassava value chain through targeted education for farmers and small-scale processors, from harvest to plate.

In collaboration with Bart van Schie and under the auspices of the Global Harmonization Initiative (GHI), our current research focuses on an innovative, enzyme-based method to reduce cyanide levels in processed cassava products. By utilizing enzymes naturally present in cassava leaves, we aim to enhance detoxification efficiency during processing without introducing costly or foreign additives. This sustainable method aligns with local practices and can be easily integrated into existing community-level processing systems.

The presentation will detail the scientific basis of the enzyme approach and strategies for scaling the method through community education, gender-inclusive outreach, and participatory training. Furthermore, it will explore how harmonizing traditional knowledge with modern food safety innovations can drive systemic improvements in informal food systems. In the context of the GHI's global agenda, this work is expected to exemplify the role of collaborative research and localized interventions in achieving safer food for all.

#478 ADEBUKUNOLA MOBOLAJI OMEMU, IBRAHIM, O.H., ADEBANJO, L.A., ONI, E.O.: KNOWLEDGE, ATTITUDE, AND PRACTICES (KAP) OF FOOD HANDLERS ON FOOD ALLERGY MANAGEMENT IN SELECTED HOSPITALITY ESTABLISHMENTS IN ABEOKUTA, NIGERIA

Federal University of Agriculture, Abeokuta, FUNAAB (Nigeria)
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Introduction:

Food allergy is an abnormal immune response to food, often resulting in severe allergic reactions. Food handlers play a critical role in managing food allergies through effective communication and practices, ensuring guest safety.

Purpose:

This study investigated the KAP of food handlers regarding food allergy management in selected hotels and restaurants within Abeokuta Metropolis, Nigeria.

Methods:

A multistage sampling technique selected 120 food handlers from purposively chosen hospitality establishments. Data were collected using structured questionnaires addressing socio-demographic characteristics, sources of information on food allergies, knowledge levels, attitudes, and practices. Descriptive statistics (frequency counts, percentages, mean, and standard deviation) and inferential statistics (Pearson Product Moment Correlation) were used for data analysis.

Results:

The majority of respondents were female (59.2%), aged 18–29 years (67.5%), and had tertiary education (70%). While 83.3% demonstrated knowledge of food allergies, only 26.7% strongly agreed that allergic reactions could cause death, and just 50% identified tree nuts as allergens. Furthermore, 40% strongly agreed that preventing food allergies in restaurants is the establishment's responsibility. Although 62.5% had participated in food allergy training, gaps in awareness and practices persisted. Social media (Mean = 1.51) and search engines (Mean = 1.41) were common sources of information. Pearson correlation analysis revealed significant positive relationships between knowledge and practices ($r = 0.412$, $P \leq 0.05$) and between attitudes and practices ($r = 0.408$, $P \leq 0.01$).

Conclusions:

The findings highlight that enhanced knowledge and positive attitudes among food handlers significantly improve allergy management practices. Targeted training programs are essential to address gaps and ensure food safety in hospitality settings.

#663 RUI COSTA: FOOD SAFETY INSPECTOR REGULATION: ESSENTIAL SAFEGUARD OR RED TAPE

Research Centre for Natural Resources, Environment and Society, Polytechnic University of Coimbra, Portugal
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Food safety is a main public health concern resulting from contamination by microorganisms, chemicals and antimicrobial resistance, exacerbated by complex supply chains, food fraud, effects of climate change, insufficient legislation and consumer demands for ready-to-eat and raw foods. New threats, such as novel foods, fake news, and increased economic pressures, make safety measures even more difficult. In order to tackle these challenges, it is necessary to take a comprehensive approach which will encompass such elements as stricter legal requirements, the development of the traceability and testing systems, awareness raising among consumers and international cooperation in the prevention of safety food hazards at the production and consumption stages.

Out of all the regulations that are important in maintaining food safety, the proper identification and the recognition of the food safety inspector as a key player has been a major concern. However, the food safety inspectors' regulation is rather exceptional rather than the rule across the European countries and even where it is applicable the standards are not the same. On the private side, recognizing this need to improve food safety, professional organizations have started creating private certification for various food safety personnel.

However, the question remains: Should this one act be considered as a regulation or as simply excessive red tape? In this presentation, the current laws of the European countries will be depicted to determine the skills and knowledge of food safety professionals as well as their education and training process. From this perspective, we will assess the need and the right measure of regulation for these important workers.

#62 JOHANN JAKOB WINTER: INTERNATIONAL QUALITY ASSURANCE IN FOOD SCIENCE AND ENGINEERING EDUCATION – PRESENTING THE VALUE AND BENEFITS OF THE EQAS FOOD LABEL

ASIIN e.V. (Germany)

EQAS[1]-Food is a European qualification framework developed by the ISEKI Food Association (IFA) to ensure excellence in higher education in food studies. It characterises the learning outcomes and qualification profiles for first and second-cycle programmes in food science and technology/ engineering. The corresponding EQAS-Food label has been established as a quality seal awarded to Bachelor's and Master's degree programmes which satisfy the criteria of the ISEKI-Food Association.

The main objectives of EQAS-Food implementation are the qualitative development of programmes in food science and technology, the creation of a harmonised information base regarding these programmes, and the international recognition of the qualifications obtained in these programmes. These objectives contribute to the overall goal of ensuring the supply of highly qualified, collaborative, and innovative personnel to guarantee the global food supply sustainably.

The German accreditation agency ASIIN e.V. is IFA´s exclusive partner for the execution of the EQAS-Food implementation. The agency looks back at over 25 years of experience in quality assurance in higher education, offers ESG-based accreditation services worldwide and has conducted procedures in more than 60 countries around the globe. It relies on a network of both German and international voluntary experts and assures the quality of the procedure through checks and balances through Committees in two stages. ASIIN offers the EQAS accreditation as part of its accreditation procedures and has additionally newly implemented a subject-specific top-up procedure to promote the EQAS-Food label among institutions that already possess an ESG-based accreditation. The presentation will highlight the benefits of the EQAS-Food label for the implementation of harmonised standards in food science and technology.

[1] European Quality Assurance Scheme

#641 RICHARD F. STIER: PREPARING FOR AN AUDIT AND HOW TO AUDIT

Consulting Food Scientist, Sonoma, C.A. (USA)

Audits are a fact of life in the food industry whether you are a processor, an ingredient supplier, or a packaging manufacturer. Your company will be audited by regulators, buyers, and potential buyers. These audits may be done by government investigators, processors or buyers or by one of the many third-party certifying bodies. It is imperative that operators develop, document, implement and maintain a procedure for not only how to work with the auditor when he/she is in your facility but how to prepare your staff for potential audits. This presentation provides guidance on how a processor can establish and implement a program for handling outside audits which includes establishing an internal audit program to ensure your programs are up-to-date and properly functioning. Quality operators may not like audits, but they one of the tools for continuous improvement - a crucial element of all food safety programs.

#478 [1*] ADEBUKUNOLA M. OMEMU, [2]OPEYEMI H. IBRAHIM, [3]LUKMAN A. ADEBANJO AND [4]ENIOLA O, ONI: KNOWLEDGE, ATTITUDE, AND PRACTICES (KAP) OF FOOD HANDLERS ON FOOD ALLERGY MANAGEMENT IN SELECTED HOSPITALITY ESTABLISHMENTS IN ABEOKUTA, NIGERIA

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Introduction: Food allergy is an abnormal immune response to food, often resulting in severe allergic reactions. Food handlers play a critical role in managing food allergies through effective communication and practices, ensuring guest safety.

Purpose: This study investigated the KAP of food handlers regarding food allergy management in selected hotels and restaurants within Abeokuta Metropolis, Nigeria.

Methods: A multistage sampling technique selected 120 food handlers from purposively chosen hospitality establishments. Data were collected using structured questionnaires addressing socio-demographic characteristics, sources of information on food allergies, knowledge levels, attitudes, and practices. Descriptive statistics (frequency counts, percentages, mean, and standard deviation) and inferential statistics (Pearson Product Moment Correlation) were used for data analysis.

Results: The majority of respondents were female (59.2%), aged 18–29 years (67.5%), and had tertiary education (70%). While 83.3% demonstrated knowledge of food allergies, only 26.7% strongly agreed that allergic reactions could cause death, and just 50% identified tree nuts as allergens. Furthermore, 40% strongly agreed that preventing food allergies in restaurants is the establishment's responsibility. Although 62.5% had participated in food allergy training, gaps in awareness and practices persisted. Social media (Mean = 1.51) and search engines (Mean = 1.41) were common sources of information. Pearson correlation analysis revealed significant positive relationships between knowledge and practices ($r = 0.412$, $P \leq 0.05$) and between attitudes and practices ($r = 0.408$, $P \leq 0.01$).

Conclusions: The findings highlight that enhanced knowledge and positive attitudes among food handlers significantly improve allergy management practices. Targeted training programs are essential to address gaps and ensure food safety in hospitality settings.

#390 ANET REŽEK JAMBRAK & JASENKA GAJDOŠ KLJUSURIĆ: EDUCATION ON AND FOR SUSTAINABILITY AND DIGITALISATION IN HIGHER EDUCATION: CONNECTING INTERDISCIPLINARITY

University of Zagreb (Croatia)

Digital and green skills are essential for the future employment and for achieving desired job position. It is estimated, by one of the leading software companies, that 77% of students will need new tech skills by 2030. Food engineering, food safety, food sustainability education is utmost important for future generations. The need for green skills (sustainability, economy, environment and society) and digital skills (internet of things, Industry 4.0, energy usage processing optimisation and cybersecurity) are pillars for future changes in food supply and processing chains. Europe is striving to become the world's first climate-neutral continent by 2050. The European union (EU) aims to be climate-neutral by 2050, an economy with net-zero greenhouse gas emissions.

The food sector in the European Union is one of the largest and most important industries. With the increasing digitization and interconnectivity of the food sector, it has become more vulnerable to cyber threats. In recognition of the risks posed by cyber-attacks to this sector there is NIS2 directive. NIS2 stands for “Network and Information Security Directive”. NIS2 categorizes the food sector as an “important entity”. Member States had until October 17, 2024 to transpose the Directive into national law.

Environmental, social, and governance (ESG) is shorthand for an investing principle that prioritizes environmental issues, social issues, and corporate governance. The European Council adopted in November 2024, a new regulation on ESG rating activities. The new rules aim at making rating activities in the EU more consistent, transparent and comparable to boost investors’ confidence in sustainable financial products.

There is urge need to educate student on and for sustainability and digitalisation in higher education. There is evidence of connecting interdisciplinarity in terms of economy, digital and green skills.

SESSION 5: ALTERNATIVE PROTEINS I

#? LOUISE MANNING, INVITED LECTURE: ANTICIPATING THE ROLE OF TECHNOLOGY IN DELIVERING MORE SUSTAINABLE, SAFER FOOD

University of Lincoln (UK)

No abstract received

#246 CHRISTELLE BOU-MITRI[2], MEKANNA, A.N.[1], ISSA, A., [2] BOGUEVA, D.[3] : CONSUMER PERCEPTION OF PLANT-BASED MILK ALTERNATIVES: SYSTEMATIC REVIEW

1 Western Sydney University, Richmond (Australia)
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Plant-Based Milk (PBM) alternatives have been a hype recently, drawing the high focus of investors, developers, and researchers. However, despite this surge in interest, the market size and potential of these products remain unclear. While several studies explored consumer perspectives on these alternatives, the variability in findings remains poorly understood. This systematic review aims to investigate consumer perceptions of PBM and to identify the factors associated with higher acceptance. Adhering to the PRISMA-P methodology, searches on two major databases – Scopus and Web of Science – were conducted. Research papers published between 2019 and 2024 were screened to capture the most recent insights, resulting in thirty-one articles. Among these studies, 71% were surveys, 50% were conducted in Europe and 46% in America. Additionally, 78% of the studies had a sample size of 500 participants or fewer, 71% assessed the perception of PBM alternative in general, while equally, 12.9% focused on soy-based milk and 12.9% on coconut-based milk. Overall, the studies evaluated preference for PBM over dairy milk, motives for consumption and other relevant factors. The research describes the socio-demographic criteria associated with the high adoption rates of these products, the reasons for choosing dairy substitutes (such as curiosity, health benefits, or social influence), and the perceived advantages and barriers to their use. The expected outcomes of this study can provide valuable insights for designing effective marketing strategies for PBM and fostering the development of sustainable and healthy food systems.

#432 MAJA BENSA, JEVŠNIK, M., VOVK, I.: INSIGHTS INTO SLOVENIAN CONSUMERS' FOOD SAFETY CONCERNS AND RESPONSIBILITIES

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Introduction: Food safety (FS) is important for public health, but is facing new challenges due to climate change and is therefore also connected with sustainability. Discussions on FS are often focussed on the safety of food itself. The role of consumers in maintaining FS is often overlooked. In Europe between the years 2018 to 2021 most foodborne outbreaks occurred in consumers' homes (domestic premises) followed by restaurants[1]. When it comes to FS, consumers are often left to their own devices and must rely solely on their knowledge of safe food handling practices.

Purpose: The aim of this study was to investigate consumers' FS knowledge, attitude and practice in Slovenia through a series of focus group discussions (interviews in small groups) about various food handling activities from shopping to cooking. This also included: 1) how consumers perceive their role and the role of other stakeholders (e.g., inspections) in ensuring FS and 2) what are consumers biggest FS related concerns.

Methods: Focus groups were conducted in person and online. The 40 participating consumers had varying demographics (gender, age, education). Each participant attended a single session lasting 1 to 1.5 hours.

Results: Consumers had different understanding of FS responsibilities with some relying more on inspections and others also being aware about the role of consumers. Consumers FS concerns included: additives, pesticides, antibiotics, microbial pathogens, food fraud, insufficient information, and inadequate inspections.

Conclusions: Consumers should be empowered about their role in maintaining FS. The consumers' trust should be restored with improved communication (e.g., labelling, information on food production and FS).

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#413 ISABELLA NYAMBAYO[1] & SENG, C.Y.[2]: MULTI-SENSORY PERCEPTION OF TEXTURE MODIFIED MEAT ALTERNATIVES PRODUCED FROM PLANT-BASED PROTEINS

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Consumption of meat and its processed products have been associated with health issues such as cancer, cardiovascular diseases, and obesity. There is a projected increase in demand for animal protein with a potential severe environmental and ecological imbalance. Meat supplies specific functionalities in food and consumers warm up to its organoleptic properties. Meat proteins are specifically responsible for the characteristic appearance, textural and functional properties of meat and its products. The production of meat analogs from plant-based proteins has been based on their techno functionalities such as the ability to form emulsions, foam, viscous structures, and gels. Several technologies have been used to produce meat analogs such as 3D printing, wet spinning, extrusion, electrospinning, freeze structuring, shear cell technology and mixtures of proteins and hydrocolloids. Fibrous product structures imitating that of meat can be formed through nozzle extrusion (low and high moisture extrusion), crosslinking bridges of either metal cations, casein, or alginate with hydrocolloids, and 3D printing using food ink. Any alterations of the formulation of the product can result in changes of texture and mouthfeel of these meat analogs which will eventually affect the consumer choice or acceptance. The food texture is considered as a multidimensional sensory property that is influenced by food's structure, rheology and surface properties. A lot of research has been done on conventional meat and its products on texture and mouthfeel including oral food processing. This presentation will consider oral processing and multi-sensorial perception of texture/ mouthfeel of meat alternatives consumed by different populations groups. Temporal dominance sensation will be considered on how it has been used to identify dominant textural attributes with time while influencing liking of the meat analogs and interaction with saliva during oral processing.

#421 ANDREJ OVCA[1] & BÁNÁTI, D.[2]: FOOD SAFETY AND ACCEPTANCE OF EDIBLE INSECTS: PERSPECTIVES FROM FOOD SCIENCE PROFESSIONALS: A MIXED-METHOD STUDY

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Edible insects are emerging as an alternative source of protein, but their acceptance and safety aspects remain a challenge. The aim of this study was to assess the food safety and acceptability aspects of edible insects using a mixed methods approach combining roundtable discussions with food experts (food science and technology, nutrition) and a survey among food science professionals during the CEFood Congress 2022.

The research utilised qualitative data from panel discussions focused on environmental, technological and food safety aspects, complemented by a quantitative online survey (n = 139) that explored perceptions and acceptance among congress participants. The survey participants were predominantly female (76.4%), between 26 and 45 years old (52.0%), came from different European countries (67.3%) and represented different areas of food science, including food safety and quality control (26.0%), food engineering and technology (19.2%) and food science in general (19.2%).

The results show that environmental sustainability and protein alternatives are attracting industry interest, while technological challenges relate primarily to contaminant detection and processing methods. The survey found that 72.7% of respondents had never tasted edible insects, with 31.5% absolutely unwilling to try them. Mycotoxins and allergens were cited as the main safety concerns. Allergens were perceived as the biggest health risk (41.3%), followed by biological hazards (32.3%). The main barriers to acceptance were emotional reactions/disgust (67.3%) and cultural norms (20.2%), while potential promoters included affordable prices (25.5%) and solving hunger problems (15.1%). Participants showed a higher acceptance of processed insect-based products, especially insect flour, than whole insects.

The results suggest that while edible insects offer opportunities for sustainable protein production, there are still significant barriers to overcome in terms of acceptance and food safety management. Future success in Western markets may depend on processed forms that disguise the origin of the insects, as well as comprehensive safety protocols.

#567 GOKARE A RAVISHANKAR: PLANT-BASED MEAT ANALOGUES: CHALLENGES AND OPPORTUNITIES FOR INDUSTRIAL PRODUCTION

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The increasing demand for meat has put tremendous pressure on the planet's ecosystem, heightening the risk of global warming and challenging the sustainable production of animal-based foods. Health-related issues associated with meat consumption are also on the rise, with increasing incidences of cancer, heart disease, and other ailments. These emerging issues necessitate a shift in dietary habits, adopting meat analogues as alternatives. Ingredients from plant and microbial sources are being explored to develop novel meat analogues that meet the nutritional and sensory attributes of meat-based food products.

Health-conscious and environmentally concerned individuals have begun to adopt flexitarian approaches to meat consumption by incorporating plant-based meat analogues (PBMAs). The religious restrictions associated with certain types of meat-based food products are also addressed by the usage of PBMAs. However, the challenges of developing acceptable PBMAs are many, including nutritional quality, processing methods, sensory perceptions, and consumers' needs.

The issue of protein quality and quantity in PBMAs compared to meat products is a significant concern for consumers. A wide range of ingredients, including microalgae, seaweeds, soybeans, peas, jackfruit, fungi, mushrooms, and fruit & vegetable processing wastes, have been incorporated into recipes for developing PBMA products. Novel PBMAs are being formulated to deliver high-quality proteins, essential nutrients, nutraceuticals, and fiber-rich ingredients. Processing technologies aimed at providing structural features that mimic meat-like characteristics in PBMAs are also being explored. Several natural pigments such as betalains, carotenoids, and annatto dyes are being used to enhance sensory appeal. Innovative processing techniques, such as 3D printing, extrusion methods, advanced packaging, and automation, are increasingly adopted in the production of PBMAs.

This presentation comprehensively addresses the global scenario of the PBMA industry, highlighting opportunities on the horizon, as well as the technical relevance of the above-outlined aspects of processing technologies and their impact on the quality of the products.

SECTION 6: FOOD PACKAGING, INGREDIENTS AND REGULATION

#629 MARCO DALLA ROSA[1], ROMANI, S.[1], ROCCULI, P.[1], ZARDETTO, S.[2]: BEYOND "USE BY" SHELF LIFE LABEL FOOD DATING: THE CASE OF FRESH PASTA

[1] *University of Bologna (Italy)*
[2] *Voltan SPA (Martellago, Italy)*

Introduction

Dating of food and shelf life concept were introduced on last century as an approach able to determine in a scientific and objective manner the end of the commercial life of food products. The main purposes were the evaluation of the quality variations of shelf stable food products like canned meat and vegetables, intermediate moisture and dried foods. Nevertheless, the concept has been also applied to the perishable and highly perishable foodstuffs where the main concerns are about food safety mainly due to microbial growths.

Purpose

Aim of this study is to investigate if the dating of some products generally considered as "perishable" and thus labeled with "Use by Date", could go beyond that concept when the processing conditions and the treatments involved in the flow diagram of production are correctly studied, where thermal and non-thermal "hurdles" have fundamental roles.

Methods

The recent literature on shelf life evaluation of different fresh pasta, considering both safety and quality approaches, relating to the microbial growth of possible alterative and pathogenic species and their survival after processing has been reviewed, paying particular attention to the research carried out in an industrial environment. Furthermore, the behavior of some chemical physical properties after treatment and during storage was considered.

Results

Due to the application of well defined flow diagrams, pasteurization(s) treatments, as well as the use of modified atmosphere packaging and a controlled storage temperature, the shelf life of the industrial fresh pasta (as defined by a specific Italian national law) is nowadays mainly related to chemical and physical quality parameters like texture and sensorial properties, rather than to microbial growths.

Conclusions

Owing to the technological and knowledge development in the fresh pasta industrial processing, the dating of those foods could be defined using a "Best Before" rather than an "Use by" indication.

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#578 CHRISTINA ANNA STAFYLI: ATHANASOPOULOU, E., SKLIROS, D., FLEMETAKIS, E., TSIRONI T: BIOACTIVE FOOD PACKAGING BASED ON MARINE BACTERIOPHAGES: CONTROLLING *VIBRIO ALGINOLYTICUS* GROWTH IN FRESH FISH FILLETS

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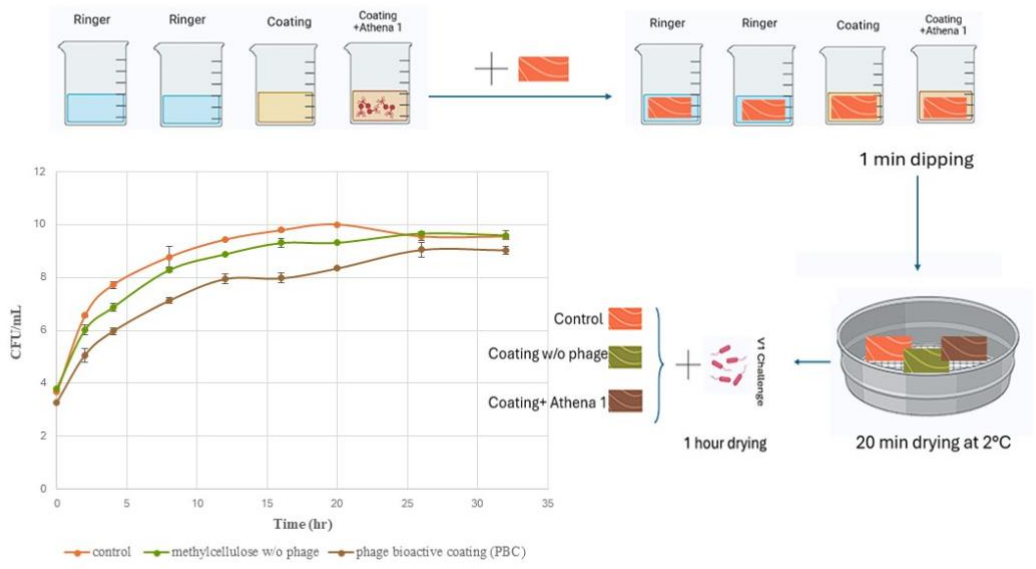
The global food industry faces numerous challenges. Aquaculture, a key food source, confronts spoilage issues from pathogens like Vibrio species, demanding effective antimicrobial solutions. This study explored bacteriophage Athena 1 as a biocontrol agent in biodegradable coatings for fresh fish contaminated with *Vibrio alginolyticus* V1 (*V. alginolyticus* V1). The research assessed phage's stability, lytic efficacy, and its activity within biopolymer-based coatings.

Athena 1 demonstrated strong lytic activity across various pH and temperature conditions. Direct application on fish slices significantly inhibited *V. alginolyticus* V1 growth compared to controls, proving effective in matrices like fish flesh. *In vitro* tests of bacteriophage or phage bioactive coating (PBC) showed variable outcomes: chitosan displayed inherent antimicrobial properties, with minimal additional benefits from phage, while sodium alginate showed effective phage release and activity. Methylcellulose PBC may have been affected by drying conditions.

In vivo experiments highlighted chitosan's potent antimicrobial effect but limited added benefit from phage, contrasting with sodium alginate's ineffectiveness, possibly due to microbiota interactions. Methylcellulose PBC effectively delayed bacterial growth by 1.68 log10 CFU/mL supporting previous findings. To confirm the effectiveness of the methylcellulose PBC, an accelerated challenge test was designed, based on artificial inoculation of fresh fish with *V. alginolyticus* V1. The growth rate of the target bacterium was significantly lower when the PBC was applied (0.395±0.0791 h^{-1}) compared to the methylcellulose coating without phage (0.748±0.0973 h^{-1}) and the untreated control (1.026±0.163 h^{-1}).

This research highlights the potential use of Athena 1 in biodegradable coatings for fish, demonstrating the broader promise of bacteriophages as a valuable tool to mitigate food loss in aquaculture. Future studies should focus on optimizing phage release mechanisms and improving stability to enhance their practical application in food preservation, with an emphasis on selecting tailored phages for effective biocontrol.



#78 IULIANA VINTILA: SCIENCE-BASED HARMONIZATION SOLUTIONS FOR NUTRITION MENU LABELLING

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Menu nutrition labelling is a mandatory legal requirement in some European countries, like Romania, for example[1,2]. The menu's design and labelling involves menu's engineering scientific solutions which meet the consumer information needs and the foodservices providing capacity. The menu's dishes & beverages nutrition declaration need food composition databases and equivalent algorithmic applications for consistent labelling reports on the catering products label. The science-based solutions supported by harmonised methodology for nutrition declaration need to be created in order to unify the foodservices practice in the matter of nutrition labelling and to offer the practical tool, used in transparency, for the national authorities which verify the legal conformity of menu's nutrition labelling with the legislation requirements.

The guidelines including the harmonised methodology for menu nutrition labelling at the national level represent the key for transparency in law application and equity in distribution & commercialization chains, in the benefit of the final consumer.

The science-based solutions for different type of menus and catering units need to be created by academia's specialists collaboration with the standardisation association and law makers, considering the society needs of correct & easy-to-understand information, the framework of EU regulations and the practical capacity the foodservices units to implement this supplementary complex task. In the previsions research study[3-4], the author proposed a simple science-based methodology of expressing and designing the menu's nutrition declaration strictly according with the Annex XV of Regulation (EU) NO. 1169/2011 requirements[5], in a classic format (listed in the menu, as a nutritional statement) and in electronical format (QR code).

Additionally, simple- to-use and easy- to- implement applications, with AI global integration of current scientific knowledge could represent successfully solutions for legal compliance of foodservices units with the required mandatory legislation regarding menu's labelling.

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#464 NAYIL DINKCI[1] & SIRBU, A.[2]: TRENDS AND INNOVATIVE METHODS IN WHEY MANAGEMENT

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The dairy sector is very important for the maintenance of the rural economy. Dairy products are an important part of the diet with high levels of nutritional protein. Approximately 10–20% of the milk entering the cheese manufacture is processed to cheese and the left 80-90% results as whey. About 200 million tonnes of whey are produced globally each year. While the waste presents environmental risks because of the high BOD and COD. Whey contains valuable nutrient compounds with a high potential for valorization. Research's highline that whey proteins, lactose, and other GOSs, B12 vitamin could be valuable compounds as ingredients for functional food and nutraceutical products. But, even nowadays, the main ways for whey valorization seem to focus on animal feed, whey-based foodstuffs (such as bakery or beverages), or biogas. However large factories in central and west Europe afford the investment of high-capacity processing equipment for whey concentration and drying, and for the elaboration of high-quality protein fractions (sold as ingredient of infant formula, and for sport drinks). In some factories, the whey protein has become the main source of value, and the cheese is just a co-product.

#323 THIERRY REGNIER & MEIRING, B.: AFRICAN PLANTS AS A SOURCE OF FOOD COLORANT: RE-DISCOVERY OF VALUABLE BUSINESS FOR COMMUNITIES

Tshwane University of Technology (South Africa)

Food colorants are commonly used in the food industry to sustain the natural hues of the products during processes and storage. In addition, natural colorants have gained attention because of their properties as food preservatives, quality indicators and coloring agents. Rediscovering unconventional plants as sources of food colorants in the changing world where unfavorable climatic and human conditions endanger natural vegetation around the planet getting momentum worldwide. Based on a bibliographic analysis, this review demonstrates the limited amount of scientific approaches conducted on the potential of the African underutilized natural resource to extract promising natural colorants, that can be utilized in the food industry. In addition, in the African context extensive internet research highlights the fact that limited to no community-orientated actions regarding the utilization of new plant species having valuable natural pigments, have been done to promote agro-businesses and empower the communities.

#536 DAMIEN ALEXANDER: FOOD SAFETY BEYOND COMPLIANCE

SQFI - Safe Quality Food (Australia)

Over the past three decades, food safety practices have transformed dramatically, particularly with the introduction of the Safe Quality Food (SQF) program in 1994 and the increased pressure from both certification bodies and customers to meet higher food safety and trade standards. As regulations have evolved, so too have the expectations for food businesses to maintain safe, high-quality products. Through these changes, I have seen recurring patterns of success and failure. What truly sets successful companies apart is their ability to build a culture that prioritizes food safety, foster management commitment, and implement strategies that go beyond mere compliance.

In this presentation, I will share insights from my journey in food safety, highlighting the key principles that go beyond the basics of compliance. Drawing on real-world examples from auditing, training, and consulting, I will explore the importance of cultivating a strong business culture that embraces food safety as an integral part of its operations. I will discuss methods of influence that drive lasting change, the role of continuous education, and how to ensure food safety becomes a meaningful practice within an organization. Ultimately, I will argue that food safety should not just be a regulatory requirement, but a shared responsibility that ensures the safety of the food we produce for ourselves, our families, and our communities.

#465 DENIS BARANENKO, LIUDMILA ZABODALOVA, ANASTASIA ZHERNYAKOVA, VICTORIA ILINA, ELENA LEMESHONOK. NIKITA TYUTKOV, IRINA ALEKSANDROVA: FUNCTIONAL FOOD INGREDIENT FOR TYPE 2 DIABETES MELLITUS PREVENTION BASED ON POLYUNSATURATED FATTY ACIDS AND PROBIOTIC MICROORGANISMS

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Introduction : Type 2 diabetes mellitus is becoming an epidemic in recent years, as the number of cases worldwide exceeds 500 million. Prevention of this disease is possible with the help of diets changes and foods enrichment with targeted biologically active components. There is now scientific evidence demonstrating the effectiveness of polyunsaturated fatty acids (PUFA), probiotic microorganisms, flavonoids and vitamin D3 in the prevention of type 2 diabetes.

Purpose: The purpose of this study is development of physiologically functional food ingredient for type 2 diabetes mellitus prevention based on PUFA and probiotic microorganisms.

Methods: To obtain the encapsulated ingredient, the extrusion method and B-390 extruder (BUCHI, Switzerland) was applied. For microcapsules development sodium alginate solution as matrix material and calcium lactate as hardener solution were used. The chemical composition of the obtained microcapsules was studied using HPLC-MS and GC-MS. The effectiveness of the developed ingredient in the prevention of type 2 diabetes mellitus was assessed in a streptozotocin model in mice and rats.

Results: The average microcapsules size was 590 ± 60 µm. Microcapsules contained at least 10^{10} CFU/g of two *Lactobacillus* and one *Bifidobacterium* probiotic strains, PUFA, flavonoids and vitamin D3 in different doses. As a result of an experiment on laboratory animals, the effectiveness of three different dosages of the proposed formula of a functional food ingredient in relation to the main biochemical indicators of type 2 diabetes was established.

Conclusions: The developed functional food ingredient based on PUFA and probiotic microorganisms can be used to create functional food products for the prevention of type 2 diabetes. However, further in-depth study of the mechanisms of action of individual components of the ingredient and possible improvement of the effectiveness of the formula is necessary.

Acknowledgements: The study was supported by the Russian Science Foundation (grant No. 23-16-00243, https://rscf.ru/en/project/23-16-00243/).

#800 AIGUL MINIAKHMETOVA[1], SERGIENKO, O.[1], KIPRUSHKINA, E.[2], BARAKOVA, N.[1], BARANENKO, D.[1]: SYSTEM APPROACH TO TECHNOLOGY SELECTION FOR OBTAINING A PHENOLIC-ENRICHED FUNCTIONAL FOOD INGREDIENT

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Introduction: The introduction of environmentally friendly technologies in agriculture and the processing of secondary plant raw materials is crucial for the realization of the principles and goals of circular economy.

Objective: The aim of the study was to investigate the environmental, economic and social aspects of the use of waste as the secondary raw material in the production of a functional food ingredient using cauliflower leaves as an example. The technologies of extracting phenolic compounds from cauliflower leaves as a valuable food ingredient is being considered.

Methods: The technologies were evaluated based on life cycle analyses performed with SimaPro 9.1.1.1.1 software, using the ecoinvent 3 database for IPCC 2013 and ReCiPe 2016 models and life cycle costing.

Results: A comprehensive assessment of the environmental, economic and social aspects of the production of a functional food ingredient allowed conclusions to be drawn on the selection of the best technology, considering producer preferences and circular economy goals. The assessment helped to identify the best technology using a more environmentally friendly method for extracting phenolic compounds.

Conclusions: In conclusion, the application of integrated assessment at the product design stage, based on the deep processing of crop waste, promotes the introduction of more sustainable technologies in production and, consequently, the production of more sustainable products.

Acknowledgements: The work was carried out within the framework of a state assignment (project FSER-2025-0008).

SECTION 7: FOOD SECURITY AND TRADIONAL FOOD IN AFRICA

#50 RUTH ONIANG'O: THE FIGHT FOR A HEALTHY PLANET STARTS RIGHT BENEATH YOUR FEET – THE ROLE OF WOMEN IN FOOD SECURITY IN AFRICA.

Editor-in -Chief AJFAND (Kenia)

In 2021 the United Nations convened an international conference on Food Systems. It was a follow up to the SDGs (Sustainable Development Goals). The definition used for food systems was: all the elements and activities related to producing and consuming food, and their effects including economic, health, and environmental outcomes. As the issue of hunger and food security continues to linger across the globe, it has brought to the fore concerns of gender. For Africa particularly, the role women play to ensure food security for their families. In the African case, family is not just the nuclear family, but extended family as well. This normally puts a lot of strain on women. In most communities in Africa, it is the woman's responsibility to ensure the family is fed. From my own experience, these women will feed their families first, and thus compromising their own health. Things have changed in gender dynamics over time.

Things have changed from a situation where gender roles were well delineated, to the present-day situation where women do almost everything in the home and on the farm; there are a few exceptions of course.. Women are involved from land preparation to making sure seed for planting had been saved, through weeding, harvesting, and packing to store mostly for family use. There are situations, however, where men get concerned with food crop farming: where a food crop makes money for the wife, then the male spouse demands a part of it. For years we have sought to support women smallholder farmers. Women have been supported in extension, in agricultural financing, and in training. Yet as we do so, Africa continues to get hungrier, and women continue to struggle to feed their families. Women struggle to make adequate income from their agricultural activities. So, what to do next? There is no doubt women will continue to play a key role in Africa's food security. But, they need help as they cannot do this alone.

Another approach is to support the "not so rich" and the "not so poor". In the advent of devastating climate change effects. The "not so poor" are often educated and have some income but fear the risk of borrowing to expand their businesses or make their lives better. These are people, who, if supported can make major positive impact. We need policies to effect this, however. And even as we support this group, we need a focus on the women, our most trusted group. All concerned need to remember, that without the active participation of women, the 2030 goal of achieving zero hunger cannot be realized.

#265 MS MOHLATSO ANNA MNISI, DR THINANDAVHA NESENGANI, PROF ELLIOT ZWANE: EVALUATING FOOD SECURITY STATUS OF PRESIDENTIAL EMPLOYMENT STIMULUS BENEFICIARIES: A CASE OF MOPANI DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

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Introduction: To encourage food production in every household, the government provides both tangible and non-targetable support to household producers throughout the Mopani District (De Cock, 2013). The rural household producers of the Mopani District have been receiving agricultural food production initiatives in the form of production inputs, garden tools, and capacity building. These initiatives are provided assuming that supporting household producers will result in households securing food (LDARD, 2023).

Purpose: This aimed to evaluate the food security status of household producers benefitted from who benefitted from the Presidential Employment Stimulus (PES) program in Mopani District, South Africa.

Methods: This study used desktop research to collect and analyze existing secondary data without fieldwork, requiring minimal resources like time and internet access. The review focused on literature from 2020 to 2024, utilizing sources like Google Scholar and online databases for relevant information.

Findings: Research indicates that strategies like backyard gardens and agricultural activities significantly reduce household food insecurity. However, a lack of comprehensive evaluation methods was noted. Preliminary reviews show that PES programs enhance food security for vulnerable producers, despite challenges such as delays in input distribution. Beneficiaries generally performed better than non-beneficiaries, suggesting the effectiveness of the program. A holistic approach to addressing root causes, like poverty and inequalities, is essential.

Conclusion: The PES program positively impacts household food security, improving access to nutritious foods and financial resources. The study recommends decentralizing input distribution, increasing beneficiary numbers, and ensuring timely funds for purchasing inputs to combat food insecurity effectively.

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#176: Mary Jimoh [1]: Land and Gender: A Case Study of the Ahero Irrigation Scheme in Kenya

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This paper highlights the relationship between gender and land focusing on the irrigation community of the Ahero Irrigation Scheme in Kenya. Ecofeminism is used to frame the paper theoretically. Ecofeminism is used to highlight the relationship between people and nature, specifically women and the engendered dynamics. The study highlights land as communal property that is managed by men. Secondly, social-cultural constructions within the Luo culture play a key role in land accessibility in the Ahero Irrigation Scheme landscape, as it is through marriage that women can gain access to land for irrigation. Thirdly, ecological feminist perspectives need to be incorporated into the land policies within the Ahero Irrigation Scheme landscape to ensure better accessibility of land for the women within the scheme.

Keywords: Women, Ecofeminism, Kenya, Irrigation

#322 PROF THIERRY REGNIER, PROF BELINDA MEIRING: WHAT ARE THE CHALLENGES JEOPARDIZING FOOD SECURITY IN AFRICA?

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Several African countries are experiencing a staggering level of food insecurity not only due to population growth or climate changes but also because of internal conflicts and a lack of infrastructure. According to the Food and Agriculture Organization of the United Nations, Africa's food security challenges are compounded by the war in Ukraine, supply chain deficiencies, conflict, and drought. Furthermore, African governments have a low commitment to spending on agriculture, especially on extension services. In addition, resources and arable land are finite, and the conventional methods of food production exert a detrimental toll on the environment. Indigenous crops already form part of the traditional diet of many communities and by incorporating it into food products, protein requirements can be met by dietary diversification. Using several reports such as the one from the Stockholm International Peace Research Institute on food insecurity in Africa (2023), this paper focuses on the importance of alleviating the current challenges faced by the African continent while reporting the potential benefit of global harmonization programs in parallel to promote food safety education and awareness. As Africa is known to hold a rich biodiversity of crops with a staggering Indigenous knowledge of traditional and underutilized crops, it is important to support all programs that include the promotion of indigenous crops and hold the potential to shape a more sustainable food future.

#448 1LANLOKUN OLABISI, 2*OMEMU A. MOBOLAJI; 3ATAYESE A. OLABISI, 3ONI ENIOLA. O AND 4OBADINA ADEWALE O.: ASSESSING AWARENESS AND HANDLING PRACTICES OF MOLD AND MYCOTOXINS IN BUSH-MANGO (IRVINGIA SPP.) SEEDS DURING PROCESSING AND VENDING IN NIGERIA

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Introduction: Mycotoxins, especially aflatoxins, pose significant global food safety risks, with millions of people exposed annually to contaminated foods. These toxins, produced by molds in tropical climates, are linked to serious health issues. In Nigeria, bush mango (Irvingia spp.) seeds (BMS), are often processed in informal settings where food safety standards are not followed. Due to their seasonal nature, seeds are fermented, sun-dried, and stored at room temperature before being ground into flour. Long storage times, environmental factors, and market exposure create ideal conditions for fungal growth and mycotoxin accumulation.

Purpose: The study assessed awareness and handling practices regarding mold contamination and mycotoxins among BMS processors and vendors in Nigeria. The findings will identify knowledge gaps and inform future interventions to improve food safety.

Methods: A cross-sectional survey was conducted in South-West Nigeria, focusing on BMS processors and vendors. Data were collected using structured questionnaires and direct observations. The survey assessed participants' knowledge of mold and mycotoxins, contamination control measures, and food safety practices. Statistical analysis identified significant relationships between awareness levels and handling practices.

Results: The majority (100% processors, 91.1% vendors) were female; 13.3% had no formal education, and 44.4% had 1-10 years of business experience. All processors used sun-drying, with 33.3% drying on bare concrete floors and 11.1% on trays. Most stored dried seeds in polyethylene sacks, while 31.1% used covered bowls. Knowledge gaps were identified in storage conditions and sanitation. Only 22.2% of vendors cleaned milling machines weekly, and 82.61% did not wash hands before handling BMS. No one was aware of mold and mycotoxin risks in BMS, and many mixed moldy seeds with new stock.

Conclusions: The study highlights the need for targeted educational interventions to improve food safety practices among BMS processors and vendors, aligning local practices with international standards to reduce mycotoxin contamination and enhance public health.

Keywords: Bush mango seeds, food safety, Molds, Mycotoxins

#384 OGUGUA CHARLES AWORH: RE-DEVELOPING AFRICAN TRADITIONAL FOODS FOR INCREASED PRODUCTION CAPACITY, QUALITY AND SAFETY

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African traditional foods that date back to ancient times are part of the rich culture of the people and African traditional food processing techniques are useful skills and indigenous knowledge, acquired over centuries and passed on from parent to child, from one generation to another. They are the bedrock of small-scale food processing in Africa. Still produced largely in the home and the unregulated informal food sector, African traditional foods contribute to food and nutrition security and many of them are functional foods with health promoting benefits that are useful in the prevention and management of diet-related non-communicable diseases such as obesity, diabetes, hypertension and heart disease. However, their contributions to the economy, food security and wellness are hampered by many factors including poor quality raw materials, the slow, time-consuming, manual operations of traditional food processing techniques, the unsanitary processing conditions, lack of standardization and adherence to good manufacturing processes and good hygienic practices, poor packaging and food safety concerns. Re-developing African traditional foods through mechanization of the manual operations and application of modern food processing principles and techniques will increase production capacity, quality and safety of African traditional foods and enhance their contributions to the economy, food security and wellness.

#279 FLORENT G. KOUAMÉ AMIEN [1], ALFRED KOFFI YAO [1], CHRISTIAN ADOBI, KADJO [1], MAÏ KOUMBA KONE [2], ISABELLE MARAVAL [3,4], RENAUD BOULANGER [3,4], SIMPLICE TAGRO GUEHI [1]*: EFFECT OF AGROFORESTRY AND COCOA PRODUCING REGIONS OF CÔTE D'IVOIRE ON THE BIOCHEMICAL COMPOSITION AND COCOA BEANS FINGERPRINT OF AROMA COMPOUNDS IN THE CLIMATE CHANGE CONTEXT

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In the recent past, cocoa cultivation needed felling trees leading to the deforestation in the main cocoa producing countries such as Côte d'Ivoire. In response to this problem in the agroecology context, the agroforestry is more and more presented as the relevant crops production system for farmers.The present research aims to contribute to the promotion of agroforestry in cocoa farming by highlighting the effect of this agricultural system on biochemical composition and aroma compounds of cocoa beans. Samples of ripe cocoa pods were harvested from cocoa plantations

according to agroforestry and full sun systems of 8 different cocoa producing regions in novembre 2023. Cocoa beans were fermented and sun-dried. Sugars, amino acids, fatty acids and polyphenols contents of mucilaginous pulp and fresh cocoa beans were quantified according previous specific biochemical tests. The volatile organic compounds of dry fermented cocoa beans were extracted using SPME method and then identified and quantified by HPLC-MS method. The results revealed that almost complete equivalence was observed between the major biochemical compounds of cocoa matrices leading to the generation of the aroma compounds in dry fermented cocoa beans regardless of the cocoa cultivation system. Neither the biochemical composition of mucilaginous pulp nor fresh cocoa beans was influenced by agroforestry. A notable variation was detected between different cocoa producing regions, suggesting that local climato-pedological factors could play a key role in the biochemical composition and in the fingerprint of volatile organic compounds of dry fermented cocoa. Although, agroforestry system has no effect the chemical composition of cocoa, its adoption as new cocoa cultivation system as it could contribute to the diversification of incomes and to the food security for farmers.

Keywords : Cocoa cultivation, agroforestry, biochemical composition, volatile organic compounds, Côte d'Ivoire

#333 OGBUELE, ONYEMECHI CHINEDU, NWABUEZE, TITUS UGOCHUKWU AND UBOR, STELLA CHIGOZIE: IMPACT OF FORTIFICATION WITH SOYBEAN CONCENTRATE AND UN-DEHULLED BREADFRUIT FLOUR ON THE MINERAL COMPOSITION OF A DOUGH MEAL FROM ACHA (DIGITARIA EXILIS)

Dough meals which are major diets in many African countries and also getting global appeal has been conventionally produced mostly from carbohydrate dense cereals and have been limited by health implication and nutritional deficiencies associated with consuming such foods. Also, currently, there is increased interest in consuming food products that are functional foods and have the potential to provide adequate nutrient requirements and also promote health benefits on regular ingestion. Dough meal from Acha which is an underutilized crop that is loaded with nutrients, gluten free and reported to have low glycemic index will be an upgrade to other dough meals and fortifying it with soybean concentrate and un-dehulled breadfruit will provide foundational knowledge on producing dough meals that will serve as functional foods.

Two varieties of Acha (Brown and White) were processed into flour, while the soybeans were processed to soybean concentrate and the breadfruit seeds were processed to un-dehulled roasted flour. The dough meal samples were formulated by blending the acha flour and the soybean concentrate using three different ratios, while the un-dehulled breadfruit flour was added at the same proportion to each of the formulated samples as a constant. The samples were stored in zip lock jut bags. The mineral composition (Calcium, Magnesium, Potassium, Iron and Zinc contents) of the dough meals samples were determined using the AOAC method. Other quality parameters such as proximate composition, phytochemical composition, functional properties, glycemic index and sensory attributes of the dough meal samples were also determined using standard methods.

The calcium, magnesium and potassium content of the white acha base dough meal samples were significantly higher than those of brown acha base dough meal samples at $p>0.05$. There was no significant different in the iron and zinc composition of the brown and white acha based dough meals samples at $p>0.05$. Overall, the mineral content of the samples was within the range of the recommended daily intake as approved by standard bodies.

The study proved that fortification using protein concentrate and un-dehulled breadfruit flour improved the overall nutritional quality of the dough meal samples especially magnesium and potassium contents of the samples. Also, processing of the soybean into concentrate helped to eliminate most of the factors limiting the consumption of legumes.

SESSION 8: INNOVATIONS IN FOOD SAFETY AND SECURITY

#1069 LICIDA GIULIANI, SURBHI AGARWAL, MICHAEL CLARK, JENNIFER MACDIARMID, PETE SMITH: SUSTAINABLE EATING MADE EASY? A COMPARATIVE ANALYSIS OF THE NUTRITIONAL AND ENVIRONMENTAL FOOTPRINT OF READY-MEALS AND HOME-COOKED MEALS

Background and Objectives: Young women aged 18–24 years are a key demographic for studying plant-based dietary patterns due to their inclination toward plant-based convenience foods, increased risk of iron deficiency, and role as future influencers of household dietary habits. Ready meals are popular due to their convenience but their nutritional quality and alignment with sustainability goals remain unclear. This calls for a deeper understanding of whether plant-based ready meals offer better nutritional quality and environmental sustainability compared to equivalent meat-containing ready meals and home-cooked options. The objective of this study was (i) to assess the greenhouse gas (GHG) emissions and nutritional profiles (ii) to examine ingredient quality (using price as a proxy) to guide young women towards more informed, sustainable choices.

Methods: The ten most frequently purchased plant-based ready meals among households including at least one woman aged 18–24 were identified from Kantar WorldPanel data (05/2017 to 04/2021) and categorised into low, medium, and high-cost alternatives. Ready meals were prepared using packaging instructions, analysed for multi-elemental content (ICP-MS), and macronutrients quantified from back-of-pack information. Equivalent home-cooked meals, using low- and high-cost ingredients, were similarly analysed using ICP-MS and Nutritics software. GHG emissions were calculated based on estimated ingredient quantities and cooking processes to assess whether switching to convenient plant-based ready meals can be a sustainable dietary option for young women.

Results: The most purchased ready meals were margherita and vegetable pizzas, macaroni cheese, cheese and tomato pasta, vegetarian tikka masala with rice, vegetable chilli with rice, vegetarian lasagne, vegetable biryani, mushroom risotto, and cottage pie, accounting for ~19% of ready meal purchases among the study population. Findings are expected to highlight trade-offs between adequate nutrition, convenience, and sustainability with the analysis to be completed by May 2025.

Conclusions: This analysis will provide information on whether ready meals can serve as a sustainable and nutritious choice for young women seeking convenient foods. Our findings will be used to inform consumers and policymakers, including Food Standards Scotland (FSS), about the trade-offs between plant-based ready meals, meat-based ready meals and home cooking. Through an artist co-op, we will create visual outputs to communicate trade-offs, making findings accessible for guiding sustainable and nutritious dietary strategies.

#332 GEERT HOUBEN*[1,2], MARJOLEIN MEIJERINK[1] AND MARTY BLOM[1,2]: ALLERGENICITY ASSESSMENT OF (NEW) FOOD PRODUCTS AND INGREDIENTS

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Existing foods and ingredients or new foods and ingredients, they all have one major common feature: they often are a source of protein. This protein may serve a general nutritional goal (i.e. the food being a protein source), but may also be present with an intended specific functional goal, or just due to its presence in the source of the food. Additionally, proteins may be present in food unintentionally due to for instrance cross-contact in production facilities. Protein in food has one major safety concern: its potential to trigger food allergic reactions. It therefore is crucial to assess allergenic risk of proteins in (new) food products and ingredients and, if indicated, to manage these risks. However, until recent years, tools for (pre-market) assessment of allergenicity of (new) food products were limited and as far as available often had poor predictive values, were not fully validated, or lacked broad acceptance, while regulatory guidance redarding the parameters to assess and accceptability or unacceptability of risks was missing.

Yet, during the past decade, the knowledge, data and methods needed for the risk assessment of proteins in food has improved considerably. Authorities like the World Health Organisation, the Food and Agriculture Organisation of the United Nations, and the European Food Safety Authority have adopted much of these and have worked on guidances for the assessment of allergenicity risks of existing and new foods.

In this presentation, the types and sources of allergenic risks of (new) food products will be presented. Subsequently, recent developments for assessing these risks and guidances developed will be presented. Lastly, remaining unclarity in regulatory requirements will be discussed and recent efforts of an EU COST (Cooperation in Science and Technology) Action and an ILSI Europe Expert Panel for stimulating development of more clear regulation will be presented.

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#531 TAPIA, M.S., RIVAS, S., AVILA, R.M., CARMONA, A., TORRES, A., NÚÑEZ, M., MACHADO-ALLISON, C., PADRÓN, M., AGUDO, R. AND LIRA B.: FOOD SAFETY IN VENEZUELA. SOME PARTICULARITIES

Interacademic Commission of the Agri-Food System and Nutrition of the Venezuelan Academies of Physical, Mathematical, and Natural Sciences (ACFIMAN) and Engineering and Habitat (ANIH).
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The Venezuelan economy has suffered for more than two decades of wrong economic policies, facing one of the world's largest economic collapses outside of war and 7.7 million migrants. A myriad of crises (political, economic, and social) gave rise to a complex humanitarian emergency and the corresponding UN response. This crisis will be discussed regarding food safety, which, if affected by the loss of institutionality and controls, could compromise the transformation of the national food system, the health of consumers, and international trade. Venezuela, a declining petrostate, has oil production severely diminished by disinvestment, reduction of the oil extractive capability, and falling oil prices, a situation that, in addition to a weakened agricultural production and high dependence on imports, exchange control, and price regulation policies, caused food shortages/scarcity at critical levels, especially during 2013-2016. Hyperinflation, low income, and poor living conditions in Venezuela triggered food insecurity and malnutrition and encouraged survival strategies in the population (28.8 M) and food companies. As a result, the government enforced diverse strategies to achieve a complete food supply: a ferrous grip on food industries, avalanches of food imports —especially for social programs—, economic emergency decrees, transitory regulations, laxity in procedures, weak compliance with manufacturing/safety protocols permitting new food businesses, and only recently, a mild economic liberalization. There is limited information on compliance with the safety and quality standards of domestic and imported food and validated data on nutritional status. The objective of this work is to describe, through the Venezuelan case, how the food safety system of a country can be affected in terms of a) an unclear relationship with the Codex Alimentarius, b) laxity in the observance of food composition, hygiene, and safety standards and c) the lack of reliable reports on outbreaks/cases of foodborne diseases.

#418 DR. MICHAEL MURKOVIC: FORMATION OF THE POTENTIAL CARCINOGEN FURFURYL ALCOHOL DURING ROASTING OF COFFEE

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Intensive heating processes result in significant chemical transformations in foods. Especially, roasting of coffee – during which temperatures of up to 270 °C are reached – results in complex chemical reactions of mainly amino acids and sucrose. Besides the formation of melanoidins, small molecules can be formed from the degradation of carbohydrates during the course of the Maillard reaction. A series of furan derivatives occurs in the roasted coffee comprising furan, HMF, hydroxymethyl furoic acid, furfural, and furfuryl alcohol. It was shown that the major occurrence of furfuryl alcohol is in roasted coffee. Other heat treated foods contain significantly lower amounts of this compound. Furfuryl alcohol is volatile to a certain extend which reduces the concentration in the roasted product. In addition, it can react to a brown polymer. The concentration of furfuryl alcohol in roasted coffee can reach a few milligrams per gram. As this compound is water soluble it is transferred to the cup during brewing with an amount of e.g. 32 mg/cup American standard coffee.

It was shown earlier by a Norwegian/German consortium that furfuryl alcohol forms DNA adducts in presence of hu sulfotransferase 1A1 different organs. This is an indication that furfuryl alcohol can be a substance of carcinogenic relevance.

Reference: A. Albouchi, J. Russ, M. Murkovic (2018) Parameters affecting the exposure to furfuryl alcohol from coffee. Food and Chemical Toxicology, 118, 473-479.

#1288 DANIEL ASHEDEN: FOOD SYSTEMS FOR LONG-DURATION SPACE MISSIONS: A CASE STUDY OF EXPERT PERSPECTIVES ON CHALLENGES AND INNOVATIONS

Introduction:

Reliable food systems are as critical to human survival in space as life support technologies. Originally tailored for short-term orbital operations, current space food systems (SFS) rely heavily on shelf-stable, pre-packaged meals. However, as exploration extends beyond low Earth orbit (LEO) towards Mars and the Moon, escalating threats from resupply limitations, nutrient degradation, and psychological pressures demand urgent innovation. Yet despite growing recognition, sustainable preservation technologies and integrated food system redesigns remain inadequately addressed.

Purpose:

This study investigates expert perspectives on the critical challenges and emerging innovations required to revolutionise future SFS and address critical deficiencies in food system design for long-duration space missions (LDSM).

Methods:

A qualitative case study approach was employed using framework-guided inductive thematic analysis. Semi-structured interviews were conducted with eight experts from NASA, ESA, and private organisations. Participants provided informed consent to participate and have their insights included. NVivo software facilitated the systematic organisation of 293 codes into five major categories and 14 interrelated subcategories.

Results:

Experts identified compounding and persistent risks, including food safety threats, accelerated nutrient degradation, and psychological impacts such as sensory dulling and menu fatigue. Logistical burdens—particularly mass, volume, and radiation exposure (notably Galactic Cosmic Radiation, GCR)—were recognised as exacerbating food system vulnerability and crew member (CM) health deterioration. Innovations prioritised included high-pressure processing (HPP), bioregenerative life support systems (BLSS), and advanced controlled environment agriculture.

Conclusion:

Experts unanimously concluded that without transformative innovation, the feasibility of sustaining human health and operational capability during LDSM remains highly uncertain. The early integration of resilient, autonomous food systems into mission architecture, substantial investment in space food science, and sustained cross-disciplinary collaboration were deemed essential. Without such advances, the viability of future human exploration missions beyond LEO would be placed at significant risk.

#58 LUIS MAYOR* AND SARA BARBOSA: TOWARDS MORE SUSTAINABLE AGRI-FOOD CHAINS BY REDUCING FOOD FRAUD AND IMPROVING TRANSPARENCY: THE WATSON PROJECT

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Both the complex nature of our globalized food supply chain and the economic motivation for more profit have contributed to the growing evidence, prevalence and attention on food fraud. Food fraud in the supply chain is costly, threatens food safety and the effective functioning of the internal market.

The WATSON project provides a methodological framework combined with a set of tools and systems that can detect and prevent fraudulent activities throughout the whole food chain thus accelerating the deployment of transparency solutions in the EU food systems.

The aim of this presentation is to highlight WATSON main activities and outcomes.

The project includes three distinct pillars, namely, a) the identification of data gaps in the food chain, b) the provision of methods, processes and tools to detect and counter food fraud and c) the effective cross border collaboration of public authorities through accurate and trustworthy information sharing. WATSON relies upon emerging technologies (AI, IoT, DLT, etc.) enabling transparency within supply chains through the development of a rigorous, traceability regime, and novel tools for rapid, non-invasive, on-the-spot analysis of food products. The results are being demonstrated in 6 use cases: a) prevention of counterfeit alcoholic beverages, b) preservation of the authenticity of PGI honey, c) on-site authenticity check and traceability of olive oil, d) the identification of possible manipulations at all stages of the meat chain, e) the improved traceability of high-value products in cereal and dairy chain, and f) combat of salmon counterfeiting.

Keywords: food fraud, transparency, supply chain, traceability, blockchain, artificial intelligence

#1154 EVGENIA N. NIKOLAOU, EFTYCHIOS APOSTOLIDIS, EVANGELIA D. KARVELA, ATHINA STERGIOU, EIRINI K. NIKOLIDAKI, VAIOS T. KARATHANOS: 3D PRINTING AS A TOOL FOR THE PRODUCTION ON NOVEL NUTRIENT-ENRICHED GLUTEN-FREE FOOD PRODUCTS

Department of Nutrition and Dietetics, Harokopio University of Athens, Greece

The increasing demand for sustainable and customizable food solutions has driven the advancement of 3D food printing, an emerging technology that enables precise control over food structure, texture, and nutrient composition. Polysaccharides and plant proteins, due to their natural abundance, biodegradability, and cost-effectiveness, have become promising alternatives to synthetic polymers in food applications. To enhance the functionality of 3D-printed foods, hydrocolloids and agricultural by-products (such as those from olive oil and wineries) are often incorporated to modify matrix properties and increase nutritional value.

This study focused on developing a customized extrusion-based 3D printing approach for producing gluten-free food structures enriched with agricultural by-products, specifically olive leaves.

The bioinks were formulated using potato and corn starches, plant protein concentrates (pea, rice, soy), κ-carrageenan and extract from olive leaves at varying concentrations to assess their suitability as functional food matrices. Printed samples were subjected to freeze-drying, and their printability, structural integrity, and mechanical stability were evaluated based on extrudability (geometric accuracy) and shrinkage behaviour. All 3D-printed ink samples demonstrated excellent retention of phenolic compounds, with the highest recorded value reaching 2.75 ± 0.21 mg GAE /g lyophilized extract. Additionally, all formulations exhibited strong antioxidant activity, highlighting the effectiveness of the 3D printing process in preserving bioactive compounds. Results also demonstrated that the incorporation of agro-industrial by-products did not significantly affect the impact of printability compared to control samples, though compositional variations significantly influenced the final structural properties. These findings confirm the potential of 3D-printed matrices for applications requiring enhanced phenolic stability, antioxidant properties, and tailored structural characteristics. This approach not only enhances the nutritional value and structural properties of printed foods but also promotes waste valorisation and environmentally responsible food production.

SESSION 9: SAFE AND SUSTAINABLE FOOD SYSTEMS

#65 PETE SMITH: INVITED LECTURE: TOWARDS A SUSTAINABLE AND HEALTHY FOOD SYSTEM

University of Aberdeen

The world is facing multiple challenges across the nexus of climate, biodiversity, water, food systems, and human health and well-being. We are facing an ever-worsening climate emergency with the global mean temperature in 2024 surpassing the 1.5°C (above pre-industrial levels) goal of the Paris Agreement, with uncertain and unprecedented extreme events threatening lives, infrastructure, and ecosystems the world over. At the same time, we face a global water crisis; over 700 million people, or 1 in 10 people, lack access to clean water. We are facing a global food system crisis; 783 million people on the planet are facing chronic hunger, with 7 million deaths per year from diets low in whole grains, fruits, nuts and seeds and with many more people consuming unhealthy diets. We are in the midst of a nature emergency; one million species are threatened with extinction, and the global rate of decline in species has accelerated to an unprecedented rate in human history. We are facing a range of global health and well-being challenges including antimicrobial resistance, increases in impacts of climate change on a range of health issues, a rise in non-communicable diseases such as cardiovascular conditions, diabetes and cancer, and inadequate prevention and preparedness for infectious diseases and pandemics.

The food system is responsible for a third of human greenhouse gas emissions, is the primary driver of biodiversity loss, is responsible for 70% of freshwater withdrawals and poor diets contribute health risks for 3-4 billion people on the planet. Attempts to remedy any of these interlinked crises must involve the food system. In this talk I will outline some of the ways the food system needs to change if we are to address these challenges.

#430 JOHN ENNIS: SIMULATED RESEARCH FOR A SUSTAINABLE FOOD FUTURE: RETHINKING TESTING WITH INTELLIGENT AGENTS

Aigora

Traditional sensory and consumer testing is slow, expensive, and often reactive. But what if we could run experiments in a simulated world first, with intelligent agents standing in for both consumers and products? In this talk, we introduce simulated research: a new paradigm where AI agents, informed by real data, interact in dynamic virtual environments to test ideas, explore edge cases, and anticipate outcomes. Unlike static digital twins, these agentic systems adapt, respond, and evolve, creating interactive simulations that support smarter, faster, and more sustainable research. As global challenges intensify, simulated research offers a path toward better decisions made earlier in the development cycle.

#844 BIRUK TEWODROS & GETAHUN, H.: FOOD, NUTRITION, AND THE RIGHT TO HEALTH: OPTIMIZING THE SCIENCE FOR ADVOCACY AND POLICY RECOMMENDATIONS.

Global Center for Health Diplomacy and Inclusion (CeHDI), Geneva, Switzerland

Food insecurity affects more than 2.4 billion people, 800 million of whom experience hunger. Increased consumption of unhealthy foods and beverages has increased the burden of non-communicable diseases, which are now the leading cause of death in the world. Likewise, more than half (4.5 billion) of the global population are not fully covered by essential health services. The increased production of processed and ultra processed food products further fuels the epidemic of food related illnesses demonstrating the interactions between food and health.

The right to food is defined as the right of every individual to have regular, permanent, and unrestricted access to adequate, sufficient, and nutritious food that meets their dietary needs for an active and healthy life. Similarly, the right to health is the recognition of the attainment of the highest standard of health by everyone with access to timely, acceptable, and affordable healthcare of appropriate quality, as well as addressing the underlying determinants of health, such as safe and potable water, sanitation, food, housing, health-related information, and education, and gender equality. Governments have the responsibility to take positive actions to ensure the right to health and the right to food, and also to prevent and protect the violation of the right to health, including by third parties, through evidence-based policies and regulations.

Despite these right-based provisions, we are faced with the double burden of under and over nutrition and increasing burden of food borne and food related diseases, which is disproportionately increasing in low- and middle-income

countries. It also drives inequality between and within societies, and the most marginalized communities always bear the brunt of the burden.

With this presentation, we aim to promote interaction and understanding of both the Right to Food as an integral part of the Right to Health and vice versa. The presentation will also discuss the need to develop a framework of evidence generation and evidence base to support and inform governments to fulfil their responsibilities on the right to food and the right to health including through the development of harmonized food safety rules and regulations. It also proposes areas to further seek collaboration with the GHI network.

#274 THIERRY ASTRUC: THE PLACE OF MEAT IN A SUSTAINABILITY PERSPECTIVE

INRAE

Livestock breeding and meat production represent 12% of greenhouse gas production (UN-FAO), the large majority (62 %) coming from cattle breeding. The significant reduction in beef consumption recommended to reduce greenhouse gas production will have significant repercussions on lifestyle, and the notion of progressiveness seems essential to adapt the population to this change in diet. To preserve the volume of milk and dairy products, the proportion of dairy herds will increase. 60% of beef consumed in Europe already comes from dairy herds. However, this meat, which can be considered a by-product of milk, and which has lesser organoleptic properties compared to meat from beef cattle, can claim similar nutritional properties. Some offal (liver, heart) are also difficult to sell even though they are particularly rich from a nutritional point of view. The purpose of this communication is to identify ways to adapt to the prospect of reducing beef production, by better use of offal and cull cow meat, and by supporting the consumer by providing hybrid foods and substitute products. Consumers already have access to meat analogues and artificial meat, but the availability of hybrid foods (meat/vegetable/fungal) is limited. The design of such foods requires rigorous research to guarantee satisfactory sensory properties and the maintenance of the nutritional properties of the food, along its process and during its storage. In parallel, we can expect to maintain a lower production of very high quality beef intended for occasional festive consumption with a high price considering the financial needs necessary for the animal production (breed, age at slaughter, mode of production) and the processing (dry ageing) of this premium meat.

#855 DR. MATILDA FREUND: HYGIENIC DESIGN, A CRITICAL PRE-REQUISITE FOR A FOOD SAFETY SYSTEM

EHEDG Switzerland

The use of Hazard Analysis and Critical Control Point (HACCP) as a system to manage food safety has been widely implemented in the food industry for over 30 years. Despite this long period of use, only recently have some of the important prerequisite programs been developed as part of a food safety certification scheme and guidance issued. One of these areas is hygienic design.

The food safety impact of poor hygienic design has long been recognized as one of the leading contributors to foodborne illness and there have been a number of high profile recalls related to poor cleaning and design. This is supported by the fact that hygienic design has long been recognized as a prerequisite program in HACCP . One organization that recognized the importance of hygienic design's role in food safety is the European Hygienic Design and Engineering Group (EHEDG), founded in 1989. EHEDG has been developing guidance and training on equipment and facility design since its inception however, despite this material, audits have generally included a review of cleaning and validation methods and not focused on hygienic design and the overall use of equipment as part of a food safety certification scheme. In 2020, the Global Food Safety Initiative (GFSI), included two new scopes of recognition, JI and JII in its Benchmarking Requirements which concern Hygienic Design of Food Buildings and Food Processing Equipment. These requirements are used by certification bodies to generate audit standards. As a result, hygienic design will now be included in the food safety certification. This presentation will provide examples of food safety issues linked to poor hygienic design and discuss the implementation of a hygienic design prerequisite program as part of an overall food safety program.

#450 MERIDETH KELLIHER, GLOBAL HARMONIZATION INITIATIVE, FETHIYE, TURKEY, DR. DIANA BOGUEVA, CURTIN UNIVERSITY SUSTAINABILITY POLICY (CUSP) INSTITUTE, SYDNEY, AUSTRALIA, PROF. DORA MARINOVA, CURTIN UNIVERSITY SUSTAINABILITY POLICY (CUSP) INSTITUTE, PERTH AUSTRALIA: META-ANALYSIS AND RANKING OF THE MOST EFFECTIVE METHANE REDUCTION STRATEGIES FOR AUSTRALIA'S BEEF AND DAIRY SECTOR

https://doi.org/10.3390/cli12040050

Although Australia remains committed to the Paris Agreement and to reducing its greenhouse gas emissions, it was late in joining the 2021 Global Methane Pledge. Finding suitable methane (CH4) mitigation solutions for Australia's livestock industry should be part of this journey. Based on a 2020–2023 systematic literature review and multicriteria decision approach, this study analyses the available strategies for the Australian beef and dairy sector under three scenarios: baseline, where all assessment criteria are equally weighted; climate emergency, with a significant emphasis on CH4 reduction for cattle in pasture and feedlot systems; and conservative, where priority is given to reducing costs. In total, 46 strategies from 27 academic publications were identified and classified as 'Avoid', 'Shift', or 'Improve' with respect to their impact on current CH4 emissions. The findings indicate that 'Avoid' strategies of conversion of agricultural land to wetlands, salt marshes, and tidal forest are most efficient in the climate emergency scenario, while the 'Improve' strategy of including CH4 production in the cattle breeding goals is the best for the conservative and baseline scenarios. A policy mix that encourages a wide range of strategies is required to ensure CH4 emission reductions and make Australia's livestock industry more sustainable.

Table 4. Ranked methane reduction strategies according to climate emergency-weighted indicators.

Ranking	Performance Ranking	Climate Emergency-Weighted Strategy
1	0.94687926	Conversion of land from ponded pasture to freshwater tidal forest
2	0.94684681	Conversion of land from ponded pasture to mangroves
3	0.94637256	Conversion of land from ponded pasture to salt marsh
4	0.92307151	Conversion of land from dry pasture to salt marsh
5	0.89979906	Methane production negatively economically valued at −0.60 c per kg CH_4 and DMI included in breeding goals
6	0.88987446	Feed lot cattle supplemented with Asparagopsis taxiformis
7	0.88001861	Methane production negatively economically valued at −0.60 c per kg CH_4 and RFI included in breeding goals
8	0.87954682	Inclusion of citral extract at 0.1% of DM
9	0.86121429	Composting manure vs. stockpiling
10	0.85934594	Methane production negatively economically valued at −0.30 c and DMI included in breeding goals

#640 SANAR MUHYADDIN: THE IRAQI BROILER INDUSTRY AND FOOD SUPPLY: BACKGROUND AND ISSUES

Wrexham University

This study reviews the past trends, the present and the future prospects facing Iraq's broiler sector in general and the small broiler farms in particular. Iraq struggles from chronic structural and emerging challenges that have hindered its food production over the years. In 2019, Iraq's population had been increasing, from 23.5 million in 2000 to around 39 million Iraqis. This amounts to a 66 percent increase in population in 20 years. Food supply, both locally produced and imported, has been struggling to catch up with the population growth, and Iraq has become increasingly dependent on food imports to meet domestic demand. Between 1985 to 2017, food imports increased from USD 2 billion to 11 billion (from 19 to 21% of total imports). Iraq's economy has been highly dependent on the oil sector, with declining oil prices, politician and international communities emphasised that agriculture can be a source for job creation, income generation and self-reliance. Nonetheless, evidence from this exploratory study with small broiler farmers indicate that there is a long way for Iraq to rely on agriculture instead of oil for its economy and improve its food system.

Furthermore, this issue is made worse by Iraq's political unrest and instability, the ongoing wars and conflicts, and the corruption and poor use of public funds. The dominance of state-owned businesses, a lack of infrastructure and security, and the difficulty farm owners face in obtaining funding due to the absence of a formal banking or credit system are just a few of the issues that have befallen iraqi farmers. In addition, there is a labour shortage in the agricultural sector, where unskilled labour makes up the majority of the workforce, and farmers' tacit knowledge is eroding.

This research contributed to the literature on small business survival in hostile and war environment. The exploratory nature of this study identifies areas for future research. Additionally, the arguments that will be presented in this research highlights the challenges that broiler farmers and the tactics they use to survive in a hostile environment like Iraq. It will also offer suggestions for policymakers and international communities to focus intervention to help broiler farmers to improve their performance.

#383 BELINDA MEIRING AND THIERRY REGNIER: FOOD SAFETY FIRST: COMBATTING FOODBORNE ILLNESS THROUGH SCHOOL FOOD SAFETY CLUBS IN SOUTH AFRICA

Tshwane University of Technology

Recent food poisoning incidents in South Africa have raised alarm, with tragic consequences, particularly for schoolchildren. Between September and November 2024, over 890 cases of foodborne illness were reported, resulting in 23 fatalities, most of them children. One of the most devastating incidents occurred in Soweto, where six children died after consuming chips contaminated with terbufos, a highly toxic pesticide. Other cases involved students hospitalized after consuming expired or contaminated food items from informal vendors. These events have highlighted significant gaps in food safety within the informal trading sector, where many vendors operate without stringent oversight. In response, the South African government has introduced measures, including mandatory spaza shop re-registration, inspections, and public awareness campaigns. The Department of Basic Education, in collaboration with the Department of Health, is also developing safety guidelines for schools to mitigate risks related to pesticide exposure and unsafe food practices. Food safety education in schools is crucial for preventing such tragedies. Early training in proper food handling, preparation, and storage equips students with essential knowledge to avoid foodborne illnesses. Additionally, it empowers them to promote safe practices at home and in their communities, contributing to long-term public health benefits. This presentation will explore the recent foodborne illness outbreaks in South Africa and highlight the role of the Global Food Harmonization Initiative (GHI) school food safety clubs in addressing these challenges. Progress from the pilot implementation of South Africa's first GHI school food safety club will also be discussed, demonstrating its potential to ensure healthier futures for learners and their communities.

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SESSION 10: ETHICS AND RELIGION – CHALLENGES AND INNOVATIONS

#64 CAROLINE HUNT-MATTHES: THE WHISTLEBLOWING IMPERATIVE IN FOOD SAFETY & FAILURE TO PROTECT

Grenoble Buisensss School (France)

Food safety scientists are the first line of defence in identifying and disclosing violations that compromise the safety and integrity of food products. The importance of the food safety scientist to have a safe environment in which to raise an alert and be protected from retaliation cannot be understated. The profit motive, ad organisational culture in particular can sometimes be a deterrent.

Caroline Hunt-Matthes is a Human Rights lawyer, Adjunct professor and international investigator. Her advocacy and publications champion the importance of safe reporting channels and proper protection for those who may be retaliated against for fulfilling their mandate. This is particularly important within the food safety eco-system. Her presentation will explore the landscape confronted by food safety scientists and the shortcomings including the importance of solidarity amongst food safety scientists to be up-standers not bystanders.

Her most recent book: We the People the UN whistleblowers- Whistleblowing and Retaliation in the United Nations urges us via several real life stories to strive for accountability and to end impunity for those who have retaliated against whistleblowers acting in the public interest and to protect the public from harm.

#715 JOE REGENSTEIN:SCIENCE AND RELIGION: HOW THE RELIGIOUS COMMUNITY IS REACTING TO NEW TECHNOLOGIES

Cornell University, Ithaca, New York, United States

The kosher and halal food laws are thousands of years old and govern how Jews and Muslims, respectively, approach food consumption. The kosher laws are important in commerce, particularly in the US and Israel, where, for example, in the US kosher certification is found on about 40% of packaged goods. About a quarter of the world's population is impacted by halal either as Muslims, or by living in a Muslim majority country that considers halal requirements. The religious leaders in both communities need to accept or reject new technologies in accordance with their interpretation of these ancient laws. This leads to more than one standard that at times is frustrating to some stakeholders but is a celebration of the diversity within the community and deserves respect. By understanding these laws and the range of acceptable choices both the food industry and consumers can make informed choices. A number of topics involving new technologies need to be discussed including: genetic modification of organisms; the use of CRISPR; the use of insects for animal feed and human consumption; plant protein-based food that mimic various animal products; cell cultured animal products; the use of ethyl alcohol; the use of marijuana derivatives; the use of microwave energy to warm the brain of an animal to cause loss of consciousness; the greater use of blood by-products; veterinary practices; and the use of manure in animal feed. Halal is concerned with what animals and people ingest while kosher is focused on human food consumption. These laws impact the farmer, and the ingredient and finish product manufacturers. Thus, as the Global Harmonization Initiative strives to improve the free movement of foods across national boundaries, the role of religious laws needs to be considered.

#569 SARAH BLANCHARD, BILL MC BRIDE: ETHICAL FOOD BUSINESS RECOGNITION

(EFBR)

ETHICAL FOOD BUSINESS RECOGNITION is a metric for food businesses that integrates business governance, environment, social, food safety, nutrition and sustainability. Bill McBride and Sarah Blanchard will explain the need, benefits and use of this self- assessment tool which provides food businesses with a health check on their food safety, quality, environmental and social compliance journey, and that of their supply chain, and encourages the integration of these business aspects under proactive business governance. EFBR is not a new compliance standard. It assimilates established food safety, sustainability, and social compliance standards and references that are compatible with the UN SDGs, UN Global Compact Principles, and WHO Global Strategy for Food Safety. EFBR is not another ESG measurement tool. It goes beyond by integrating food safety quality, and nutrition with ESG performance. Owned and managed by Foodlink EFBR, a non-profit business registered in Australia, the intellectual property for the metric and methodology is under Creative Commons licence CC BY-ND 4.0. It has been peer reviewed and endorsed by a volunteer team of global food industry experts. The food business conducts the assessments and takes the required actions. All Foodlink does is provide the tool, verify the assessments, and collates the results by industry sector. There are three levels of assessment:

Level 1 – assesses the governance, direction and oversight provided by the leadership of the business, whether the BOD of a multi-site business, or the on-site leadership of a single site

food business.

Level 2 – considers the implementation of food safety, environmental, and social values, policies and practices within each manufacturing business unit.

Level 3 - applies to the implementation of the same policies and practices within each food and packaging material supplier.

The food manufacturing industry needs a synergistic approach. Food safety, sustainability, social compliance, cannot be effective in isolation, but when the business is considered as a whole, the combined effect is greater than the sum of the individual parts.

#303 ESRA ÇELİK[1]**, AŞKIN YAŞAR[1]: SCALE DEVELOPMENT AND VALIDATION STUDY TO DETERMINE FOOD ETHICS AWARENESS*

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* This study, prepared by benefiting from the Doctoral Thesis titled “Determining the Effect of Food Ethics Awareness of Individuals on Animal Food Consumption Preferences in Türkiye” of the first author, was supported by Selçuk University Scientific Research Projects Coordination Office with Project number 22112007.

While ethics investigates what the concepts of “good-bad” and “right-wrong” are, whether there is “universal good” and “universal truth” and whether these can be achieved, food ethics can be defined as a more specific field. This field focuses on discussing the value problems and conflicts that arise from the production to consumption stage of food, making them understandable and finding solutions. Since ethical awareness positively affects ethical decision-making skills, it is important to determine the effect of food ethics awareness on food-related ethical decision-making skills. However, since there is no scale measuring this structure in the literature, this study aimed to develop and validate a scale that measures food ethics awareness.

The Food Ethics Awareness Scale (FEAS) was developed in four main steps: 1. Generating the initial item pool covering all aspects of food ethics; 2. Reviewing items with experts; 3. Sampling and survey administration (N=600); 4. Conducting psychometric analyses. Construct validity was assessed using exploratory (EFA) (N1 =300) and confirmatory (CFA) (N2 =300) factor analyses. Content and discriminant validity, internal consistency, test-retest reliability and Item-Response Theory (IRT) were examined.

Participants (N=600) completed a survey with face to face consisting of the FEAS. The initial pool of 125 items was refined to 17 items using EFA. The EFA revealed a five-dimensional model of the FEAS - namely “food consumption”, “food security”, “global hunger”, “sustainable food”, and “biotechnological food” which was verified through a CFA. Adequate content validity was achieved. To assess test-retest reliability, 24 participants completed the FEAS again two weeks later. Discriminant validity was supported by significant differences between subgroups of individuals. The Scale showed good internal consistency, with a high Cronbach Alpha Coefficient (0.85) and adequate test-retest reliability (>0.70). The measurement power was increased with IRT.

This study validated the first measurement tool to assess the total food ethics awareness score and scale dimensions in a general population. Future studies may include this scale when investigating food ethics awareness according to various sociodemographic factors and its impact on food-related ethical decision-making skills.

Keywords: Food ethics, Food ethics awareness, Scale development, Validation

#624 DIANA BOGUEVA: FOOD, AI AND GENERATION Z

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The intersection of artificial intelligence (AI) and food systems is reshaping how Generation Z (Gen Z) engages with food, offering opportunities to revolutionize production, distribution, consumption, and sustainability. As digital natives, Gen Z demonstrates a unique affinity for technology-driven innovations, showing a strong interest in personalized nutrition, smart kitchens, and sustainable food choices enabled by AI. AI-powered tools, such as predictive analytics, chatbot nutritionists, and precision agriculture, are influencing how Gen Z evaluates food quality, convenience, and ethical considerations. However, this cohort also raises critical concerns about privacy, data security, and the transparency of AI applications in food systems. This abstract explores the dual role of AI as both a facilitator and a disruptor, emphasizing

its potential to meet Gen Z's demands for health-conscious, eco-friendly, and culturally relevant food solutions while addressing their apprehensions about technology's ethical implications. By understanding Gen Z's perceptions and priorities, stakeholders in the food industry can harness AI to foster innovation that aligns with their values and shapes the future of food.

#220 JOE REGENSTEIN[1], MR. FELIPE KLEIMAN[2], DR. AWAL FUSEINI[3]: KNIVES USED FOR THE RELIGIOUS SLAUGHTER OF ANIMALS: A CRITICAL LOOK

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3Agricultural and Horticultural Board, Kenilworth, England

The religious slaughter of animals has been controversial because the traditional practice is to use a horizontal knife cut across the neck without any prior interventions. The animal rapidly becomes unconscious, although not instantaneously. Important critical details include having an unstressed animal and a proper alleyway leading to a well-designed restraining box, facilitating a quick process. In addition, the best practices for the specifically designed knife is that it be twice the width of the animal's neck and have a straight edge to make a quick, painless and efficient cut by being totally smooth with a sharp edge. A minimum number of strokes by a well-trained slaughterman at the right place and depth reaching the carotids, jugulars, trachea, esophagus and the braquioencephalic nerve trunk is needed. This knife requires a specific metal softness for sharpening with multiple whetstones including a special finishing stone (of at least 8,000 grit), and then be able to retain the sharpness. More importantly, the knife needs to be free of any nicks, as it is the nicks that are the likely source of any pain felt by the animal. The slaughtermen must be trained to check the knife for nicks, ideally between each animal. In addition, during training and occasionally each year, slaughtermen should have the sharpness and smoothness of their knives determined objectively using the Anago knife sharpness-testing instrument. Because of the cost of this instrument, an organization (e.g., government, general NGO, or a Muslim organization) in each country/state/province might provide appointment-based access to the instrument by all slaughterhouses doing religious slaughter of animals. They might also help rollout the changes by purchasing knives and whetstones wholesale for internal distribution along with appropriate educational/training materials. Additionally, they might make the sharpness testing available to other companies to help prevent ergometric work-related injuries.

#572 MAHSA SADEGHI: VISUAL AND MULTIMODAL METAPHORS IN FOOD ADVERTISING

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Since the introduction of conceptual metaphor theory (CMT) by Lakoff and Johnson in 1980, extensive research has highlighted the essential role of metaphors in human cognition. Over the last twenty years, there has been a significant increase in scholarly interest regarding multimodal metaphors across various discourse genres, including political cartoons, magazines, posters, advertisements, television programs, and films. A multimodal metaphor is characterized as "a metaphor whose target and source are rendered exclusively or predominantly in two different modes (or modalities)" (Forceville, 2009). In contrast, a visual (or pictorial) metaphor is a monomodal metaphor where both the target and source are depicted in a visual format. Drawing on multimodal metaphor theory (Forceville, 1994, 1996), this study seeks to analyze visual and multimodal metaphors within a selection of food advertisements broadcast on Iranian television. Given that television food advertisements integrate images, sound, and text to effectively promote products and entice consumers, multimodal metaphors play a crucial role in achieving specific commercial objectives. The primary aim of this research is to investigate how the emotional, argumentative, and persuasive functions of metaphors can effectively communicate the intended message of the advertisement. The data for this study comprises ten television advertisements for food products, collected through a random sampling method. Preliminary findings indicate that visual and multimodal metaphors in advertisements facilitate analogical reasoning by drawing comparisons between elements of the source and target domains of the metaphor, thereby persuading consumers to purchase the featured product. Additionally, the emotional states of happiness (associated with positive feelings such as satisfaction and joy) and sadness (linked to negative feelings like dissatisfaction and disinterest), when represented metaphorically, can enhance the persuasive impact of advertisements. The research has the potential to enhance the existing literature on multimodal and visual metaphors in advertising by exploring the diverse roles these metaphors serve. Additionally, the findings could prove advantageous for marketers in creating more compelling and impactful advertisements.

Keywords: Food marketing, Multimodal symbolism, Visual symbolism, Persuasiveness, Food sector.

#408 BETTY FENG: ENHANCING FLOUR SAFETY COMMUNICATION FOR INFORMED CONSUMER CHOICES: A MIXED METHOD STUDY WITH SURVEYS AND EYE-TRACKING

Purdue University

Flour, a low-moisture food product, has been identified as a source of pathogenic bacteria, including Salmonella and E. coli, leading to foodborne outbreaks and recalls. Despite this, many consumers remain unaware of the risks associated with consuming raw cookie dough or batter. Flour safety messages on packaging play a critical role in consumer education but may lack effectiveness in changing behavior.

Purpose:

This study aims to assess the accessibility of flour safety messages on packaging, identify consumer barriers to processing these messages, and evaluate consumer knowledge and behaviors regarding flour handling, recalls, and outbreaks.

Methods:

The study utilized a mixed-methods approach. Eye-tracking technology tracked 47 participants' eye movements to measure time-to-fixation (TTF) on flour safety messages from ten package designs (short and long messages). In a separate study, an online survey of 1,045 U.S. flour-using consumers was conducted, focusing on flour handling behaviors, recall awareness, and message effectiveness.

Results:

Eye-tracking data revealed that participants had an average TTF of 9.78 seconds for short messages and 9.22 seconds for long messages, with only 4.3% of participants identifying all safety messages across the packages. Most participants (93%) found the long message on Package, which was also the most preferred (34%). Survey data showed that awareness of flour recalls or outbreaks was low (15%), and fewer consumers (17%) believed they could be affected. Notably, 66% of consumers who bake admitted to eating raw cookie dough or batter, with dough "eaters" perceiving food safety messages as less effective compared to "non-eaters."

Significance:

Insights from this study underscore the need for science-based messaging strategies to improve flour safety communication and consumer education. Enhanced messages can assist in more accurate risk assessment and promote safer flour handling practices.

SESSION 11: FOOD TRANSITION

#635 DORA MARINOVA: INVITED LECTURE: FOOD SUSTAINABILITY TRANSITION

Curtain University

Sustainability is a major way of reshaping the way we live within the planetary boundaries. It requires substantial changes in all areas of life including in food production and consumption. Throughout history, humanity has progressed in advancing many technologies that had impacted the way food is produced, stored, distributed and consumed. We are currently on the brink of a new technological wave of innovations shaped by sustainability imperatives which also include food. What are the push and pull factors that shape demand for food? Are we prepared to examine how our food preferences affect climate change, biodiversity, resource use, inter- and intragenerational justice? Do we understand how new technologies challenge the availability of food and in fact, define what food is? It is important to take a global perspective while examining the role of food in a sustainability transition but search for answers that reflect local realities, cultures and opportunities. Concepts, such as food security and regenerative agriculture, have a different meaning for the wealthy countries and those exposed to the challenges of development. Consumer preferences and industry interests are shaping the future and revealing where they stand in a global transition holds the key to a healthier and more sustainable future.

#581 ERMOLAOS VERVERIS[1]*, GÉRALDINE BOUÉ [2,3], AIKATERINI NIFOROU[4], ANDRONIKI NASKA[4]: RISK-BENEFIT ASSESSMENT AS A TOOL TO EVALUATE FOOD SUBSTITUTIONS AND INFORM DIETARY SHIFTS IN AGRIFOOD SYSTEMS: INVESTIGATING RED MEAT REPLACEMENT

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Introduction: Transforming global food systems to enhance sustainability, safety, and health could include integrating new foods into our diet. While some of them expand dietary choices, others could replace traditional staples, necessitating a careful evaluation of their safety and health impact. Risk-Benefit Assessment (RBA) provides a unified framework to evaluate both risks and benefits, integrating nutritional, toxicological, and microbiological aspects.

Purpose: In response to growing interest in alternative protein sources, and concerns regarding red meat consumption, our case study evaluates the overall health impact of substituting beef with house cricket powder European populations' diet.

Methods: A harmonized framework was developed to select relevant compositional components, considering nutrients, chemical and microbiological hazards, and associated health outcomes. Meta-analyses were employed to document associations between nutrient intake/toxicological elements, and health outcomes. Microbiological risks were assessed using disease incidence, source attribution, safety thresholds, and dose-response models. Probabilistic modeling was used to estimate the health impact, expressed in disability-adjusted life years (DALYs), of substituting minced beef with cricket powder in burger patties among adult populations in Denmark, France, and Greece.

Results: The sodium content, naturally high in crickets, emerged as a critical factor influencing the overall health impact, far surpassing any other nutritional, microbiological, or toxicological considerations. Incorporating cricket powder into diets in a well-considered manner showed potential for positive health impact. However, while cricket powder is generally safe, it does not present a healthier alternative to beef when high content of cricket powder is used in the formation of the patties.

Conclusions: Through a comprehensive, multifaceted approach, the potential of a novel protein source as a replacement for beef in diets was highlighted. The findings emphasize the importance of carefully considering risks and benefits during product formulation to optimize the overall health impact. The RBA approach should be further explored towards supporting evidence-based dietary shifts and guiding informed decisions and strategies in food system transformations.

#424 MAHSA FARROKHI, ANA MARQUES MOTA, INÊS RAMOS, CRISTINA L.M. SILVA*: ULTRASOUND TECHNOLOGY IN GLUTEN-FREE FOODS: A NOVEL APPROACH TO FUNCTIONAL AND SUSTAINABLE BREADMAKING

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Producing high-quality gluten-free bread remains a challenge due to the absence of gluten, which compromises texture, volume, and sensory appeal. Ultrasound technology has emerged as a promising method to enhance the functionality of gluten-free flours by inducing structural and functional modifications at the molecular level (1).

This study investigates the impact of ultrasound-treated gluten-free composite flour, comprising starches, flours, hydrocolloids, and enzymes, on key bread quality attributes. The flour was sonicated at 15% hydration for 10 minutes at room temperature. Two bread variants were prepared: one using sonicated flour and the other with non-sonicated flour as a control. Both were made using a standardized formulation (56% composite flour, 38% water, 4% vegetable oil, and 2% fresh yeast) and baked at 220°C after proofing. Analytical evaluations included bake loss, loaf volume, water activity, pH, texture profile analysis (hardness, chewiness, cohesiveness, springiness, and resilience), color, and sensory assessment by a trained panel.

The results revealed that sonicated flour significantly increased bread volume, which can be attributed to improved gas retention (2). While bake loss and water activity remained consistent between the two samples, the pH of the sonicated bread was slightly higher, potentially indicating changes in enzymatic activity. Texture analysis showed a softer crumb and crust, with reductions in hardness and chewiness (3, 4) (Figure1). Colour analysis confirmed no perceptible colour changes ($\Delta E^* = 0.88$). Sensory panellists preferred the texture of sonicated bread for its softness and chewability.

These findings demonstrate the potential of ultrasound as an effective and sustainable tool for improving the quality of gluten-free bread. By enhancing the structural and functional properties of gluten-free composite flour, ultrasound addresses key challenges in gluten-free product development, offering innovative solutions to meet consumer expectations for better texture and sensory appeal.

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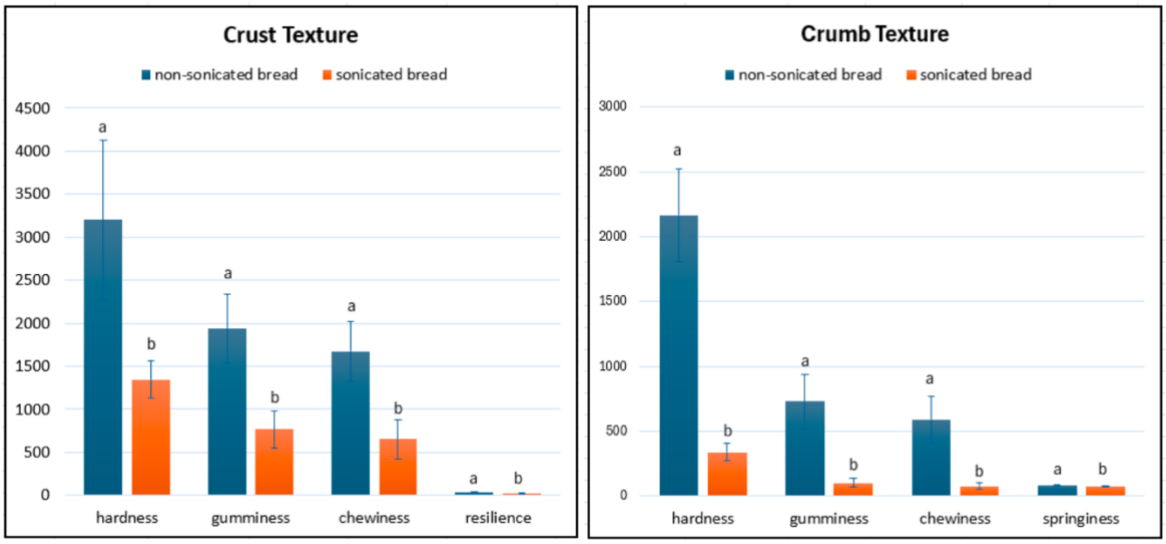

Figure 1 - Results of crumb and crust texture analysis in non-sonicated and sonicated (15% hydration) gluten-free bread.

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#851 VLADIMIR SURČINSKI, HANS-DIETER PHILIPOWSKI: TRANSPORT HYGIENE RISK ASSESSMENT RESULTS: TREND ANALYSIS ACROSS 50+ EVALUATED FOOD COMPANIES

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Introduction

Transport hygiene in the food supply chain is crucial to preventing contamination, microbial growth, and allergen cross-contact. This study evaluated hygiene risk assessments from over 50 companies, identifying key trends, challenges, and best practices to enhance food and feed transport safety.

Purpose

This study aimed to assess transport hygiene risks in bulk food and raw material logistics. By analyzing hygiene assessment results, we highlight common risk factors, compliance trends, and best practices.

Methods

Using the ENFIT Transport Hygiene Risk Analysis (THR Analysis), data were collected from 50+ food companies. Key factors included:

- Cleaning validation results (microbial, chemical, physical, allergen contamination).
- Effectiveness of cleaning protocols and compliance with ENFIT HQF certification.
- Training levels of transport hygiene personnel.
- Cross-contamination incidents due to improper cleaning or procedural failures.
- Intentional contamination and fraudulent activities during transport.

Results

Cross-Contamination Risks: Many companies failed to meet hygiene standards, with bacterial and allergen cross-contact risks due to poor cleaning and design of transport units.

Cleaning Validation Gaps: Cleaning efficacy was often judged visually or based on unreliable documentation. Many companies lacked validated cleaning programs and effective internal monitoring.

Training Deficiencies: Even companies with structured training rarely covered transport-specific cleaning, loading/unloading controls, and handling nonconformities.

Digital Solutions: Some companies adopted digital tracking systems, including blockchain, for improved traceability and hygiene monitoring.

Conclusions

While progress has been made, gaps remain in cleaning validation, training, documentation, and ENFIT compliance. Companies with robust validation, staff training, and digital monitoring are more likely to ensure safe food transport. Industry-wide standardization is needed to enhance food safety transport regulations.

#701 ELIZA J. VILLARINO: PROPENSITY TO CONSERVE FORESTS AMONG NON-CERTIFIED COCOA PRODUCERS IN COLOMBIA

International Center for Tropical Agriculture

Global pressure to ensure sustainable cocoa production has heightened due to new European Union regulations banning commodities linked to deforestation, alongside a recent cocoa supply crisis. Amid this trend, this study examines the willingness to conserve forests of non-certified cocoa producers in Colombia. Using survey data from 819 producers in the departments of Caquetá and Cesar, we analyzed factors, including socio-economic conditions and farming practices, that may influence willingness to conserve forests. A probit model analysis revealed significant regional differences: Key factors influencing the willingness to conserve forests included the proportion of farmland dedicated to forests, total farm area, and the "marquesina" method for drying cocoa beans, particularly in Cesar. The findings suggest that developing and scaling strategies tailored to regions would be advantageous for Colombia, enabling the country to reach its ambition to become a leader cocoa producer and trader in the region. With increased production that promotes forest conservation, the country can contribute to securing global cocoa supply and strengthening its position in markets that value sustainably produced commodities, such as the European Union.

#445 LISOULI PÉREZ-TORRES [1,2], E. DE LA BARRERA [2*]: EXPLORING FOOD AVAILABILITY: A FILTERS APPROACH

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Introduction. Food is essential for human survival and is ultimately rooted in biodiversity, which influences diets and the sustainability of food systems. It is important to analyze food availability and the factors that influence it, such as population growth, food security and dietary patterns. How is food availability and diversity structured in urban environments?

Purpose: To identify food availability in urban areas.

Methods. A biodiversity-filters approach was used to analyze dietary diversity in Morelia, Michoacán, a mid-sized city in western Mexico. Starting with the total number of known species, a series of filters progressively narrowed the number of available foods. The filters included the state's biodiversity and agricultural production, and were then refined by the food items available at public food distribution points. At the neighborhood scale, food availability was analyzed as a function of the degree of marginalization.

Results. In the state of Michoacán, 360 edible species were identified, representing 7% of the total edible species. Of the cultivated species in Mexico, only 29% are edible, and in Morelia this proportion decreases to 4%. At the distribution points, approximately 37% of the edible food species present in Michoacán were available. Local availability varied significantly with marginalization, as highly marginalized areas had the lowest food diversity, while public markets in low and very low marginalized areas offered the highest diversity and availability.

Conclusions. Food diversity availability varies considerably in relation to the food available in Michoacán. This is likely due to the fact that a significant portion of food is imported or sourced from distant regions rather than locally grown. Socioeconomic marginalization significantly affects food access and diversity, with higher marginalization linked to lower availability.

#59 SOFIA F. REIS[1], LUMINITA CIOLACU[1], ANA NOVO DE BARROS[2]: DECISION SUPPORT TOOLBOX FOR MEASURING, MONITORING AND MANAGING FOOD LOSS AND WASTE ACROSS THE FOOD SUPPLY CHAIN

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In the EU, over 59 million tonnes of food waste (132 kg/inhabitant) are generated annually [1], with an associated market value estimated at 132 billion euros [2]. Substantial variation is observed across all countries and sectors in EU [1], yet it is hard to say whether this reflects real variation or differences in methodologies and scopes. There is a clear need for a harmonised food waste (FW) measuring and monitoring to allow more consistent and comparable data to decrease the uncertainties and make it possible to better understand the magnitude of the problem. How much and where along the supply chain various foods are lost or wasted is crucial to achieve the Sustainable Development Goal (SDG) Target 12.3: to halve per capita global food waste at the retail and consumer level by 2030 and reduce food losses along the food production and supply chains. WASTELESS project rises to this need and aims to develop a decision support toolbox to enable all FSC actors to engage in the Food Loss and Waste (FLW) measuring and monitoring with personalised digital tools and methodologies adapted to their specific food commodities, stages of the supply chain and geographical location.Five digital tools tailored to the needs of Food Supply Chain (FSC) actors have been developed: (1) Electronic registry supported by a blockchain system, tested through all the FSC; (2) Surplus-stock measurement and management, tested by industries, retailers and food services; (3) AI-based data driven approach for FW management, tested by retailers; (4) Automatic System for FW assessment, tested by retailers and at households; (5) Computer vision-based analysis, tested at households. Data from the case-studies and strategic reduction actions are being integrated in the toolbox. This decision support toolbox further envisions a ‘data collection hub’ of as many stakeholders as possible to generate and gather data from various sources, a common baseline for the EU countries with the challenge of mapping FLW for efficient reduction strategies.

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#276 ESRA ÇELİK[1]**, AŞKIN YAŞAR[1]: THE RELATIONSHIP BETWEEN FOOD ETHICS AWARENESS LEVEL AND FOOD CONSUMPTION PREFERENCES*

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** This study, prepared by benefiting from the Doctoral Thesis titled "Determining the Effect of Food Ethics Awareness of Individuals on Animal Food Consumption Preferences in Türkiye" of the first author, was supported by Selçuk University Scientific Research Projects Coordination Office with Project number 22112007.*

In today's world where food has gained a strategic position, there is an increasing need for a better understanding of individual ethical awareness and food consumption preferences related to food. Therefore, the study aimed to determine the effect of individuals' food ethical awareness on consumption preferences and motivational sources affecting consumption preferences.

Data were obtained by a face-to-face interview technique, using stratified sampling according to gender and education categories (n=1083) in 12 regions of Türkiye. Participation was completely voluntary, and the first part of the survey included the 17-item Food Ethics Awareness Scale, the second part included 12 closed-ended statements to determine sociodemographic characteristics. The Mann-Whitney U test was used in two groups, the Kruskal Wallis-H Test was used in more than two groups, and the Bonferroni-Dunn test was used to determine significant differences.

It was determined that 1.8% of Türkiye's consumer profile was vegan, 2.6% was vegetarian, 0.7% was pescatarian, 76.3% was omnivorous, and 18.6% was ethical omnivorous. Also, there was a relationship between food ethics awareness and age, province of residence, level of education, profession, working period (years), income level, food consumption preferences, motivation sources affecting food consumption preferences, whether receiving ethics training, and opinions on whether having food ethics committees would contribute to eliminating the problems in this area. Young people, women, students, high levels of education, those shorter working periods, those receiving ethics training and awareness that having food ethics committees will contribute to the elimination of problems were effective factors in the preference of motivation sources related to ethical reasons underlying food consumption preferences and vegan and/or vegetarian diets ($p<0.01$).

It can be concluded that the increase in the level of food ethics awareness positively affects ethical food consumption and that factors that serve a good purpose, especially health, ecology and animal rights/welfare, are effective in determining ethical consumption preferences.

Keywords: Food ethics, Food ethics awareness, Food consumption preferences

#409 ELENA KIPRUSHKINA[1], DIANA BOGUEVA[2], OLGA SERGIENKO[3], OLGA RUMIANTCEVA[3], AIGUL MINIAKHMETOVA[3], ELENA KUPRINA[1], VASILINA KOSTIUK[3], STEPAN KIRU[4] AND DORA MARINOVA[2]: AGRICULTURAL LOSS REDUCTION THROUGH BIOLOGICAL PROTECTION IN THE CASE OF POTATO

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INTRODUCTION

Greening agricultural production and post-harvest storage technologies for plant products is important for implementing the principles and goals of sustainable development.

PURPOSE

The purpose of the study was to investigate the ecological, economic and any other aspects of the use of biological means of protection in the production of crops on the example of potato.

METHODS

The life cycle analysis was carried out with SimaPro 9.1.1.1, with the ecoinvent 3 database for the IPCC 2013 and EPD 2018 models.

RESULTS

Overall, due to the introduction of a biological product, a 1.01-fold increase in the carbon footprint in the supply chain is achieved. As the study did not take into account the use of pesticides and fertilizers, which is common with the conventional method of growing potatoes, the overall real carbon footprint is expected to be lower with the biological treatment.

The introduction of biological products reduces total losses in the supply chain by 17% compared to the traditional way of growing and storing these potatoes. Microbiological preparations accelerate ripening and improve potato quality, which can increase the selling price by 10 %. During storage, the incidence of tuber blight and late blotch disease is reduced by 2-3 times.

CONCLUSIONS

In conclusion, the application of biological products prior to planting, during the stages of vegetation and harvesting and before long-term storage, generates a range of positive benefits for the potato crop. They include economic benefits and improved nutritional value and such a biologics treatment can reduce the negative environmental impacts associated with crop losses responding to climate change and other ecological challenges.

#56 GEORGE MONBIOT: INVITED LECTURE: HOW TO FEED THE WORLD WITHOUT DEVOURING THE PLANET

The Guardian

The food sector causes more environmental destruction than any other, but it is the one we are least prepared to talk about. How do we ensure that everyone has access to healthy, affordable food, while greatly reducing its impacts on the world's living systems?

SESSION 12: GHI: UNITING MINDS, SECURING FUTUTRE

#565 HAMID EZZATPANAH [1,2*], HUUB LELIEVELD[1], MOHAMMAD MOHAMMADI [2,3*], DIANA BOGUEVA$_1$: POSSIBLE PARTNERSHIPS BETWEEN GHI WORKING GROUPS AND RELEVANT GLOBAL ORGANIZATIONS

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The Global Harmonization Initiative (GHI) seeks to align food safety laws and regulations on a global scale. The mission of GHI is to foster consensus regarding the scientific foundations of food regulations and laws, thereby ensuring that safe, secure, and nutritious food and beverages are accessible to all consumers worldwide, while also promoting the approval of innovative food processing technologies. Central to the GHI strategy are the Working Groups (WGs), which comprise experts in food safety, nutrition, regulation, and trade from various sectors, including business, government, and academia. Furthermore, numerous international organizations are dedicated to enhancing food security, safety, quality, and standardization. The primary objective of this study was to explore how GHI WGs can collaborate with their global counterparts. It appears that WGs focused on areas such as Ethics in Food Safety, Food Law and Regulations, Food Safety Training, and Genetic Toxicology can engage with organizations like FAO, WHO, CAC, JECFA, JEMRA, JMPR, INFOSAN, RASFF, WTO, WB, ISO, and GSFI while WGs focusing on consumer perception and food preservation technologies can work with FAO, WHO, CAC, ISO, GSFI, UNIDO, WFP and IFAD. The following outlines additional collaboration opportunities for GHI's WGs with their international counterparts:

- Chemical Food Safety: FAO, WHO, CAC, JECFA, JMPR, INFOSAN, RASFF, WTO, WB, ISO and GSFI
- Food Microbiology: FAO, WHO, CAC, JEMRA, INFOSAN, RASFF, WTO, ISO and GSFI
- Food Packaging Materials: FAO, WHO, CAC, ISO, WPO, and GSFI
- Food Safety related to Religious Dietary Laws: FAO, WHO, CAC, INFOSAN, RASFF, ISO and GSFI
- Global Incident Alert: FAO, WHO, CAC, INFOSAN, RASFF, WTO, ISO and GSFI
- GM based Plant Food: FAO, WHO and CAC
- Livestock Methane Reduction: FAO, WB
- Mycotoxins: FAO, WHO, CAC, JECFA, INFOSAN, RASFF, WTO, ISO and GSFI
- Nanotechnology and Food: FAO, WHO, WTO, WPO, ISO and GSFI
- Nomenclature on Food Safety and Quality: FAO, WHO, CAC, WPO, IWA, ISO and GSFI
- Nutrition: FAO, WHO, WTO, CAC, UNIDO, WFP, IFAD, ISO and GSFI
- Reducing Post-Harvest Food Loss and Waste: FAO, WHO, UNIDO, WFP, IFAD, WPO, ISO and GSFI
- Safe Water: FAO, WHO, CAC, WTO, IWA, ISO, GSFI, JECFA, JEMRA, JMPR, WFP, UNIDO and IFAD
- Science Communication: FAO, WHO, CAC, UNIDO, WTO, WPO, IWA, JECFA, JEMRA, JMPR, INFOSAN, RASFF, WTO, WB, ISO and GSFI

#646 DUMITRU MNERIE: ROLE AND IMPORTANCE OF GHI CERTIFICATION PROCESS

GHI Certification Officer, GHI Ambassador, Romania

In its more than 20 years of activity, the Global Harmonization Initiative (GHI) has managed to develop a significant international network of individual scientists and scientific organizations who have proven that it is possible to work together, disinterested in material issues, to promote the harmonization of global food safety regulations and legislation.

Currently, many scientists from all over the world work on behalf of the GHI, campaigning for the food that reaches the population to be safer and more nutritious. They have expressed their competent and impartial views, based on a scientific consensus, always making recommendations on improving food safety legislation and regulations, to at a global level.

To benefit from more authority of the GHI members, in relation to those who oppose this process, it is considered necessary to have documents attesting to the quality of specialist in the field, affiliated with the GHI organization.

Certification of the quality of GHI Member, respectively of Consultative Expert Ambassador, Volunteer "of Presence", "of "Appreciation" and "of Excellence", represents a guarantee of competence, affiliation and good intention. It is a formal attestation or confirmation of certain advanced knowledge, a certain degree of professional awareness. The signing of certificates by the representatives of the GHI staff reflects an agreement on the representation of the GHI organization, an accreditation of the person, with the labeling "competent to practice", respectively "competent to represent us".

The certificate can also be advantageous in recognizing the individual's international cooperation skills, possibly for granting qualifications/appreciations at the workplace.

The presentation contains details on the current level of certification, as well as practical ways to obtain and/or confer the certificate. The presentation aims to support the organizational management of GHI Association.

#1562 PETER OVERBOSCH (THE NETHERLANDS) DAJANA VUCINIC (SERBIA): PROGRESS REPORT OF THE WG "ETHICS IN FOOD SAFETY PRACTICES"

The WG "Ethics in Food Safety Practices" (WG Ethics) started in 2017 and has initially focused on a proposal to establish "Food Safety Professional" as a regulated and protected job category, and an overview of Whistleblowers laws and practices in the countries where GHI is active.

Currently, we are working with new topics under 4 headings:

- The place of ethics in food safety management
  - A "code of ethics" for Food Safety Professionals (FSPro), to be integrated in the previously (2021) published FSPro proposal, which is to be updated this year.
  - The interaction between ethics and "Food Safety Culture". Integration of Ethics in Food Safety training or Food Safety Culture schemes officially recognized as such (i.e. GFSI white paper).
- Education and communication
  - Developing a curriculum for Food Safety education at high school level, and for food handlers, to be used globally.
- Technology
  - Ethical implications of emerging technologies, such as artificial intelligence and blockchain, on food safety practices.
- Food waste, environment/sustainability
  - Ethical considerations surrounding food waste and sustainability.
  - The development of a Risk Assessment & Management Tool for addressing Food Waste issues along the value chain.

The WG currently consists of around 60 members from all over the world. working on all these topics.

The presentation will be an interim report on the status of each of these topics/sub-WGs.

#57 JOE REGENSTEIN[1], PROFESSOR DIANA BOGUEVA[2]: IMPROVING THE ACCESS OF MUSLIMS TO HALAL FOOD - THE GHI APPROACH

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The working group for food safety in relation to religious dietary laws recognizes the importance of foods being consistent with the cultural, religious, and ethnic requirements of consumers if those consumers are to experience food security. Religious freedom generally involves personal decisions, which suggests that harmonization by setting one specific global standard is not in the consumer's best interest. Having governments involved in religious decisions may lead to more government control than is desired by consumers. However, a government may have a role in accrediting agencies doing religious supervision of products working with principles such as "say what you do and do what you say", which recognizes consumers' right-to-know, and the importance of truth in labeling. Thus, GHI has focused on providing information starting with giving the name, country, and websites/email of halal certifying agencies. To help consumers determine the standards of the agency, the working group has prepared a questionnaire for these agencies. Halal certifying agencies are encouraged to provide their information to GHI and correct any errors changes on the GHI website. GHI's goal is transparency, i.e., sharing the agency's standards with respect to those issues that are likely of most interest to Muslim consumers. GHI recognizes that these variations in standards can be frustrating to the commercial world and consumers, but this is necessary to respect religious freedom. Companies need to do their homework and pick an agency that has a wide appeal, is well run, and is accepted by many consumers. No product will ever be accepted by everyone within the faith – as that is part of the beauty of religious diversity. GHI has focused first on halal because close to a quarter of the world's population is Muslim. Halal and kosher also represent the two religions where the consumption of food, cosmetics, drugs, and pharmaceuticals follow a series of well-defined rules.

SESSION 13: FOOD MICROBIOLOGY

#400 INDRAWATI OEY, NICHOLAS HORLACHER, SZE YING LEONG, JESSIE KING, PUI YEE LEE: EFFECTIVENESS OF PULSED ELECTRIC FIELD TECHNOLOGY FOR MICROBIAL INACTIVATION IN PLANT-BASED MILK ALTERNATIVES

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Riddet Institute, Palmerston North, New Zealand

Plant-based milk alternatives (PBMA) have gained significant consumer interest due to their enhanced nutritional profiles and alignment with sustainable food production values. However, their sensitivity to heat presents challenges for conventional pasteurization, necessitating innovative preservation solutions. Pulsed Electric Field (PEF) technology has emerged as a promising non-thermal alternative, involving cell electroporation to effectively inactivate microbial cells, ensuring safety while maintaining product quality. While PEF has demonstrated commercial success in preserving low-acid fruit juices, its application in PBMA remains underexplored, particularly given the unique physicochemical properties of plant proteins.

This presentation highlights our research findings and industrial collaboration with oat (Avena sativa) grower/exporter to investigate the efficacy of PEF technology in achieving microbial inactivation in oat-based PBMA enriched with pea protein. It also addresses consumer concerns and perceptions regarding PEF technology in PBMA production.

Continuous PEF processing was conducted using a pilot-scale PEF unit from Elea GmbH (Germany), applied at field strengths up to 9.0 kV/cm, combined with preheating (35-45°C). Microbial reductions were assessed using selective and non-selective plating techniques, with Escherichia coli and Listeria innocua used as surrogate organisms. Results showed that preheating at 45°C, coupled with PEF at 205 kJ/L, achieved a >6.6-log reduction, thus satisfying regulatory requirements for a 5-log reduction of foodborne pathogens. Further research into optimising PEF parameters for other PBMA formulations is recommended.

To enhance the acceptance of PEF-treated PBMA, we emphasised the importance of effectively communicating its sensory, nutritional, and environmental benefits through clear and engaging product labelling. Moreover, educating industry stakeholders about the unique advantages of PEF technology is crucial for its adoption in PBMA pasteurisation, paving the way for commercial success. Ultimately, collaborative efforts among technologists, industry practitioners, sensory scientists, and consumer researchers are essential to unlocking the full potential of PEF technology and advancing sustainable food production.

Related references:

Horlacher, N., Oey, I., & Leong, S. Y. (2024). Effect of pulsed electric field processing on microbial and enzyme inactivation in blended plant-based milk alternatives: A case study on a microbial challenge test for a non-presterilized oat-based beverage enriched with pea protein. Innovative Food Science and Emerging Technologies, 94, 103699.

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#262 CHINASA OKORIE-HUNPHREY, MICHAEL OKPARA: PRODUCTION AND EVALUATION OF THE MICROBILOGICAL QUALITY OF BOTTLED AND STERILIZED TIGERNUT MILK STORED FOR 6 MONTHS

BACKGROUND: The prevalence of veganism, improved health, awareness of animal welfare and the idea of lower environmental impact has created an opportunity for plant-based beverages to thrive. Given the global interest in food security, it is important to explore the nutritional and economic potentials of underutilized crops. Tigernut milk is one of the appreciated plant-based beverages with no allergy-causing components. However the short shelf-life of tigernut milk limits its production thereby, necessitating their immediate consumption after production. In view of the global tendency towards increase in the consumption of plant-based beverages, it is of particular interest to food producers to prolong the commercial shelf-life of these products to enable worldwide distribution.

METHODS: This study investigated the microbial quality of bottled and sterilized tigernut milk produced from two varieties of tigernut tuber (yellow and brown) using three processing methods (boiling, soaking, and malting).

RESULTS: There was microbial growth on the freshly prepared tigernut milk before sterilization, which indicates that tigernut milk cannot be stored without eliminating the spoilage organisms. After sterilization, the microbial load identified on the unsterilized tigernut milk were eliminated. However, the microorganism present in malted boiled brown samples were lower than the values obtained before sterilization. The assessment during storage showed that there was

no presence of microorganism detected at month one while it varied in some samples. No viable microorganism was detected on the sixth month. The microbiological quality remained consistent and stable towards the end of the shelf-life study.

CONCLUSION: The result elucidated that the bottled and sterilized tigernut milk samples remained stable at room temperature without deterioration. This study highlighted the possibility of processing tigernut milk that can be stored for an extended period.

#288 ABIODUN KUPOLUYI MYCOTOXIN CONTAMINATION OF “ACHI” (BRACHYSTEGIA EURYCOMA) POWDER FROM SELECTED MARKETS IN LAGOS STATE.

Federal University of Agriculture Nigeria

Biological contamination of food by various microbes, including mycotoxigenic fungi, is a major cause of food poisoning and poses significant health risks, affecting both developing and developed countries. Fungi are among the primary microbial agents responsible for food discoloration, spoilage, off-flavors, and mycotoxin contamination which is particularly dangerous due to their chemical stability and resistance to food processing.

In Nigeria, food thickeners like "achi" (Brachystegia eurycoma), harvested, processed, and used in various regions, have been reported to be contaminated by mycotoxigenic fungi. This study, using Liquid Chromatography-Mass Spectrometry (LC-MS), examined mycotoxin contamination in "achi" powder from several Lagos markets. The analysis identified multiple mycotoxins, including deoxynivalenol (DON), fusarenon-X (FUS-X), fumonisin B1 (FB1), aflatoxin B1 (AFB1), and roquefortine C (ROQ-C).

Alarmingly, some samples, particularly from Mile 12 market, showed aflatoxin levels exceeding the EU's safety limit of 4 µg/kg, indicating potential health hazards. DON was also detected in samples from Oyingbo, Boundary, Sangotedo, and Mile 12, with Oyingbo presenting the highest concentration at 111 µg/kg. Elevated levels of FUS-X were found in samples from Pobo and Ajah, while smaller amounts of FB1 were detected in samples from Igando, Ile-Epo, and Oshodi. Steeped samples exhibited significant concentrations of DON, AFB1, and FB1, particularly from Pobo and Ajah markets, where FB1 reached concentrations as high as 142 and 155 µg/kg, respectively.

Although Fusarium and Penicillium species were not detected, the presence of DON, ROQ-C, and FB1 suggests possible cross-contamination. Detection of these mycotoxins, particularly in blended steeped "achi" seeds, raises serious concerns about the safety of consuming these products. While contamination levels were not uniformly high across all samples, the findings highlight the persistent public health risks posed by mycotoxins due to their toxicity and resilience, even at low concentrations emphasizing the urgent need for stricter food safety measures to mitigate these risks.

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#340 OLUWAKEMI BABASESIN [1,2], JOHN OLAYIWOLA*[1], THERESA AWOTUNDUN[1], AFOLAKE OLANBIWONINU[1]: DETECTION OF SHIGA TOXIGENIC ESCHERICHIA COLI (STEC) AND KLEBSIELLA QUASIPNEUMONIAE FROM THE FRESHLY USE ABBATOIR TABLE

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Introduction: The morbidity and mortality associated with several recent large outbreaks of disease caused by STEC and Klebsiella has highlighted the threat these organisms pose to public health.

Purpose: The aim of this study is to isolate and profile the antibiotic sensitivity of STEC and Klebsiella spp. isolated from beef butcher's table.

Methods: The total number of 103 bacteria were isolated from 50 swab samples of butcher's table using Sorbitol MacConkey Agar and Violent Red Bile Dextrose Agar. Morphological and biochemical tests were carried out on the isolates. Antibiotics susceptibility profile was carried using selected β-lactam, fluoroquinolones and Aminoglycosides antibiotics.

Results: Isolated bacteria were identified as STEC (53.4%), non-Shiga toxin Escherichia coli (32%) and Klebsiella species (14.6%). Sequencing of 16S rRNA was carried out on selected Klebsiella sp. and identified as Klebsiella quasipneumoniae strain IB BT46C while detection of stx 1 and 2 genes was used to confirm STEC. Klebsiella spp. were 100% resistance to β – lactam antibiotics and 87 % to cefuroxime while STEC was 98 % resistance to imipenem. The resistance of STEC and Klebsiella spp. to fluoroquinolones and aminoglycoside was very low which showed that some of the antibiotics in these classes of antibiotics had functional antibacterial activities. Multiple antibiotic resistance index of STEC ranges from 0.66 to 1.0 and 0.58 to 0.91 for klebsiella species. TEM gene which encodes resistance to β-lactam antibiotics was detected in the Klebsiella spp. STEC and Klebsiella spp. isolated from the beef butcher's tables were grossly resistance to multiple antibiotics which make them pan drug resistant bacteria.

Conclusion: The occurrence of resistant strains of STEC and Klebsiella spp. on beef butcher's table necessitates the need for good hygiene practices in the abattoir services so as to reduce meat contamination.

Keywords: STEC; Klebsiella; Antibiotic resistance; beef butcher's table; Shiga toxin genes

#295 ONI E.O.* AND OMEMU A.M.: MICROBIAL AND AFLATOXIN ASSESSMENT OF EDIBLE DRIED INSECTS {PALM WEEVIL, CRICKET AND SHEA TREE CATERPILLAR} CONSUMED IN SOUTHWESTERN AND SOUTHEASTERN REGIONS OF NIGERIA.

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INTRODUCTION: In Nigeria, edible insects such as palm weevil, cricket, and shea tree caterpillar are traditional, nutrient-rich food sources, gaining popularity as sustainable protein alternatives. However, the safety of these insects remains uncertain. This study explores their microbial and aflatoxin levels to address potential health risks associated with their consumption.

PURPOSE: This research investigates microbial contamination and aflatoxin presence in widely consumed edible insects across Nigeria's southwestern and southeastern regions. By assessing the safety of these nutrient-dense insects, the study aims to provide vital insights into food safety practices and support sustainable, secure dietary alternatives for Nigerian communities.

METHODS: Sixty dried edible insect samples from various Nigerian states were packaged in sterile zip lock bags. Microbial load analysis was performed using the Standard Microbial Technique, while aflatoxin quantification was done using High-Performance Liquid Chromatography (HPLC).

RESULTS: Cricket samples from Ibadan and Ondo had high aerobic bacterial loads (104.0×10^7 cfu/g and 91.0×10^7 cfu/g). Dominant bacteria identified were *Staphylococcus aureus, Escherichia coli*, and *Proteus mirabilis*. Mycotoxin-producing fungi included *Aspergillus niger*, *A. terreus*, and *A. flavus*. Aflatoxin levels were highest in Ondo and Ibadan crickets (17.00 µg/kg and 12.00 µg/kg), exceeding safe limits (AFB1; 2 µg/kg, total aflatoxins; 4 µg/kg).

CONCLUSION: This study reveals significant microbial contamination and aflatoxin presence in dried edible insects from southwestern Nigeria, particularly in crickets from Ondo and Ibadan, where aflatoxin levels exceeded safe consumption limits. Detecting pathogens like *Staphylococcus aureus* and *Escherichia coli* highlights a need for improved hygiene and safety measures in harvesting, processing, and packaging of these insects. Addressing these safety concerns through stringent handling practices and monitoring could enhance the overall safety of edible insects, promoting them as a reliable and nutritious food source within Nigeria and beyond.

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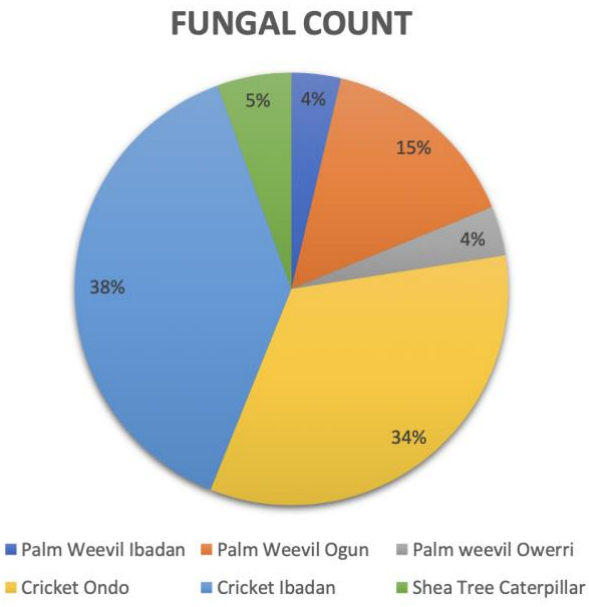

Figure 1: Frequency of occurrence of fungal count isolated from common edible insects in some markets in Nigeria

#431 A.A. NOVICHENKO[1]*, S.S. GUR'EV[1], V.S. KOROVYANSKY[1], V.A. IVANOVA[1]: TORULASPORA DELBRUECKII AS A PERSPECTIVE SOURDOUGH MICROORGANISM

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Torulaspora delbrueckii yeasts have long attracted attention of many scientists as an alternative option for a baker's yeast. One of the main advantages of Torulaspora delbrueckii in breadmaking is their superior survivability at freezing temperatures, rendering them a more reliable option for frozen dough semi-finished products [1]. They also form a unique aroma profile, which affects the aroma and taste profile of bread [2]. Finally, they are renowned for their superior osmotic tolerance [3].

Torulaspora delbrueckii are able to outperform Saccharomyces cerevisiae in freeze-thaw dough, and are less affected in their performance by added sugar and salt [4], but fail to outperfor. However, under regular conditions, Torulaspora delbrueckii are inferior in terms of leavening activity. The key reason is their slower maltose metabolism, limiting their ability to utilize native sugars of dough [5].

Considering the abovementioned reports, it was decided to study Torulaspora delbrueckii as a single culture and as part of microbial compositions, particularly in wheat, amaranth, brown rice, hydrothermally unprocessed buckwheat sourdough combined with Saccharomyces cerevisiae and Lactobacillus brevis.

According to rheofermentometric analysis, in the span of 3 hours Torulaspora delbrueckii produced 64,5% less carbon dioxide compared to the industrial strain of Saccharomyces cerevisiae in wheat dough free from added sugars. All sourdough samples have gone through sensory evaluation and had positive organoleptic and physico-chemical characteristics, except for amaranth-based variant that poorly developed and was excluded from further studies. Other samples were then used in baking; the resulting loaves of bread all had positive organoleptic and rheological characteristics, as evaluated by sensory and structurometric analysis.

The results confirm the possibility and viability of using Torulaspora delbrueckii as a sourdough microorganism.

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SESSION 14: FOOD REGULATIONS AND HARMONIZATION

#51 MARK J POST, MD, PHD:INVITED LECTURE: THE REGULATORY AND CONSUMER ACCEPTANCE CHALLENGES OF CULTIVATED MEAT

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Since the start of scientific development of cultivated meat in 2005 major steps have been made to convert this medical technology into a bona fide food production process. The three challenges are: 1) achieving high quality fat and muscle tissue, 2) scaling up cell and tissue production and 3) achieving price parity. Currently, the largest 10 cultivated meat companies are starting to scale up production and three companies have some level of regulatory approval for their product. The products are hybrids and contain differentiated or undifferentiated chicken cells. One cultivated chicken nugget product is approved and to some degree marketed in Singapore already in 2020 and two other chicken products received a no-questions letter from the FDA late 2022, early 2023. The products are all hybrid products that are based on a relatively large proportion of plant-based material. For regulators, cultivated meat as a novel food, is a new category with a complex composition and a new production method. Mid 2023, there is little coordination between regulatory bodies in various geographies when it comes to setting standards and defining an approval process. End of 2022, the FAO took a first initiative towards harmonization by inviting an expert panel to discuss principals of assessing hazards for cultivated meat. The report came out in April 2023 and will hopefully be a basis for worldwide discussions between regulatory bodies to set standards.

The need for animal-component free culture of cells and tissues, abstinence of antibiotics and, for some consumers or regulatory bodies, genetic modification are points of attention that limit the solution-space available to developers of cultivated meat and for materials needed. At the same time, consumers are increasingly willing to accept alternative sources of meat, giving the field an appreciable tailwind. This is an exciting endeavor for which 2023 is likely a year with highlights when various products will see the light of day. After this year, however, the field will continue to develop and improve the quality of the products, increase the scale of production and reduce the price. A very diversified portfolio of products and species is to be expected, creating additional challenges and work for regulators.

#327 GEERT HOUBEN* AND MARTY BLOM: TOWARDS GLOBAL HARMONISATION OF FOOD ALLERGEN RISK ASSESSMENT AND ALLERGEN LABELING

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It is only in the past three to four decades that there has been widespread recognition of the need to identify allergenic hazards in food and to assess and manage these risks as part of food safety management. Today, most countries mandate labeling of major allergens when used as an ingredient in food. Allergens may however also be present in food unintentionally. Food business operators often apply Precautionary Allergen Labeling for such situations, but harmonised regulation regarding when and when not to warn for unintended allergen presence is lacking. As a consequence, there is poor correlation between the presence or absence of such warnings and the actual risks of food products, which is a major cause of distress to food allergy sufferers, food business operators, and society as a whole.

In 2020, at the request of the United Nations Codex Alimentarius Commission, the World Health Organisation and the Food and Agriculture Organisation of the United Nations convened an ad hoc Joint Expert Consultation on Risk Assessment of Food Allergens to advice Codex regarding:

- an update of the list of priority allergens for mandatory allergenic ingredient declaration;
- Health-based Guidance Values (Reference Doses) for Precautionary Allergen Labeling;
- guidance for Precautionary Allergen Labeling;
- assessment of exemption from mandatory allergenic ingredient declaration of allergenic food-derived low-protein derivatives.

Between 2020 and 2024, the ad hoc Joint Expert Consultation prepared advice on these 4 topics. A careful characterisation of the risks of various levels of exposure to food allergens was the key basis enabling the formulation

of the recommendations. Currently, the recommendations are in the process of discussion and implementation by the Codex Committee on Food labelling (CCFL).

During the presentation, the drivers for this process, the key elements of the Expert Consultation recommendations and the data underlying these will be presented.

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#671 YASMINE MOTARJEMI, FOOD SAFETY CONSULTANT BASED IN SWITZERLAND AND NICOLA STANLEY, FOOD QUALITY CONSULTANT BASED IN UNITED KINGDOM: MAKING FOOD SAFETY CULTURE A REALITY

We examine food safety within the broader context of organisational culture and critically review prevailing paradigms. Drawing on the authors' extensive experience, alongside reviewing regulatory positions and expert opinions, we propose a comprehensive, yet simple, definition of food safety culture as: “the organisational conditions under which food safety is managed, from leaders’ values and commitments to employees’ behaviour”.

In organisations with a strong food safety culture, policies move beyond theoretical intentions and are embedded in daily practices. Employees instinctively understand the correct actions and decisions to ensure food safety, guided by a deep-rooted commitment to safety principles. When uncertain, they proactively seek advice from more knowledgeable colleagues or higher authorities, creating a climate of open communication and trust, free from fear of intimidation and reprimand.

Until now, food safety culture is often talked about but not always put into practice. Our paper explores food safety as part of organisational culture, reviewing current thinking, regulatory frameworks, and industry practices. Leveraging the authors' personal experiences and expertise, we propose a more comprehensive approach - a practical framework to evaluate food safety culture.

Our overall conclusion is that successful and sustained food safety management is only possible if underpinned by a robust food safety culture.

#625 DIANA BOGUEVA DIETARY GUIDELINES AND SUSTAINABILITY - THE NEED FOR GLOBAL HARMONIZATION

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This presentation addresses the current status of dietary guidelines across the world and the global need for harmonizing dietary guidelines and sustainability assessments to improve public health and environmental outcomes. It explores the Balanced Food Choice Index (BFCI) as a tool for assessing dietary patterns, with a focus on a few countries including Australia’s ranking and insights gained from this framework. It highlights the current disparities in international nutrition regulations, such as differences in Nutrient Reference Values (NRVs), daily energy intake, and health claims, which hinder global consistency. The role of the Global Harmonization Initiative (GHI) in aligning nutrition policies is discussed, alongside acknowledging cultural and geographical differences and recommendations for harmonizing dietary guidelines and food regulations. Emphasis is placed on the societal needs driving this initiative, including the alignment of nutrition legislation with sustainable food systems. The proposed harmonization framework aims to ensure fair trade, better food quality, and improved health outcomes worldwide, reinforcing the need for global cooperation and evidence-based policies.

#634 MILLER H[1], MARINOVA D[1], BOGUEVA D[1], BAUM F[2] ANASTASIOU K[2], FISHER M[2], HAYES A[2:]A REVIEW OF WESTERN AUSTRALIAN AGRICULTURAL FOOD POLICIES: IMPLICATIONS FOR HEALTH EQUITY AND CLIMATE CHANGE

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[2]Stretton Health Equity, Stretton Institute, The University of Adelaide

The Australian state of Western Australia (WA) covers just over 2.5 million square kilometres, representing almost one third of the Australian continent. The state is endowed with an abundance of natural resources and a relatively high level of economic prosperity; it is also amongst the least densely populated places globally with a population just under three million people. Western Australia is not without challenges; climate change impacts and health disparities are evident and particularly pronounced in the WA's regional and remote areas.

In WA, food and particularly agricultural policies are often designed to support productivity, economic growth and diversification; however, their impacts on health, equity and climate remains underexamined. We present a review of agricultural food policies analysing their alignment with health equity and climate change and sustainability goals.

Twenty-six WA Government food related policy documents have been analysed in the agricultural, environment, food processing, manufacturing and marketing sectors. A qualitative coding framework was developed by the team examining policies for all Australian federal, state and territory agencies. Policies were coded to identify the stated goals, objective and strategies and importantly to identify the intended benefiting parties. The policies have also been assessed to understand the degrees of recognition of health, equity and sustainability outcomes.

Our findings highlight that food policies rarely prioritise sustainability or health impacts of the Western Australian food system and could better integrate principles of sustainable food production while jointly contributing to equitable access to health promoting foods.

This research contributes to the broader discourse on sustainable food systems by offering a region-specific analysis that may assist policymakers, stakeholders, and researchers working toward integrated food policy frameworks. As WA navigates the dual challenges of climate change and growing health inequities, our research underscores the important role of policy in shaping equitable long-term health and environmental sustainability.

#560 JEANETTE VISAGIE: A LEGAL PERSPECTIVE ON THE DETERMINANTS OF HEALTH RELEVANT TO UNHEALTHY FOODSTUFFS CONSUMPTION AND MARKETING IN SOUTH AFRICA

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Over the past thirty years, consumer dietary patterns in South Africa have moved away from a traditional diet towards an over-consumption of ultra-processed foods and beverages (collectively "foodstuffs"). This dietary shift has contributed to the rise in obesity and diet-related non-communicable diseases ("NCDs") among consumers. Today, NCDs are the leading cause of illness, death and disability in this country.

In analysing several policy documents issued by the South African government, this paper identifies key determinants of health which have contributed to the current obesogenic food environment. It finds that political and economic changes since the 1990s, linked with globalisation, industrialisation, increased urbanisation and digitalisation have contributed to the current health crises. Relevant social determinants of health include poverty and the mounting pressure on the public health care system. The NCD burden is also exacerbated by aggressive marketing practices of unhealthy foodstuffs producers, particularly when considering the limited literacy levels of many South African consumers. Cumulatively, these determinants impact several constitutional and consumer rights within the broader universal right to health. It is argued that relevant rights include the right to a food environment that is not harmful to health or well-being, and consumers' right to have access to nutritional information that is understandable.

Looking to the future, and in line with target 3.4 of the UN's SDG 3, the South African government aims to create an enabling environment for healthier food choices. Within the food law framework, the Department of Health has proposed implementing legislation that will impose marketing restrictions on unhealthy foodstuffs labelling and advertising. Measures proposed include introducing mandatory country-specific front-of-pack warning labels, removing certain visually appealing graphic elements from labels, and banning the advertising of unhealthy foodstuffs to children. The paper concludes by highlighting potential challenges in implementing and enforcing the legislative proposals and making practical recommendations.

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#627 ISABELLA VAN ROEKEL VAN RIJN MSC PUBLIC HEALTH NUTRITION: THE EFFECT OF WAR ON (RELIGIOUS) FOOD REGULATION

GHI Working group Co-chair Food safety in relation to religious dietary law

Today the world faces multiple disruptions, including the consequences of climate change, political instability, polarization, wars and armed conflicts. These crises have exacerbated global food insecurity, with violent conflicts directly impacting food systems.

An increasing number of people are living in food insecurity as a consequence of the current food crises affected by or having an impact on violent conflicts.

Destruction of agricultural land, irrigation schemes, and infrastructure are among the most visible effects on food security.

In 2024 the Russia-Ukraine war and the Hamas Israel war conflict highlight how such wars influence not only national food regulations in the affected countries, but also global food trade and policies in importing nations.

While "secular' view and perspectives on food regulation during conflicts are often explored, the requirements and the role of religious dietary laws in times of war or armed conflict are not mentioned as such and remains underexamined. Limited research addresses how Religious Food regulations are managed in times of war.

Historically, food has also been weaponized, leading to starvation as a consequence and as a strategy of war.

To mitigate this International Humanitarian law prohibits the use of food as a weapon, while human rights law enshrines the right to food.

Both international humanitarian law and human rights law legal frameworks aim to protect the life, health and dignity of individuals and groups of people, though their approaches differ significantly depending on the different circumstances in which they are applied.

#1149 PITTIA P. [1]*, ROCCARO M.[2], CORREDIG M. [3], REDDY M.[4], MARZANO M.[5], DI FALCO G.[6], VICENTE A.[7], VODNAR D.[8], SACIO-SZYMAŃSKA A.[9]; FRIAS J.[10]: GLOBAL ECOSYSTEMS AND EXPANDED KNOWLEDGE FOR GREEN SKILLS AND CAPABILITY IN THE FOOD SECTOR (GEEK4FOOD)

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The Agri-Food systems need to renew their task force and educate the new generation of job seekers towards sustainability and resilience to provide healthy and secure food. The EU Green Deal, among the other strategic EU policies, to be effective requires both green technical skills and a mind-shift of the people involved in the food value chain. GEEK4Food envisions to develop and provide a smart intervention model for both types of skills and competences.

GEEK4Food, a project funded by the European Commission within the Erasmus+ program, is developing a cross-sectorial framework to support the food system transition towards sustainable and green solutions by an integrated approach that applies Artificial Intelligence (A.I.) tools coupled with reactive and fast responding educational modules design and delivery. A platform where the agri-food system's actors (learners, HE institutions, business and policymakers) collaborate and co-create to shape educational offerings on green-skills will be also created.

The project outcomes include:

- the GEEK4Food Skill Passport, an Artificial Intelligence (AI)-based tool able to determine and forecast current and future green skills for the food sector to timely support the development of educational and training paths matching the job market needs.

- an interactive learner-centric virtual platform for green skill mapping to merge learners' needs with training offers and agri-food job opportunities.
- a forward-looking model of training design and implementation of HE and cross-sectoral trainings intended for graduates and food professionals to enhance green skills.

The evidence- and impact-based solutions of the project will be used to embed multi-level and multi-actor policy actions supporting skill-fluidity for the green transition of the food sector.

The AI-supported and impact-driven patterns of the GEEK4Food model aims to favour innovative green training and educational models and provide tools for all the main actors including policy makers of the food systems to promote adherence to green transition.

SESSION 15: SENSORY SCIENCE

#1195 JOHN ENNIS: INVITED LECTURE: REWIRING THE FOOD SUPPLY CHAIN WITH AI AND SENSORY SCIENCE

Aigora

The modern food system faces rising demands for transparency, adaptability, and sustainability. This talk explores how AI and sensory science can be combined to rewire the supply chain from the ground up. With real-time data from smart sensors and advanced coordination algorithms, we can create systems that respond dynamically to shifts in quality, shelf life, and consumer acceptance, not just volume or price. By treating supply chains as living systems instead of static pipelines, we open the door to faster responses, lower waste, and food systems that are both smarter and more humane.

#209 BARBARA BORUSIAK: WHAT CONSUMERS ARE WILLING TO DO IN ORDER TO REDUCE MATERIAL FOOTPRINT OF THEIR CONSUMPTION?

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As the natural resources of the Earth are being rapidly depleted, there is an urgent need to encourage people to adopt self-restrictive behaviours concerning their consumption. The objective of the current study is to investigate which types of products and services are most likely to experience voluntary reductions in consumption due to environmental reasons. The following planned actions were taken into consideration: restrictions on means of transport, on travel, on food purchasing and food waste, co-housing, reductions in buying new clothes, in buying new furniture, in utility use (energy and water), and extending the life of equipment. All of these were regarded as independent latent variables, each measured by several statements. The research was conducted using the CAWI method in two groups of respondents representing both Generation X and Generation Z; and as found in the author's previous studies, the highest level of achievement in the declared consumption reductions was observed in Generation X, while the lowest was observed in Generation Z. Data were collected in Poland in 2024 from 361 Generation X and 329 Generation Z respondents. The data were analysed using multivariate linear regression analysis. In the case of Generation X, out of the eight variables, their impact on a willingness to reduce consumption for environmental reasons was found to be statistically significant in only three cases: restrictions on food purchasing and food waste, co-housing, and reductions in buying new clothes. The remaining variables did not have a statistically significant impact on the dependent variable, suggesting that their effect on any intention to reduce the material footprint of consumption in this group is small or non-existent. For Generation Z, three independent variables were also found to be significant: restrictions on means of transport, restrictions on food purchasing and food waste, and reductions in buying new clothes. In conclusion, planned restrictions on food purchasing and food waste, as well as planned restrictions on buying new clothes, were the only two actions indicated in both generational groups of respondents as measures they intended to undertake to reduce the material footprint of their consumption.

#584 HELEN ONYEAKA: UNDERSTANDING FOOD CHOICES AND CONSUMER PERCEPTION OF FOOD SAFETY: AN EXPLORATION OF THE DETERMINANTS OF CONSUMER BEHAVIOR AND STRATEGIES FOR EFFECTIVE FOOD EDUCATION

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Food is an indispensable aspect of human life and influences critical aspects of human behavior, affecting public health, and outbreaks of foodborne diseases. Thus, humans yearn for nutritious and safe food which are organoleptically desirable and meets their psychological needs. Because food not only fulfils the nutritional and energy needs of the consumer, but has psychological, socio-cultural and economic dimensions, food choice and consumer perception of food safety are based on a complex interplay of factors. Utilising a multidisciplinary approach this study will explore the factors which determines consumer food choices, and how consumer food safety perception is influenced by these. The determinants of food choice studied include; Food-related factors (e.g., sensory attributes, perceived quality, labelling, packaging, and safety incidents), Consumer-related factors (e.g., knowledge, education, habits, identity, and preferences), and Sociocultural factors (e.g., cultural norms, financial considerations, politics, and religion). An understanding of these key determinants of food choice which influences a consumers food safety perception will aid in the identification of strategies for the promotion of healthier eating habits, help in improving food production processes,

packaging and labelling approach, reduction of food waste, and enhancing the sustainability of the global food system. By analysing responses obtained in this study, we aim to gain an understanding of the main determinants of consumer food choices and any possible interconnectedness of these determinants which shapes consumer behavior and the implications of these for food safety and foodborne disease outbreak prevention. Our study will further discuss possible strategies for effective communication and education of consumers on food safety to improve their understanding and decision-making processes. The knowledge gained from this study can guide innovations in food production, reformulation, and marketing and through effective food safety education, promote public health and food security while fostering sustainable consumption patterns for a secure food future.

Keywords: Food Safety; Consumer Perception; Sustainable Consumption: Food Security: Food Psychology

#1332 JOHANNA CORCORAN[1]: STONE SOUP SOLUTIONS: CROSS-SECTOR PARTNERSHIPS TO ADDRESS HUNGER IN HIGH-NEED COMMUNITIES

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This presentation introduces the "Stone Soup Solutions" methodology, a cross-sector partnership model implemented by Feed RI to address food insecurity among Rhode Islanders. Drawing inspiration from the traditional folktale, this approach brings together diverse stakeholders— schools, businesses, nonprofits, and community members—each contributing resources to create sustainable food security solutions.

Feed RI's cross-sector partnership initiatives have demonstrated significant impact across Rhode Island communities, with data showing measurable improvements in food security metrics and broader social outcomes. Strategic corporate-community collaborations have increased access to nutritious food for over 2,000 families while simultaneously reducing food waste through innovative partnerships with local food producers and businesses. These partnerships move beyond traditional philanthropy toward integrated strategies that align corporate objectives with community needs.

This case study offers transferable insights for implementing similar models globally, particularly in resource-constrained environments where cross-sector collaboration is essential for sustainable impact. The presentation will explore scaling opportunities, adaptation strategies for diverse cultural contexts, and the critical intersection of food security, health outcomes, and educational achievement.

These findings align with the conference's focus on innovative approaches to food security challenges and demonstrate how local initiatives can inform global food system solutions.

Keywords: food security, cross-sector partnerships, school pantry programs, sustainability, innovation

#676 NADIYA BOYKO: NOVEL FOOD PROGRESS WE MADE AND OBSTACLES WE ARE FACED

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Food is a fundamental for human life, and its impact on our health and well-being is undeniable. The human nutrition on health is complex and inadequate or imbalanced food intake had profound consequences on various physiological and metabolic processes, leading to the development of non-communicable diet-related and gut infectious diseases.

As our understanding of the interplay between diet and health has deepened, it has become increasingly challenging to identify the most significant contributors to poor nutrition. The regulation of food quality has become a complex issue, with a range of factors influencing the safety and efficacy of different food products. In response to these challenges, regulatory bodies such as the European Food Safety Authority (EFSA) have proposed a range of strategies to increase demands to validate truthful healthy nutrition. These include promoting traditional foods and encouraging the consumption of fermented foods, which are rich in microbial components and postbiotics that can help regulate the gut microbiome and improve overall health.

Advances in food science and technology have enabled us to develop novel food products that are both nutritious and appealing to consumers. Application of postbiotics, which are the beneficial products of microbial fermentation, is an emerging area of research that shows promise in improving gut health. By combining the benefits of traditional foods with modern scientific knowledge and innovation, we can develop a range of functional foods that meet the diverse and individualized needs of consumers. However, it is essential to ensure that these products meet stringent safety and quality standards, and that they are appropriately regulated to protect the health and well-being of consumers.

By fostering international collaboration, scientific rigor, stakeholder engagement, and innovation, the GHI contributes to the development of modern nutrition strategies that are personalized, healthy, and aligned with the latest advancements in science and technology.

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#453 GIULIA ANDREANI[1], GIOVANNI SOGARI[1], EMMA COPELOTTI[2], ASIA ZANZOT[2], SIMONE MANCINI[2]: EXPLORING CONSUMER ACCEPTANCE OF INSECT-FED FISH: SENSORY PERCEPTION AND THE ROLE OF INFORMATION DISCLOSURE

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Introduction and Methodology

Given the increasing interest in the use of insects as food and feed sources, this study investigates the sensory perception and acceptance of sea bream raised on insect-based feed compared to traditionally fed sea bream among Italian young adults. Data collection is currently ongoing. We expect to reach approximately 150 participants evaluating both types of fish under two conditions: Expected (with the product information provided – i.e., whether the fish is traditionally fed or insect-fed – and without tasting) and Actual (with the product information provided and with tasting). Additionally, participants are divided into two groups: a control group, which receives no information about the feeding practices in the actual condition, and an informed group, which receives information on the different feeds adopted in the two samples.

Results and Conclusions

The study aims at assessing whether insect-fed fish have a different sensory performance compared to traditionally fed fish, as well as the impact that information has on the sensory evaluations and acceptance of the product. By exploring consumer evaluations of this innovative and sustainable aquaculture practice, the research seeks to contribute to understanding the potential market acceptance of the use of insects as feed. Data analysis will provide insights into how information disclosure impacts sensory evaluations and consumer attitudes, offering implications for communication strategies. Results are expected to inform policymakers and industry stakeholders about effective approaches to promoting sustainable aquaculture and consumer acceptance of alternative feed practices.

Acknowledgment: This project has been funded by the European Union - Next Generation EU

#664 VILLARINO, CASIANA BLANCA J*., LIM, RILEY LEROY T, TANGCUECO, VANESSA GAYLE T, SOLOMON, RAPHAEL LUIS C, BASINANG, AIRISSE RAE P., PAGULAYAN, JIN MARK DG., AND VELASQUEZ, MARY MICHELLE: RELATIONSHIP OF ALCOHOL INTAKE AND FOOD PREFERENCES AND NUTRIENT INTAKES OF YOUNG FILIPINO ADULTS

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Introduction: Alcohol intake was found to affect food preferences and food consumption of young Filipino adults and thus their nutritional and health status.

Objective: The study assessed the relationship between alcoholism and food preference, and nutrient intakes of young Filipino adults. The food preferences and nutrient intakes of the selected Filipino adult respondents (n=103) were established using a self-administered food preference checklist and 3-day food record, respectively. The participants were classified into their drinker status using the alcohol use disorder identification test (AUDIT).

Results: The respondents comprised mainly of females (60%), equally divided into drinkers (n=51) and nondrinkers (n=52). Significant correlations ($p<0.05$) were found between drinker status and preferences for beverages, foods under the bitter modality, and selected food items (i.e., hotdogs, water spinach, Chinese cabbage, boiled eggs, and mussels). A significant correlation ($p<0.05$) was determined between drinker status and thiamin intake, with drinkers having a significantly lower thiamin intake.

Conclusion: Findings of the study imply that alcohol intake of young Filipino adults may affect their food preferences and nutrient intakes, thus their health status.

#460 MOJCA JEVŠNIK PODLESNIK[1], *, ANGELIKA STROPNIK[2]: WOMEN'S FOOD SAFETY PERCEPTION DURING PREGNANCY AND BREASTFEEDING

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Introduction: Pregnant women are more susceptible to food-borne illnesses due to the altered functioning of the immune system. Food-borne illness during pregnancy can lead to severe consequences for the health of the mother and the fetus.

Purpose: The aim was to obtain information that helped us understand how pregnant and postpartum mothers perceive the food safety risks.

Methods: We used a qualitative method with interviews to understand the awareness, knowledge, behaviour, and risk perception of women during pregnancy and breastfeeding regarding food safety. We also conducted a literature review comparing quantitative and qualitative research that has investigated knowledge and adherence to food safety recommendations during pregnancy. 10 pregnant women and 10 postpartum mothers (mothers during breastfeeding) took part in the interviews.

Results: With the qualitative analysis of the interviews, we obtained three themes: knowledge of recommendations, adherence to recommendations and sources of information. We found that pregnant women and post-partum mothers had general food safety knowledge, but there were some gaps. Pregnant women and postpartum mothers had little knowledge of microorganisms that pose a risk of food borne diseasses during pregnancy, except for the T. gondii parasite. Most of the interviewees do not defrost their food properly and more than half of them consume high-risk foods during pregnancy. Interviewees perceived medical personnel as the most reliable source of food safety information, but only half received some information from a gynaecologist.

Conclusions: We suggest improving and unifying ways of raising awareness about food safety during pregnancy and after birth by medical personnel. Additional research would also be needed on which methods are more effective in raising food safety awareness.

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SESSION 16: ALTERNATIVE PROTEINS II

#54 ARNOLD VAN HUIS: INVITED LECTURE: EDIBLE INSECTS TO ASSURE FOOD SECURITY

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During the last six years the number of articles dealing with edible insects increased exponentially. In the tropics more than 1500 insect species are consumed, while in the western world, locusts and different species of mealworms and crickets are on the market. As feed for animals, the black soldier fly is often targeted, mainly because the larvae can transform many different organic side streams of low economic value in high value proteins and fats. Microbial communities in substrates and the insect gut may help in the conversion of low-quality organic side streams. The nutritional values of insect products compare well to those of the common meat products. Health benefits of insects relate to the high content of polyunsaturated fatty acids, the high iron and zinc content, the antioxidant capacity, and the positive effects on the gut microbiota. Chitin strengthens the immune system in humans and in animals, improves plant growth and activates plant defense. The fat of insects can be technology applied as bio lubricants, biodiesel, cosmetics, and butter replacements in bakery products. Proteins can be employed as a base for bioplastics used for agricultural purposes. The environmental impact of producing insects is lower than that of common production animals. Legislation is gradually becoming more conducive. A major challenge for human consumption is to process insects and disguise them in familiar products and make them safe and appetizing. Several strategies are proposed to convince consumers to go from an occasional snack to mainstream food.

#264 AGNIESZKA ORKUSZ[*1], JOANNA HARASYM[1]: FOOD SECURITY - IS IT REALLY BY EDIBLE INSECTS?

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Due to the growing global population, there is an urgent need to find alternative protein sources. Edible insects are primarily identified as an alternative to livestock production. Being low-emission and highly efficient, industrial insect production is based on low-value by-products of the agri-food industry.

This study aimed to characterize the potential benefits of industrial insect production, aligning with the environmental and climate priorities of the European Union. The research was conducted based on a literature review.

Insects feed on agricultural waste, such as leaves, bran, vegetable, and fruit residues. The water consumption in insect farming is significantly lower compared to plant cultivation or livestock farming. Insects have a low water requirement. Some species, like *Tenebrio molitor*, can obtain the necessary moisture from fruits and vegetables, while others, like *Acheta dom*esticus, require access to a small amount of water to prevent drowning. Insect farming is associated with lower greenhouse gas emissions compared to livestock farming. It is noted that energy consumption in insect production systems can be high due to the need for relatively high temperatures during rearing. This is because insects are ectothermic, meaning their body temperature depends mainly on the ambient temperature. On the other hand, it is observed that the feed consumed by insects is more efficiently converted into growth compared to poultry or cattle, as the energy contained in the feed does not need to be used to maintain a constant body temperature. Insects can produce several times more mass from the same dry food as poultry or cattle.

The new UE regulations categorize edible insects as novel foods, which opens up the possibility of its growing processing and consumption. Introducing insects to their diet seems distant for many Europeans and, for some, even impossible.

It should also be noted that three main potential risks are associated with the consumption of insects: the possibility of transmitting pathogenic bacteria, the allergenic effect of proteins and chitin, which is the insect's shell and still unknown bio-actives of insect metabolism.

#452 XIN YAN [1,2] *(PRESENTING AUTHOR), VANESSA JURY[2], JEAN-MICHEL CAPPELIER[1], MICHEL FEDERIGHI[3], GÉRALDINE BOUÉ[1]: DEVELOPING SAFE, NUTRITIOUS AND SUSTAINABLE NOVEL FOOD PRODUCTS BY A MULTI-CRITERIA ANALYSIS FRAMEWORK: A CASE OF INSECT-BASED MILK ALTERNATIVE

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Edible insects present great potential as an alternative protein source for growing population, aligning with the shift toward environmentally friendly food systems. However, challenges such as food safety concerns and low consumer acceptance hinder their adoption. This study applied a multi-criteria analysis framework to guide the early-stage development of safe, nutritious, sustainable and consumer-acceptable insect-based food products.

A consumer survey was first employed to assess preferences for 13 insect-based products. A quantitative multi-criteria ranking method was then developed, incorporating four key criteria: consumer intention, environmental impact, nutritional quality, and microbiological food safety risks. The analysis identified a novel milk alternative derived from Tenebrio molitor larvae as the most promising candidate. Pilot-scale trials were subsequently conducted to establish a feasible processing pathway. Advanced non-thermal technologies, including high-pressure and pulsed electric fields, were applied to address critical issues such as shelf-life extension, emulsion stability, nutritional enhancement, and sensory optimization. The final prototype achieved a comparable nutritional profile to whole cow milk while demonstrating a significantly lower environmental footprint, as confirmed by life cycle analysis. To further assess the overall health impacts, a risk-benefit analysis was integrated into the framework, focusing on the substitution of cow milk with insect-based milk in adult populations.

This study provides a structured, data-driven framework for facilitating novel food products development, addressing safety, consumer acceptance and technical challenges. The findings underscore the versatility of insects as a food source and their potential role in sustainable diets, offering valuable insights for future research and development in insect-based food innovations.

#254 MOA HANSELL[1], MATILDA JOHANSSON MELKER[1], VIKTORIA OLSSON[1], KARIN WENDIN [1,2], OLUWAFEMI ADEBO[3], NOMUSA DLAMINI[4]: ACCEPTANCE OF INSECT-BASED FOODS AMONG YOUNG SOUTH AFRICANS

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Introduction: Entomophagy (the practice of eating insects), has been a part of human diet worldwide, providing essential nutrition in many cultures. In South Africa, entomophagy is still a part of some individuals' daily diet and is considered a traditional heritage in several societies (Hlongwane et al., 2020). However, Obopile and Seeletso (2013) found that eating insects seemed to decline as younger generations were unfamiliar with edible insects. Understanding the acceptance of insect-based foods among young individuals is important as they constitute the future consumer demographic. Investigating attitudes towards entomophagy may provide insights towards promoting sustainable and nutritious food practices. This study focuses on South Africa as it has a diverse population and variations in the acceptance of insects as food.

Purpose: To investigate the attitudes of young South Africans towards entomophagy and to identify potential ways of marketing insect-based food products as sustainable food sources.

Methods: The study was conducted through a MFS scholarship from SIDA (The Swedish International Development Cooperation Agency). Data was collected through an Entomophagy Attitude Questionnaire (La Barbera et al., 2020), semi-structured interviews, and observations. The quantitative data was analyzed using a one-way analysis of variance, and the qualitative data thematically using open coding to identify patterns and themes (Braun and Clarke, 2006).

Results: Younger generations tend to avoid consuming insects due to feelings of disgust and the perception of them as unclean or hazardous. Western culture has influenced dietary choices, leading to the abandonment of traditional food practices. As people move to urban areas, knowledge and traditions surrounding food may be lost. To promote insect-based foods among young South Africans, they should be presented as trendy, fashionable, and beneficial in terms of nutrition and sustainability. Price is also a crucial consideration for consumption decisions.

Conclusions: This study provides insights into the obstacles that deter individuals from consuming insects and highlights the importance of presenting insects and insect-based products as desirable among the younger generation.

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#564 MARYIA MISHYNA[1], MARIE-LOUISE BAKKER[1], MARJANNE VERHOEVEN[1], CATRIONA LAKEMOND[1]: CRAFTING EDIBLE FIBROUS STRUCTURES WITH INSECT AND PLANT PROTEIN BLENDS

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Edible insects are a valuable food and feed source comprising hundreds of insect species of different compositions and characteristics. After harvesting, insects are processed into food and feed ingredients where insects are not visually recognizable. Texturization of insect biomass using a high-moisture extrusion technique is one of the processing approaches to create fiber-like structures. The extrudability and extent of fiber formation are influenced by numerous factors, from the composition and quality of edible insects to extrusion conditions and characteristics of other used ingredients. This study demonstrates a case on extrusion of blends consisting of yellow mealworm (Tenebrio molitor) larvae ingredients and pea proteins. Pea proteins are known to form anisotropic structures under extrusion conditions, but it is still little known how addition of insect materials to pea proteins affects formation of fibers. Extrusion was performed using a twin-screw lab scale extruder Process 11 (Thermo Scientific, Germany). The effect of the gradual substitution of pea proteins by yellow mealworm materials was assessed by changes in the degree of anisotropy and textural properties of extrudates and their macro-and micro-structures. The results demonstrated that the incorporation of mealworm materials up to 30% of the blends does not deteriorate structure formation on macro- and micro-scales. Further opportunities and potential challenges for extrusion insect and plant protein blends are discussed along with food applications of extruded products.

#837 N.S. TEIXEIRA[1], A.C.S.D. CHAVES[2], D.W.H. CHÁVEZ[3], R. DELIZA[2], A. ROSENTHAL[2]*: APPLICATION OF HIGH-PRESSURE HOMOGENIZATION FOR PROCESSING A PLANT BASED TROPICAL FRUIT ICE CREAM

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Ice cream is a product with a complex matrix composed of dispersed air bubbles, fat globules, ice crystals, proteins, dissolved sugars, emulsifiers and flavorings, which can be natural or artificial. The composition and processing influence the formation of the ice cream structure and, consequently, its physical properties, such as melting, overrun, hardness and rheological properties (SERT, MERCAN, KILINÇ, 2021). Due to the growing demand for plant-based products, the food industry and research groups have been seeking alternatives for new ingredients that can meet the needs of consumers of these products, such as in ice creams.

This study investigated the impacts of high-pressure homogenization as a possible solution for improving the structure and, consequently, the physical properties of a plant- based protein ice cream. The optimized formulation contained 40% of a fruit preparation (with açaí, *jabuticaba* and sugar), 8.5% fava bean protein, 6.5% coconut oil, 44% water, 0.5% stabilizer, and 0.5% emulsifier. The final formulation showed an increased protein content, resulting in a relevant amount of essential amino acids and a lower amount of fat compared with commercially vegan ice creams available in the market. The ice cream syrup was subjected to five different treatments in the mixing/homogenization step. A conventional blender was used in the operation as a control in comparison to a high- pressure homogenizer operating at four different pressure levels (0, 15, 45, and 90 MPa). High-pressure homogenization significantly altered the particle

size and rheological properties of the syrup, resulting in lower overrun and greater resistance to melting and firmness of the ice cream, thereby evidencing the impact of the process on the technological properties of the ice cream.

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#1065 SURBHI AGARWAL[1], LICIDA GIULIANI[2], MICHAEL CLARK[3], JENNIFER MACDIARMID[1], PETE SMITH[2]: CAN REPLACING MEAT-BASED MEALS WITH PLANT-BASED READY MEALS IMPROVES 'SUSTAINABILITY' IN DIETS? ANALYSING NUTRITIONAL AND ENVIRONMENTAL IMPACTS AMONG YOUNG WOMEN

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Background and Objectives

Reducing the consumption of animal-sourced foods, especially red meat intake plays a crucial role in mitigating environmental impacts. Sustainable dietary patterns increasingly advocate for such reductions, yet transitioning to plant-based meals remains challenging due to factors like cooking skills and meal preparation time. Offering plant-based options as convenient, ready-to-eat foods can help overcome these barriers, reducing meat consumption and accelerating the shift toward more sustainable diets. As a result, this study evaluates the nutritional and environmental implications of replacing meat-based main meals with plant-based ready meals among young women in the UK (18 to 24 years), a key demographic more likely to move to plant-based diets, their potential influence on future household dietary habits and higher risk of iron deficiency. Additionally, it examines how cost variations in plant-based ready meals influence nutritional intake and greenhouse gas (GHG) emissions.

Methodology

The study utilizes two primary datasets: (1) the Kantar WorldPanel Dataset (05/2017 to 04/2021) identifying the most commonly purchased plant-based ready meals and categorised into low, medium and high-cost alternatives, and (2) the National Diet and Nutrition Survey (NDNS) covering dietary intake patterns of young women in the UK from Year 1 to Year 11. Meat-based main meals were systematically replaced separately with low-cost, medium-cost and high-cost plant-based ready meals. Changes in nutritional intake and GHG emissions in modelled diets were assessed against baseline diets. The nutritional intake was also assessed against dietary reference values.

Results

The findings reveal that substituting meat-based meals with plant-based ready meals results in decreased energy (9-15%), protein (28.4-35.7%), and fat intake while increased fibre consumption. Notable differences in some micronutrient levels were also observed. The replacements of the meat based main meals with plant based ready meals has influenced the GHG emissions to varied levels. The analysis will be completed by April 2025 and findings are expected to highlight the potential of convenience foods in promoting sustainable dietary shifts, emphasizing the importance of ensuring balanced nutrient intake while exploring innovative food alternatives such as plant-based ready meals for long-term dietary sustainability.

#582 ERMOLAOS VERVERIS[1]*, REINHARD ACKERL[1], OCÉANE ALBERT[1], DOMENICO AZZOLLINI[1], ELISA BENEVENTI[1], WOLFGANG GELBMANN[1], EIRINI KOULOURA[1], MARCELLO LAGANARO[1], LEONARD MATIJEVIC[1], VANIA MENDES[1], ESTEFANIA NORIEGA[1] FERNANDEZ[1], IRENE NUIN[1], GABRIELA PRECUP1, RUTH ROLDAN TORRES1, ANNAMARIA ROSSI1, EMANUELA TURLA1, GEORGES KASS[1], ANDREA GERMINI[1]: ASSESSING NOVEL PROTEIN SAFETY: EFSA'S UPDATED NOVEL FOODS GUIDANCE AND ITS ROLE IN THE EU AGRIFOOD SECTOR

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The European Union (EU) defines "novel foods" as those not widely consumed within the Union before May 15, 1997, including products developed using innovative processes and technologies, new sources and traditional foods from outside the EU. These foods, distinct from GMO products, require pre-market authorization supported by science-based safety assessments conducted by the European Food Safety Authority (EFSA).

EFSA's role in the novel foods area extends beyond safety assessments, including transparent risk communication and support for food business operators through detailed guidance on preparing novel food application dossiers. Responding to regulatory advancements, scientific innovation, and the centralization of EU novel food assessments in 2018, EFSA revised its Novel Foods Guidance to address recent developments. This updated guidance details comprehensive requirements for data on compositional analysis, identity, production processes, toxicological studies, nutritional aspects, exposure assessment, and allergenicity. It applies to a vast array of protein sources such as plants, animals, microorganisms, algae, and cell/tissue cultures, as well as their derivatives (e.g., powders, concentrates, isolates, hydrolysates).

As global efforts intensify to reshape food systems to include sustainable and diverse food sources, ensuring safety must remain the foremost priority because "if it isn't safe, it isn't food". This work explores how EFSA's updated guidance upholds this principle, ensuring that novel protein sources and products thereof meet the EU safety standards while supporting safe agrifood innovation by encouraging the "safe-by-design" concept. The core principles and requirements for safety assessment will be detailed, emphasizing specific considerations for novel, emerging protein sources.

#513 İ.H TEKINER1, E. BANCALARI2, D. GRACE3, P. ACHARYA3, M. PACIULLI2, M. ALINOVI2, G. SOGARI2, T. STATHERS3, S. ENNAHLI4, S. UÇAK5, M. TAINSA6, EL AMINE AJAL7, L. MEHDIZADEHTAPEH8: FOOD SAFETY HAZARDS IN ALTERNATIVE PROTEIN-RICH PLANTS AND SEAWEEDS

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The IPSUS project explores opportunities to extract proteins from upcycled plants, seaweeds, and overlooked sidestreams generated during production or processing stages and to find novel food applications for these new ingredients. Despite a large food safety literature base, a deeper understanding of the safety aspects of various plant and seaweed protein sources is needed. The current study synthesized existing knowledge and gaps on safety hazards associated with brewers' spent grain (BSG), grapes, hazelnuts, potatoes, pumpkins, and seaweeds. A literature review of the last twenty years (2003-2023) was conducted to identify potential microbial, chemical, mycotoxins, heavy metals, and allergenic hazards in focal commodities from production or processing sidestreams using search strings. The records obtained from the PubMed database were exported into an online reference management platform (RMP) and screened by inclusion and exclusion search strings. After removing duplicates, full-text articles were assessed for eligibility by two reviewers. In all, 9127 papers were identified in the PubMed database. After screening based on search strings and removing duplicates by RMP, 1639 articles were left for eligibility assessment. The reviewers finally included 144 articles. Amongst the commodities, most safety studies were on grapes, with 55 papers, followed by potatoes (n=38), seaweeds (n=21), hazelnuts (n=19), pumpkin (n=9), and BSG (n=2). Based on hazard type, heavy metals were the most studied ones, with 49 papers in the final dataset, followed by mycotoxins (n=31), microbial risks (n=23), chemical contaminants (n=21), and allergenic risks (n=20). Overall, to meet the growing need for alternative proteins, their food safety aspects should be extensively studied to deliver safe, healthy, and affordable substitutes based on robust safety standards.

Keywords: Food safety; meat substitute, dairy substitute, plant-based protein.

Acknowledgements:

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2) This work is supported by TÜBİTAK 1071-Support Programme for Increasing Capacity to Benefit from International Research Funds and Participation in International R&D Cooperation [Grant number: 122N018].

SESSION 17: VISION FOR PERSONALIZED NUTRITION

#53 STANLEY BRUL[1], JUAN WEN[1], YAN WANG[1], RONALD BREEDIJK[2], NORBERT VISCHER[1,2], LONG JIAO CHEN[1,3], JOCELYNE VREEDE3 AND PETER SETLOW[4]: INVITED LECTURE: OPEN QUESTIONS FOR THE GUT MICROBIOME AND ITS ROLE IN HEALTH AND DISEASE

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Bacterial endospores are sturdy structures that resist environmental challenges such as thermal insult, enzymatic degradation and harsh chemicals. They can be considered survival capsules of the organisms that generate them i.e. strictly anaerobic Clostridia common to the gut as well as aerobic Bacilli. The challenge for the spores is to respond to favorable environmental changes rapidly and efficiently whilst mitigating as much as possible untimely germination events thus preventing too early outgrowth and poor efficiency of the sporulation event in terms of cellular survival under adverse environmental conditions. Bacterial endospores and their molecular composition may also be seen as a model for the build-up and molecular challenges facing other survival structures in the microbial world. Spore-forming microorganisms are ubiquitous among the gut microbiota and hence their analysis is also important to the growing field of microbiome studies.

For the spores to sense the environment and initiate the onset of spore germination germinant receptor proteins need to capture small molecular weight germinants such as amino acids, purines and/or bile salts. These events can be captured by assessing the presence of germinantion protein complexes and their possible conformational changes. Here I will discuss our visualization of germinant receptor proteins in bacterial spores, their interaction with scaffold proteins in the formation of a germination protein complex (germinosomes) and the dynamic changes that occur during germination in both the germinosomes and a calcium dipicolinic acid (CaDPA)specific channel protein SpoVA. The latter is crucial to spore formation as CaDPA replaces water in dormant spores, a key step to the spores' resistance to thermal insult. The data provide a framework for the identification and dynamic analysis of all spore germination proteins and their complexes as they occur in the inner membrane and cortex of the bacterial endospore. The current studies mainly originate from the well known facultative anaerobic organism Bacillus subtilis and provide a basis for the extension of the work towards unexplored strictly anaerobic species in the gut.

#48 CHIN-KUN WANG: ACHIEVEMENT OF PERSONALIZED NUTRITION BY ARTIFICIAL INTELLIGENCE PLATFORM

UN Goodwill Ambassador, Chung Shan Medical University (Taiwan)

Normal nutrition is current situation in the world. The advanced is flow nutrition and then to personalized nutrition by using big data at artificial intelligence (AI) system. Big data is established by Chung Shan Medical University under the support of United Nations. Dietary recall is obtained by the link of camera image, weighting skill and nutritional database. Illness history is obtained from National health insurance system. Experts like food scientists, dietitian, medical experts from different departments are all involved. The data provided from individual and the feedback from the experts are used to train the AI system. The first ten thousand individual data was obtained and the dietary behavior and nutrient deficiency were also well known. Based on the need of the individual, the correct response and treatment were given back from the experts. Geographical cooperation to enlarge this AI platform is necessary in the near future. This could provide the real nutritional need of food supply, agricultural direction and food industrial production. All criteria is to meet the request of each individual.

5. POSTER PRESENTATIONS

#1080 MAGALY ACEVES MARTINS[1], ANNELI LÖFSTEDT[1], CARLOS FRANCISCO MORENO-GARCÍA[2], MARISKA DOTSCH[3], ELIZABETH H ZANDSTRA[3], ANNE J WANDERS[3], BAUKJE DE ROOS[1]: CONSUMPTION OF DIETARY FIBRE, FRUITS AND VEGETABLES, AND FISH, IS ASSOCIATED WITH GREATER FOOD BIODIVERSITY IN UK DIETS

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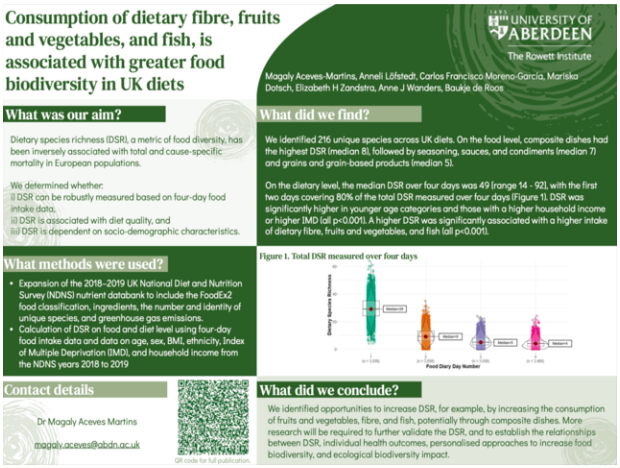

Background: Dietary species richness (DSR), a metric of food diversity, has been inversely associated with total and cause-specific mortality in European populations.

Objectives: We determined whether i) DSR can be robustly measured based on four-day food intake data, ii) DSR is associated with diet quality, and iii) DSR is dependent on socio-demographic characteristics.

Methods: The NDNS nutrient databank 2018–2019, with data on nutrient composition, was expanded to include data on FoodEx2 food classification, ingredients, the number and identity of unique species, and greenhouse gas emissions. Four-day food intake data and data on age, sex, BMI, ethnicity, Index of Multiple Deprivation (IMD), and household income were obtained from the UK National Diet and Nutrition Survey (NDNS) waves 9–11 (years 2018 to 2019), to calculate dietary quality indicators and DSR on the food and diet level.

Results: We identified 216 unique species across UK diets. On the food level, composite dishes had the highest DSR (median 8 [Q1=4, Q3=12]), followed by seasoning, sauces, and condiments (median 7, [Q1=4, Q3 =10]) and grains and grain-based products (median 5, [Q1=2, Q3=7]). On the dietary level, the median DSR over four days was 49 [Q1=43, Q3=56; range 14 - 92], with the first two days covering 80% of the total DSR measured over four days. DSR was significantly higher in younger age categories and those with a higher household income or IMD (all p<0.001). A higher DSR was significantly associated with a higher dietary fibre intake, fruits and vegetables, and fish (all p<0.001).

Conclusion: Based on four-day food intake data, we successfully established DSR in UK diets. We also identified opportunities to increase DSR, for example, by increasing the consumption of fruits and vegetables, fibre, and fish, potentially through composite dishes. More research will be required to further validate the DSR and establish the relationships between DSR, individual health outcomes, personalised approaches to increasing food biodiversity, and ecological biodiversity impact.

#475 DIÁNA BÁNÁTI[1], KRISTINA VARGA[1]: CONSUMER PERCEPTION OF ALGAE AND ALGAE-BASED PRODUCTS

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Algae, microalgae and cyanobacteria represent a very diverse group of organisms, which are rich in bioactive compounds, such as pigments, polyunsaturated fatty acids, polysaccharides, and polyphenols. Consumer perception of microalgae and cyanobacteria varies widely. There is a growing interest in and acceptance of these organisms due to their potential health benefits and sustainability aspects. The analysis of the literature has unveiled specific consumer preferences and experiences with algal-based foods. The literature indicates that healthiness and sustainability are primary motives for algae consumption, while food neophobia and lack of knowledge and familiarity serve as key barriers. Our survey conducted among university students (n=600+), including 45 questions, reflected the interest but lack of knowledge regarding microalgae. Half of the respondents have already tasted algae and almost 60% attribute health benefits to microalgae. Young consumers are keen to try foods fortified with microalgae. The majority would like to taste micro algae either in pasta (42.7%), in sauces and condiments (50.4%), in beverages (35.5%), in yoghurt (32.3%), or in cheese (26.8%), in bread (25.6%), in crisps (22.2%) and in cakes (18.2%). However, food supplements are much more preferred (73.2%) as a source of microalgae. The willingness of pay for microalgae-based foods was also analysed.

Efforts to educate consumers about the nutritional value, safety, and ecological advantages of algae-based products can help improve their perception and further increase market acceptance.

#1563 CHINONSO BENSON: TRENDS IN HEALTH AND NUTRITION INCLUDING GUT HEALTH

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Current advances in nutritional science highlight the pivotal role of the gut microbiota in regulating systemic health and informing evidence-based dietary interventions. The gastrointestinal microbiome acts as a central modulator of host metabolism, immune function, and detoxification pathways. Diets rich in non-digestible fibres and polyphenol-containing plant foods enhance microbial diversity and functional capacity, whereas consumption of refined sugars and ultra-processed foods contributes to dysbiosis, chronic low-grade inflammation, and elevated risk of metabolic disorders. The integration of functional foods, such as prebiotics, probiotics, and bioactive phytochemicals, is increasingly recognized for its capacity to selectively modulate gut microbial communities, reduce oxidative stress, and support intestinal barrier integrity. Concurrently, plant-forward dietary patterns incorporating legumes and fermented foods contribute to both individual health and environmental sustainability, aligning with the objectives of the Sustainable Development Goals (SDGs)1. Moreover, technological innovation is accelerating the shift toward precision nutrition. Wearable biosensors and AI-driven dietary tracking platforms enable real-time assessment of nutritional intake and microbiome interactions. In parallel, commercial microbiome sequencing kits are allowing individuals to personalize dietary strategies based on microbial functional profiles, such as enhancing butyrate-producing taxa linked to anti-inflammatory outcomes. Public health policy is increasingly incorporating microbiome-targeted strategies, advocating for reduced sugar consumption, increased intake of whole foods, and early-life nutritional interventions such as breastfeeding. Global agencies, including the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), support these shifts as foundational to long-term population health. This convergence of microbiome science, sustainable nutrition, digital health technologies, and public policy reflects a transformative model of healthcare; one that emphasizes preventive, data-informed, and environmentally conscious approaches to nutrition. Gut-centred dietary frameworks offer a scalable and integrative pathway for advancing both personal wellbeing and planetary health.

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#435 EMILY CHOI (SIU MEI CHOI) [1], WAI YIN TANG [1], KA WING TAM [1], HEI TUNG CHAN[1]: DEVELOPMENT OF TEXTURE-MODIFIED FOOD WITH EDIBLE MUSHROOM FOR OLDER ADULTS

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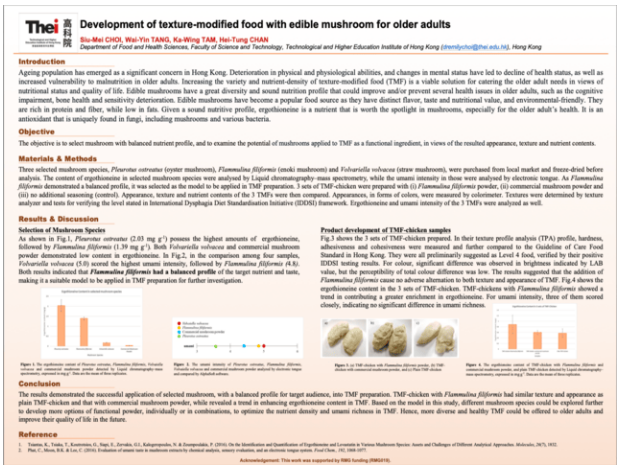

Development of texture-modified food with edible mushroom for older adults

Siu-Mei CHOI, Wai-Yin TANG, Ka-Wing TAM, Hei-Tung CHAN

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Introduction

Ageing population has emerged as a significant concern in Hong Kong. Deterioration in physical and physiological abilities, and changes in mental status have led to decline of health status, as well as increased vulnerability to malnutrition in older adults. Increasing the variety and nutrient-density of texture-modified food (TMF) is a viable solution for catering the older adult needs in views of nutritional status and quality of life. Edible mushrooms have a great diversity and sound nutrition profile that could improve and/or prevent several health issues in older adults, such as the cognitive impairment, bone health and sensitivity deterioration. Edible mushrooms have become a popular food source as they have distinct flavor, taste and nutritional value, and environmental-friendly. They are rich in protein and fiber, while low in fats. Given a sound nutritive profile, ergothioneine is a nutrient that is worth the spotlight in mushrooms, especially for the older adult's health. It is an antioxidant that is uniquely found in fungi, including mushrooms and various bacteria.

Objective

The objective is to select mushroom with balanced nutrient profile, and to examine the potential of mushrooms applied to TMF as a functional ingredient, in views of the resulted appearance, texture and nutrient contents.

Materials & Methods

Three selected mushroom species, *Pleurotus ostreatus* (oyster mushroom), *Flammulina filiformis* (enoki mushroom) and *Volvariella volvacea* (straw mushroom), were purchased from local market and freeze-dried before analysis. The content of ergothioneine in selected mushroom species were analysed by Liquid chromatography- mass spectrometry, while the umami intensity in those were analysed by electronic tongue. As *Flammulina filiformis* demonstrated a balanced profile, it was selected as the model to be applied in TMF preparation. 3 sets of TMF-chicken were prepared with (i) *Flammulina filiformis* powder, (ii) commercial mushroom powder and (iii) no additional seasoning (control). Appearance, texture and nutrient contents of the 3 TMFs were then compared. Appearances, in forms of colors, were measured by colorimeter. Textures were determined by texture analyzer and tests for verifying the level stated in International Dysphagia Diet Standardisation Initiative (IDDSI) framework. Ergothioneine and umami intensity of the 3 TMFs were analysed as well.

Results & Discussion

Selection of Mushroom Species

As shown in Fig.1, *Pleurotus ostreatus* (2.03 mg g^{-1}) possess the highest amounts of ergothioneine, followed by *Flammulina filiformis* (1.39 mg g^{-1}). Both *Volvariella volvacea* and commercial mushroom powder demonstrated low content in ergothioneine. In Fig.2, in the comparison among four samples, *Volvariella volvacea* (5.0) scored the highest umami intensity, followed by *Flammulina filiformis* (4.8). Both results indicated that ***Flammulina filiformis* had a balanced profile** of the target nutrient and taste, making it a suitable model to be applied in TMF preparation for further investigation.

Product development of TMF-chicken samples

Fig.3 shows the 3 sets of TMF-chicken prepared. In their texture profile analysis (TPA) profile, hardness, adhesiveness and cohesiveness were measured and further compared to the Guideline of Care Food Standard in Hong Kong. They were all preliminarily suggested as Level 4 food, verified by their positive IDDSI testing results. For colour, significant difference was observed in brightness indicated by LAB value, but the perceptibility of total colour difference was low. The results suggested that the addition of *Flammulina filiformis* cause no adverse alternation to both texture and appearance of TMF. Fig.4 shows the ergothioneine content in the 3 sets of TMF-chicken. TMF-chickens with *Flammulina filiformis* showed a trend in contributing a greater enrichment in ergothioneine. For umami intensity, three of them scored closely, indicating no significant difference in umami richness.

Conclusion

The results demonstrated the successful application of selected mushroom, with a balanced profile for target audience, into TMF preparation. TMF-chicken with *Flammulina filiformis* had similar texture and appearance as plain TMF-chicken and that with commercial mushroom powder, while revealed a trend in enhancing ergothioneine content in TMF. Based on the model in this study, different mushroom species could be explored further to develop more options of functional powder, individually or in combinations, to optimize the nutrient density and umami richness in TMF. Hence, more diverse and healthy TMF could be offered to older adults and improve their quality of life in the future.

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Ageing population has emerged as a significant concern in Hong Kong. Deterioration in physical and physiological abilities, and changes in mental status have led to decline of health status, as well as increased vulnerability to malnutrition in older adults. Increasing the variety and nutrient-density of texture-modified food (TMF) is a viable solution for catering the older adult needs in views of nutritional status and quality of life. Edible mushrooms have a great diversity and sound nutrition profile that could improve and/or prevent several health issues in older adults, such as the cognitive impairment, bone health and sensitivity deterioration. Edible mushrooms have become a popular food source as they have distinct flavor, taste and nutritional value, and environmental-friendly. They are rich in protein and fiber, while low in fats. Given a sound nutritive profile, ergothioneine is a nutrient that is worth the spotlight in mushrooms, especially for the older adult's health. It is an antioxidant that is uniquely found in fungi, including mushrooms and various bacteria. In this study, the potential of mushrooms applied to TMF as a functional ingredient has been demonstrated. A range of mushrooms, namely Pleurotus ostreatus (oyster mushroom), Flammulina fili-formis (enoki mushroom) and Volvariella volvacea (straw mushroom) are evaluated in terms of their ergothioneine content and umami intensity. Flammulina filiformis is selected as the model in TMF application due to its balanced profile in nutrition value required by an older adult. TMF made by Flammulina filiformis powder and that of commercial mushroom powder (control) are compared in views of appearance, texture and nutrient contents so as to evaluate the respective performance. TMF made by Flammulina filiformis powder has an enriched ergothioneine suitable to older adult diets, with acceptable umami intensity, texture and appearance.

#434 EMILY CHOI (SIU MEI CHOI)1, BAI MINGXUAN2, HU JIAYI2: STUDY OF SPENT COFFEE GROUNDS AND TEA RESIDUES AS POTENTIAL SOURCES OF PREBIOTICS

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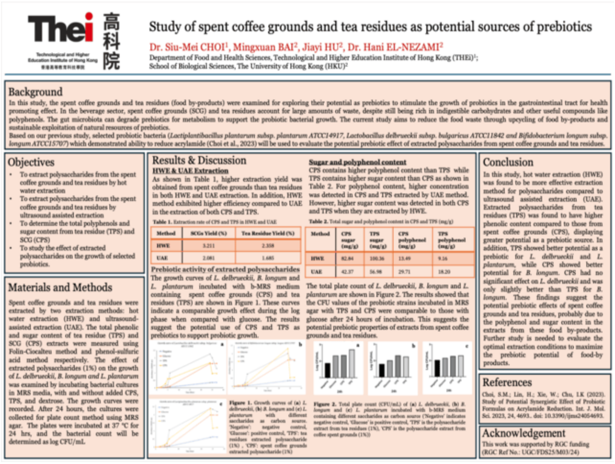

The coffee and tea beverage industry is one of the popular ready-to-eat food products and produces a significant amount of food by-products after processing. This study aims to reduce waste through upcycling of food by-products and sustainable exploitation of natural resources of prebiotics. Spent coffee grounds (SCGs) and tea residues are rich in non-indigestible carbohydrates and could be explored as a potential source of prebiotics to support probiotic growth. In this study, SCGs and tea residues were examined to evaluate their potential sources as prebiotics to support the growth of selected probiotics: Lactiplantibacillus plantarum subsp. plantarum ATCC14917, Lactobacillus delbrueckii subsp. bulgaricus ATCC11842 and Bifidobacterium longum subsp. longum ATCC15707. The total numbers of viable cells (CFU/mL) with or without extracted polysaccharides after incubation were compared. Hot Water Extraction (HWE) and Ultrasonic-Assisted Extraction (UAE) methods were utilized to extract the polysaccharides from both SCGs and tea residues. The results showed that the HWE method exhibited higher efficacy in polysaccharide extraction than the UAE method. The total sugar and total phenolic content of extracts from tea residues (TPS) were higher than those from SCGs (CPS). Based on plate count results, TPS demonstrated better prebiotic potential for Lactobacillus delbrueckii and Lactiplantibacillus plantarum, while CPS exhibited a higher potential for Bifidobacterium longum but did not significantly promote Lactobacillus delbrueckii. The current findings may indicate that tea residues possess a stronger potential as prebiotics compared to SCGs under testing condition. Both SCGs and tea residues may exert growth-promoting effects on the selected probiotic bacteria. These extracted polysaccharides could be applied as novel sources of prebiotics. The spent coffee grounds and tea residues could be further utilized as functional food ingredients with prebiotic effects in promoting the growth of probiotics and the relevant health benefits in human body.

#1384 NKIRUKA DAVID-CHUKWU[1], ONWUKA G.I.[1], IWE M.O.[1], OGBUJI, C. A.[2]: PRODUCTION AND PHYTOCHEMICAL PROPERTIES OF STORED COCOYAM-BASED PRODUCTS

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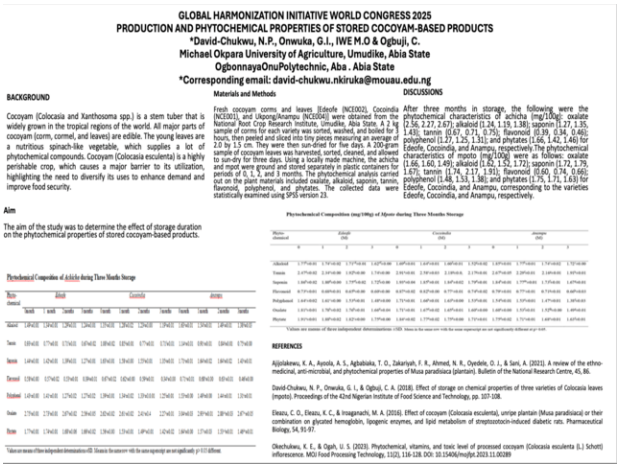

GLOBAL HARMONIZATION INITIATIVE WORLD CONGRESS 2025

PRODUCTION AND PHYTOCHEMICAL PROPERTIES OF STORED COCOYAM-BASED PRODUCTS

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BACKGROUND

Cocoyam (Colocasia and Xanthosoma spp.) is a stem tuber that is widely grown in the tropical regions of the world. All major parts of cocoyam (corm, cormel, and leaves) are edible. The young leaves are a nutritious spinach-like vegetable, which supplies a lot of phytochemical compounds. Cocoyam (Colocasia esculenta) is a highly perishable crop, which causes a major barrier to its utilization, highlighting the need to diversify its uses to enhance demand and improve food security.

Materials and Methods

Fresh cocoyam corms and leaves [Edeofe (NCE002), Cocoindia (NCE001), and Ukpong/Anampu (NCE004)] were obtained from the National Root Crop Research Institute, Umudike, Abia State. A 2 kg sample of corms for each variety was sorted, washed, and boiled for 3 hours, then peeled and sliced into tiny pieces measuring an average of 2.0 by 1.5 cm. They were then sun-dried for five days. A 200-gram sample of cocoyam leaves was harvested, sorted, cleaned, and allowed to sun-dry for three days. Using a locally made machine, the achicha and mpot were ground and stored separately in plastic containers for periods of 0, 1, 2, and 3 months. The phytochemical analysis carried out on the plant materials included oxalate, alkaloid, saponin, tannin, flavonoid, polyphenol, and phytates. The collected data were statistically examined using SPSS version 23.

DISCUSSIONS

After three months in storage, the following were the phytochemical characteristics of achicha (mg/100g): oxalate (2.56, 2.27, 2.67); alkaloid (1.24, 1.19, 1.38); saponin (1.27, 1.35, 1.43); tannin (0.67, 0.71, 0.75); flavonoid (0.39, 0.34, 0.46); polyphenol (1.27, 1.25, 1.31); and phytates (1.66, 1.42, 1.46) for Edeofe, Cocoindia, and Anampu, respectively. The phytochemical characteristics of mpoto (mg/100g) were as follows: oxalate (1.66, 1.60, 1.49); alkaloid (1.62, 1.52, 1.72); saponin (1.72, 1.79, 1.67); tannin (1.74, 2.17, 1.91); flavonoid (0.60, 0.74, 0.66); polyphenol (1.48, 1.53, 1.38); and phytates (1.75, 1.71, 1.63) for Edeofe, Cocoindia, and Anampu, corresponding to the varieties Edeofe, Cocoindia, and Anampu, respectively.

Aim

The aim of the study was to determine the effect of storage duration on the phytochemical properties of stored cocoyam-based products.

Phytochemical Composition (mg/100g) of Mpoto during Three Months Storage

Phytochemical Composition of Achicha during Three Months Storage

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Cocoyam (Colocassia and Xanthosoma spp.) is a stem tuber that is widely grown in the tropical regions of the world. The effect of storage duration and cocoyam variety on the phytochemical properties of stored cocoyam-based products was investigated. Cocoyam (Colocasia esculenta) is highly perishable, limiting its utilization and creating the need to diversify its uses to boost demand and food security. Fresh cocoyam corms and leaves [ede ofe (NCE002), cocoindia (NCE001) and ukpong/anampu (NCE004)] were sourced from National Root Crop Research Institute, Umudike, Abia State. A 2kg of corms per sample were sorted, washed and boiled for 3 hrs; peeled, sliced, and sun-dried for five days. Additionally, 200g of cocoyam leaves were sorted, cleaned and sun-dried for three days. Both achicha and mpoto were pulverized using a locally made machine and stored separately in plastic containers for 0, 1, 2, and 3 months. The phytochemical analysis was carried out on the plant material. With SPSS version 23, the collected data were statistically examined. Fisher's Least Significant Differences was used to separate the means at $P \leq 0.05$. After three months in storage, the following were the phytochemical characteristics of achicha (mg/100g): oxalate (2.56, 2.27, 2.67); alkaloid (1.24, 1.19, 1.38); sponnin (1.27, 1.35, 1.43); tannin (0.67, 0.71, 0.75); flavonoid (0.39, 0.34, 0.46); polyphenol (1.27, 1.25, 1.31); and phytates (1.66, 1.42, 1.46) for edeofe, cocoindia, and anampu, respectively. The phytochemical characteristics of mpoto (mg/100g) were as follows: oxalate (1.66, 1.60, 1.49); alkaloid (1.62, 1.52, 1.72); sponnin (1.72, 1.79, 1.67); tannin (1.74, 2.17, 1.91); flavonoid (0.60, 0.74, 0.66); polyphenol (1.48, 1.53, 1.38); and phytates (1.75, 1.71, 1.63) for edeofe, cocoindia, and anampu, corresponding to the varieties edeofe, cocoindia, and anampu, respectively. Processed cocoyam achicha and mpoto contain health-promoting phytochemicals, indicating their potential use in food preparation and managing certain chronic diseases.

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Okechukwu, K. E. and Ogah, U. S.(2023). Phytochemical, vitamins and toxic level of processed cocoyam (*Colocasia esculenta* (L.) Schott) inflorescence. MOJ Food Process Technols.; 11(2):116–128. DOI: 10.15406/mojfpt.2023.11.00289

#249 MEHDI GABSI[1,2], AMIRA MRAD[1]: LESION STUDY OF LIVERS AND LUNGS AFFECTED BY HYDATID CYSTS IN SHEEP AT THE SLAUGHTERHOUSE OF SOUSSE (TUNISIA) 2024

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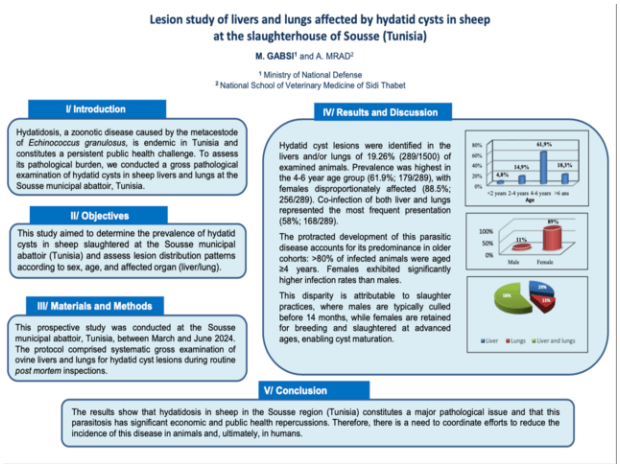

Background: Hydatidosis, caused by the larva of Echinococcus granulosus, is a widespread parasitic disease in Tunisia. For this reason, we decided to carry out a lesion study of this parasitosis in the liver and lungs of sheep at the slaughterhouse of Sousse (Tunisia).

Objectives: The present work aims to determine the prevalence of hydatid cyst in sheep and the frequency of lesion distribution according to sex, age and lesion location (liver or lung).

Methods: Our study was conducted in the slaughterhouse of Sousse during the period from March 2024 to June 2024. Our work consists of inspection and search of liver and lung with hydatid cyst lesions in sheep.

Results: The prevalence of animals with hydatid cyst lesions in livers and lungs was 19.26% (289/1500). Animals in the age group of 4-6 years were the most affected with a frequency of 61.93% (179/289). Females were more contaminated by hydatid cyst lesions 88.58% (256/289). With a percentage of 58.13% (168/289), the liver-lung complex was the most frequent location.

Conclusion: According to the findings, sheep hydatidosis is a pathological dominant disease in the city of Sousse. In addition, this parasite has major repercussions on public health. Then, it is necessary to coordinate efforts to prevent the infestation of sheep and humans. Also, the infestation of dogs should be prevented through the destruction of parasitized viscera and increased control operations at slaughterhouses.

#235 MEHDI GABSI[1, 2], MRAD AMIRA[1], SOUISSI FATMA[1], OUESLATI WALID[1]: NEWS ON THE SEARCH FOR ANTIBIOTIC RESIDUES IN FOODSTUFFS OF ANIMAL ORIGIN IN TUNISIA (2021-2024)

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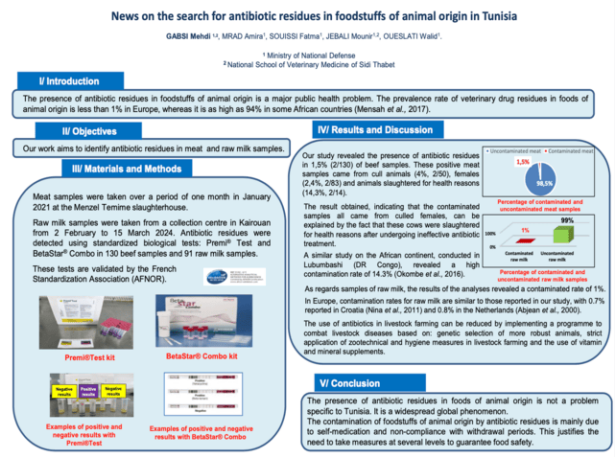

Background: The presence of antibiotic residues in foodstuffs of animal origin is a major public health problem. The prevalence rate of veterinary drug residues in foods of animal origin is less than 1% in Europe, whereas it is as high as 94% in some African countries (Mensah et al, 2017).

Purpose: Our work aims is to identify antibiotic residues in certain food samples.

Methods: Antibiotic residues were detected using standardized biological tests: Premi®Test and BetaStar®S Combo in 130 beef samples, 60 farmed fish samples and 91 raw milk samples.

Results Our study revealed the presence of antibiotic residues in 7% (9/130) of beef samples. These positive meat samples came from cull animals (18%, 9/50), females (11%, 9/83) and animals slaughtered for health reasons (57%, 8/14). With regard to farmed fish, out of a total of 60 samples with an equal distribution of sea bass (Dicentrarchus labrax) and gilthead sea bream (Sparus aurata), the positive rate was around 40% for sea bass (12/30) compared with 27% (8/30) for gilthead sea bream. As regards samples of raw milk taken from a collection centre in Kairouan, the results of the analyses revealed a positive rate of 30% (27/91). Betalactam residues showed the highest percentage of milk contamination, at 60% (16/27).

Conclusion: The contamination of foodstuffs of animal origin by antibiotic residues is mainly due to self-medication and non-compliance with waiting times. This justifies the need to take measures at several levels to guarantee food safety.

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#275 TAGRO GUEHI: ALFRED KOFFI YAO 1, DOMINIQUE KOUADIO KOUAKOU1, MAÏ KOUMBA KONE [2], CHRISTIAN ADOBI, KADJO [1], NABOUNOU KONE [1], JEAN CHRISTOPH MEIL [3,4], ISABELLE MARAVAL [3,4], RENAUD BOULANGER [3,4], SIMPLICE TAGRO GUEHI [1]*: SACCHAROMYCES CEREVISIAE AND CANDIDA INCOMMUNIS INOCULATED DURING COCOA (THEOBROMA CACAO L) FERMENTATION AS GREAT BIOLOGOGICAL AGENTS FOR REDUCTION OF THE BEANS SPOILAGE BY MOLDS

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Faced with the increasing cocoa beans spoilage due to the development of molds in the climate change context, international attention of chocolate industry is more and more focused on the agroecological solutions such as using of safe microorganisms for sustainable cocoa production. Cocoa beans sourced from Côte d'Ivoire were seriously exposed to the production of ochratoxin A due to the hight contamination by molds. Many bacteria and some yeasts present some relevant ability to reduce the growth of mycobiota. This study investigated the improvement the quality of fermented cocoa beans by the bio-control of molds growth. Saccharomyces cerevisiae and Candida incommunis the best antifungal yeasts species among 33 species isolated from cocoa fermentation were used as monoculture starter for fermentation of cocoa beans from 6 days-opened pods delay. Cocoa beans without inoculated Aspergillus carbonarius conidiae nor antifungal yeasts cells suspension constitued negative control and positive control consisted in cocoa beans inoculated with only target Aspergilus carbonarius conidia suspension. The changes in physico-chemical factors such as temperature and acidity content, martketable quality and level of molds contamination of cocoa beans sampled during fermentation were measured by the pH determination, the cut test and the microbiological cultures on Potatoes dextrose agar respectively. Candida incommunis induced higher temperature until 49°C than Saccharomyces cerevisiae. Neither the acidity content (comprised between 0,06 and 0,12 Eq. de NaOH.g-1) nor markatble quality (grade 1 according to FAO standard) of dry fermented cocoa beans were influenced by any inoculated yeast strain. However, only Candida incommunis highlighted gretar bioncontrol capacity against growth of mycobiota on cocoa beans. So, Candida incommunis could be used as culture starter by farmer for both the relevant fermentation and the reduction of molds developmenton the farm level for cocoa beans safety and security.

Keywords : Cocoa beans, antagonistic yeasts, molds, biocontrol, sanitary quality, Côte d'Ivoire.

#279 FLORENT G. KOUAMÉ AMIEN [1], ALFRED KOFFI YAO [1], CHRISTIAN ADOBI, KADJO [1], MAÏ KOUMBA KONE [2], ISABELLE MARAVAL [3,4], RENAUD BOULANGER [3,4], SIMPLICE TAGRO GUEHI [1]: BIOCONTROL OF THE GROWTH OF MYCOTOXINOGENIC MOULD STRAINS USING ANTAGONISTIC YEASTS ISOLATED FROM COCOA (THEOBRAMA CACAO L.) FERMENTATION

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In the recent past, cocoa cultivation needed felling trees leading to the deforestation in the main cocoa producing countries such as Côte d'Ivoire. In response to this problem in the agroecology context, the agroforestry is more and more presented as the relevant crops production system for farmers. The present research aims to contribute to the promotion of agroforestry in cocoa farming by highlighting the effect of this agricultural system on biochemical composition and aroma compounds of cocoa beans. Samples of ripe cocoa pods were harvested from cocoa plantations according to agroforestry and full sun systems of 8 different cocoa producing regions in november 2023. Cocoa beans were fermented and sun-dried. Sugars, amino acids, fatty acids and polyphenols contents of mucilaginous pulp and fresh cocoa beans were quantified according previous specific biochemical tests. The volatile organic compounds of dry fermented cocoa beans were extracted using SPME method and then identified and quantified by HPLC-MS method. The results revealed that almost complete equivalence was observed between the major biochemical compounds of cocoa matrices leading to the generation of the aroma compounds in dry fermented cocoa beans regardless of the cocoa cultivation system. Neither the biochemical composition of mucilaginous pulp nor fresh cocoa beans was influenced by agroforestry. A notable variation was detected between different cocoa producing regions, suggesting that local climato-pedological factors could play a key role in the biochemical composition and in the fingerprint of volatile organic compounds of dry fermented cocoa. Although, agroforestry system has no effect the chemical composition of cocoa, its adoption as new cocoa cultivation system as it could contribute to the diversification of incomes and to the food security for farmers.

Keywords: Cocoa cultivation, agroforestry, biochemical composition, volatile organic compounds, Côte d'Ivoire.

#284 ALINE ISSA[1], ALEXANDRIA MEKANNA[2], JACQUELINE DOUMIT[1], CHRISTELLE BOU-MITRI[1]: REDEFINING FOOD SAFETY: THE CONFLUENCE OF WEB 3 AND AI TECHNOLOGIES IN THE MEAT SUPPLY CHAIN - A SYSTEMATIC REVIEW

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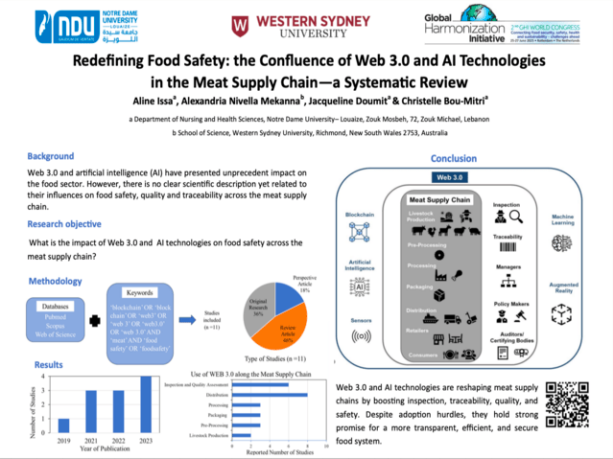

Background: Web 3 and Artificial Intelligence (AI) have had their share of novel, unprecedent impact on the food safety sector. However, there is still much to explore regarding their impact on food safety, quality and traceability across various sectors.

Objective: The aim of this review was to evaluate the role of the emerging technologies on the food safety implications across the meat supply chain.

Methods: This systematic review followed the PRISMA-P methodology. The articles selected were identified by searching three databases: Scopus, Web of Science and PubMed. The data were cross-analyzed to examine the role of various web 3 and other novel technologies available, on various stages of the meat supply chain.

Results: Out of the screened articles, 11 were included in the review. The meat industry and the meat supply chain have their share of positive implications instigated by web 3 technologies. Web 3 technologies are shown to be effective for the food safety of meat from farm to fork. Technological influences on food safety in the meat sector were specifically evident at the level of the distribution and traceability across the supply chain.

Conclusion: Web 3 technologies can be implemented throughout the meat supply chain by manufacturers to enhance the safety of meat for consumer consumption. Further research is still however needed to examine the role of such technologies at the level of other parts of the supply chain including the pre-processing step, processing and packaging.

#461 MOJCA JEVŠNIK-PODLESNIK[1], TINA GRČA[1], ANDREJ OVCA[1]: HOW EFFECTIVE ARE NUDGE TOOLS TO PROMOTE FOOD HYGIENE BEHAVIOUR IN KINDERGARDEN KITCHENS

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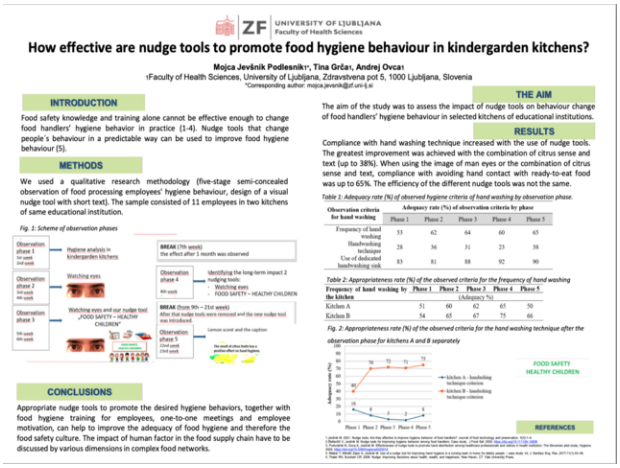

Introduction: Food establishments that deal with food handlers as a risk factor use different tools to motivate them. Food safety knowledge and training alone cannot be effective enough to change food handlers' hygiene behavior in practice. Nudge tools that change people´s behaviour in a predictable way can be used to improve food hygiene behaviour.

Purpose: The aim of the study was to assess the impact of nudge tools on behaviour change of food handlers' hygiene behaviour in selected kitchens of educational institutions.

Methods: We used a qualitative research methodology (five-stage semi-concealed observation of food processing employees' hygiene behaviour, design of a visual nudge tool with short text). The sample consisted of 11 employees in two kitchens of same educational institution.

Results: The results were presented as compliance rate (%) of hygiene behaviour. Compliance with hand washing technique increased with the use of nudge tools. The greatest improvement was achieved with the combination of citrus sense and text (up to 38%). When using the image of man eyes or the combination of citrus sense and text, compliance with avoiding hand contact with ready-to-eat food was up to 65%. The efficiency of the different nudge tools was not the same.

Conclusions: Appropriate nudge tools to promote the desired hygiene behaviors, together with food hygiene training for employees, one-to-one meetings and employee motivation, can help to improve the adequacy of food hygiene and therefore the food safety culture. The impact of human factor in the food supply chain have to be discussed by various dimensions in complex food networks.

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#451 MERIDETH KELLIHER[1], DR. DIANA BOGUEVA[2], PROF. DORA MARINOVA[2]: SCALING SEAWEED PRODUCTION FOR ENTERIC METHANE REDUCTION: A SYSTEMATIC LITERATURE REVIEW ON ENVIRONMENTAL AND OZONE IMPACTS

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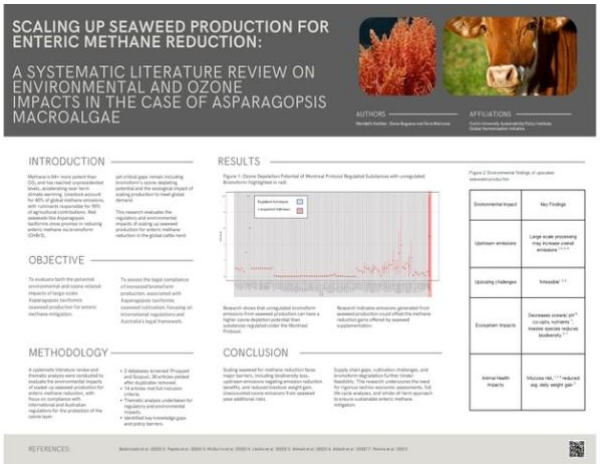

Methane, a potent greenhouse gas, has a global warming potential over 84 times that of carbon dioxide over its atmospheric lifespan. Current concentrations are at their highest in 800,000 years, exacerbating near-term climate warming with severe impacts. Livestock agriculture is a primary contributor, accounting for 40% of global methane emissions, with enteric emissions from ruminants responsible for 90% of agricultural methane. Seaweeds, particularly Asparagopsis taxiformis, have garnered attention as feed additives capable of reducing enteric methane via bromoform, a bioactive compound. However, concerns about bromoform's carcinogenicity and ozone-depleting potential persist. This study systematically reviewed 14 peer-reviewed publications addressing the environmental and ozone impacts of scaling seaweed production. Results indicate that supplementing 0.4% of DMI for 1% of global beef and dairy herd would require harvesting over 6.67 million kilograms of fresh seaweed daily. Challenges include sustainability, biodiversity loss, upstream emissions offsetting methane reductions, and animal health impacts such as reduced weight gain and ruminal mucosa. Additionally, the supply chain, cultivation practices, and preservation of bromoform potency remain underdeveloped. This study underscores the need for techno-feasibility assessments, life cycle analyses, and diversified mitigation strategies to ensure sustainable and effective enteric methane reductions.

Table 2: Environmental Concerns Identified in the Systematic Literature Review on Upscaled Seaweed Production

Environmental Impact	Key Environmental Findings from SLR	References
Upstream emissions	LCA needed to determine farm scale production impacts of growing, harvesting, drying and shipping and storing seaweed supplements. Large scale processing may increase overall emissions.	(Bačėninaitė, Džermeikaitė et al. 2022) (Pepeta, Hassen et al. 2024) (McGurrin, Maguire et al. 2023) (Lileikis, Nainienė et al. 2023)
Upscaling challenges	Commercial scaling to supply 50- 100gms per head infeasible	(Ahmed, Suzuki et al. 2023) (McGurrin, Maguire et al. 2023)
Biodiversity concerns	Biosecurity risks of invasive species Potential for spread of invasive species via ballast water, maritime traffic or oyster trade.	(Bačėninaitė, Džermeikaitė et al. 2022) (Pereira, Fraga-Corral et al. 2021) (Pereira, Fraga-Corral et al. 2021)
Ecosystem impacts	Risks of shading seabed grass and co-opting of nutrients from other species Seaweed farming decreased Ph levels by 33% over ten in Indonesian waters Mass harvesting of seaweed contributes to biodiversity loss	(Bačėninaitė, Džermeikaitė et al. 2022) (Pereira, Fraga-Corral et al. 2021) (Abbott, Aasen et al. 2020) (McGurrin, Maguire et al. 2023)
Animal health impacts	Cattle consuming algae can cause ruminal mucosa.	(Bačėninaitė, Džermeikaitė et al. 2022, Lileikis, Nainienė et al. 2023) (Ahmed, Suzuki et al. 2023) (McGurrin, Maguire et al. 2023)
	Reduced DMI decreases animal productivity Reduces average daily weight gain by -3.75%	(Lileikis, Nainienė et al. 2023) (Pepeta, Hassen et al. 2024)

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#240 ABDERREZAK KENNAS: PREVALENCE OF MALNUTRITION USING THE MALNUTRITION UNIVERSAL SCREENING TOOL (MUST) AMONG ALGERIANS CANCER OUTPATIENTS UNDERGOING CHEMOTHERAPY

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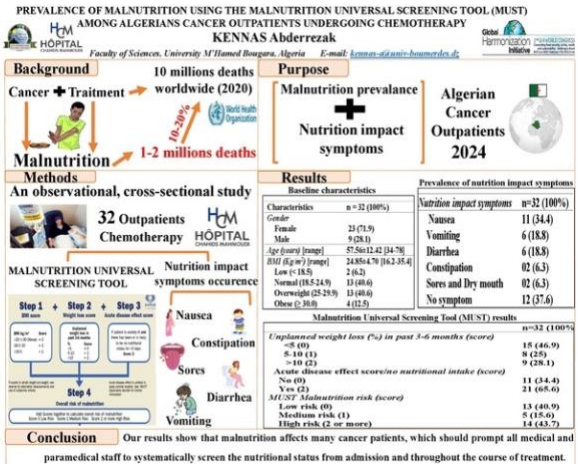

Introduction: Cancer patients are often subject to malnutrition. Unfortunately, very few studies on this subject exist in Algeria, and the evaluation of the nutritional status of oncology patients is not systematic.

Purpose: Our study examines the prevalence of malnutrition and changes in dietary behavior among Algerian cancer outpatients.

Methods: This cross-sectional and descriptive study was conducted from March to July 2024 among 32 cancer outpatients undergoing chemotherapy. The risk of malnutrition was assessed using the Malnutrition Universal Screening Tool (MUST). During the survey, information was collected on the occurrence of nutrition impact symptoms (diarrhea, constipation, nausea, etc.), the exclusion of certain food groups, and the use of oral nutritional supplements and dietary supplements (vitamins, minerals, fatty acids, etc.).

Results: Malnutrition risk was identified in 59.3% (19 cases) of the patients. nutrition impact symptoms were reported by 62.5% (20 cases) of the patients. In total, 16 out of 32 patients reported having changed their eating habits after the cancer diagnosis, particularly by eliminating certain food categories (red meat, dairy products, white flours, and sweets) from their diet. Thirteen patients use oral nutritional supplements, and sixteen out of 23 use dietary supplements after the cancer diagnosis.

Conclusion: Our results show that malnutrition affects many cancer patients, which should prompt all medical and paramedical staff to systematically screen the nutritional status of patients from admission and throughout the course of treatment.

Keywords: Cancer; Malnutrition; Malnutrition Universal Screening Tool; Dietary habits.

#585 ANNIKA MADLER [1,2], A.F. HOSSEINI[1], C. NOACK[1], Y. DADMOHAMMADI[1], A. ABBASPOURRAD[1], X. G. LEI[2]: HIGH-YIELD SECRETORY RECOMBINANT BOVINE LACTOFERRIN EXPRESSION FROM PICHIA PASTORIS AND ITS ENHANCED THERMOSTABILITY

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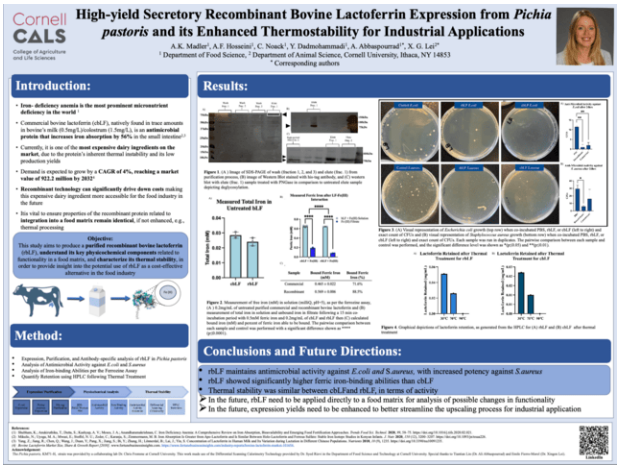

Bovine lactoferrin is an 80 kDa, iron-binding glycoprotein that is a member of the transferrin family natively found in trace amounts in the colostrum and milk of lactating animals. This studyaims to produce purified recombinant bovine lactoferrin that would decrease the production costby streamlining the purification process and diminishing the need for pasteurization in itsentirety. In this study, bovine lactoferrin was produced in and secreted from Pichia pastoris, KM71-H, using a pPICZa-alpha plasmid. With a his-tag, the secreted bovine lactoferrin waspurified and analyzed via a his-trap column and a Western blot, respectively. The recombinantprotein showed greater anti-microbial activity than a commercial counterpart against the grampositivebacteria, Staphylococcus aureus, and comparable anti-microbial activity to gramnegativebacteria, Escherichia coli. Furthermore, they showed similar iron-binding capabilities,as measured by the ferrozine assay. Its thermal stability was then measured up to 90°C for 5 min to represent boiling (n=3). Commerical lactoferrin and recombinant lactoferrin showed comparable thermal stability, in terms of anti-microbial activity with onset of actitivy loss beginning at 60-70°C. Structural retention following thermal treatment was also analyzed for similarities using High Performance Liquid Chromatography and Differential Scanning Calorimetry, which showed comparable retention rates for both proteins. Notably, Differential Scanning Calorimetry showed a later onset of thermal denaturation of recombinant lactoferrin

(70.61°C) than commercial (58.44°C) insinuating it may be able to maintain stability for longer under thermal treatment. Overall, we have shown that bovine lactoferrin was produced in and secreted from the Pichia pastoris yeast host, and the recombinant protein remained active. Investigating the challenges associated with scaling up and exploring potential downstream applications could generate interest in the utilization of this innovative multifunctional protein within the food and pharmaceutical industries.

Keywords: Lactoferrin; Thermal stability; Recombinant; Pichia pastoris

#703 RAQUEL MARTINEZ[1], RUALES JENNY[1]: IN-VITRO PROBIOTIC POTENTIAL OF LACTIC ACID BACTERIA STRAINS ISOLATED FROM FOODS

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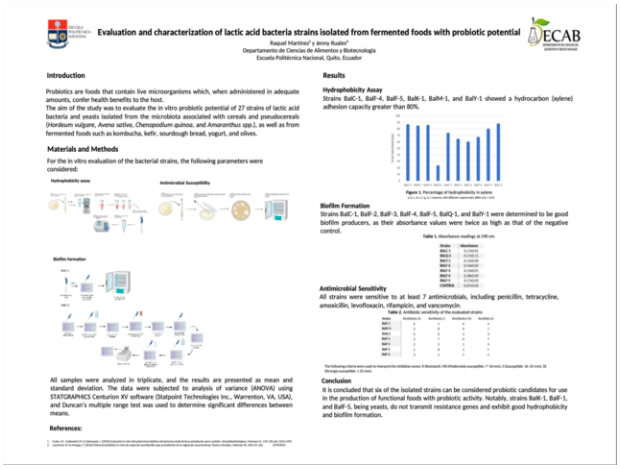
Evaluation and characterization of lactic acid bacteria strains isolated from fermented foods with probiotic potential

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Introduction

Probiotics are foods that contain live microorganisms which, when administered in adequate amounts, confer health benefits to the host.
The aim of the study was to evaluate the in vitro probiotic potential of 27 strains of lactic acid bacteria and yeasts isolated from the microbiota associated with cereals and pseudocereals (Hordeum vulgare, Avena sativa, Chenopodium quinoa, and Amaranthus spp.), as well as from fermented foods such as kombucha, kefir, sourdough bread, yogurt, and olives.

Materials and Methods

For the in vitro evaluation of the bacterial strains, the following parameters were considered:

Hydrophobicity assay

Antimicrobial Susceptibility

Biofilm formation

All samples were analyzed in triplicate, and the results are presented as mean and standard deviation. The data were subjected to analysis of variance (ANOVA) using STATGRAPHICS Centurion XV software (Statpoint Technologies Inc., Warrenton, VA, USA), and Duncan's multiple range test was used to determine significant differences between means.

References:

Results

Hydrophobicity Assay

Strains BalC-1, BalF-4, BalF-5, BalK-1, BalM-1, and BalY-1 showed a hydrocarbon (xylene) adhesion capacity greater than 80%.

Biofilm Formation

Strains BalC-1, BalF-2, BalF-3, BalF-4, BalF-5, BalQ-1, and BalY-1 were determined to be good biofilm producers, as their absorbance values were twice as high as that of the negative control.

Antimicrobial Sensitivity

All strains were sensitive to at least 7 antimicrobials, including penicillin, tetracycline, amoxicillin, levofloxacin, rifampicin, and vancomycin.

Conclusion

It is concluded that six of the isolated strains can be considered probiotic candidates for use in the production of functional foods with probiotic activity. Notably, strains BalK-1, BalF-1, and BalF-5, being yeasts, do not transmit resistance genes and exhibit good hydrophobicity and biofilm formation.

Probiotics are foods containing live microorganisms that, when administered in adequate quantities, confer health benefits to the host and constitute one of the most important sectors of functional foods. There are several microorganisms that can be used as probiotics, among which lactic acid bacteria and bifidobacteria stand out; however, in the process of selecting probiotic microorganisms, several aspects must be considered, such as safety, functional and technological characteristics. The study aimed to evaluate the in vitro probiotic potential of strains of lactic acid bacteria isolated from the microbiota associated with cereals and pseudocereals (barley, oats, quinoa and amaranth) and fermented foods, such as kombucha, kefir, sourdough bread, yogurt and olives. Adherence to hydrocarbons was determined –using a cell surface hydrophobicity test–, the capacity to form biofilms and resistance to 17 antibiotics by the disk diffusion method. The data were analyzed for variance using the Statgraphics statistical program, and the Duncan comparison test was used to verify the differences between means. Strains BalC-1, BalF-4, BalF-5, BalK-1, BalM-1 and BalY-1 showed an adhesion capacity to hydrocarbons (toluene and xylene) greater than 80%; strains BalC-1, BalF-2, BalF-3, BalF-4, BalF-5, BalQ-1 and BalY-1 were found to be good biofilm formers and all strains were sensitive to at least 7 antimicrobials, including penicillin, tetracycline, amoxicillin, levofloxacin, rifampicin and vancomycin. It is concluded that 6 of the isolated strains can be considered as candidates for probiotics, for use in the manufacture of functional foods with probiotic activity.

Keywords: fermented foods, lactic acid bacteria, probiotics.

#702 RAQUEL MARTINEZ[1], JENNY RUALES[1]: PHYTATE, IRON, ZINC AND CALCIUM CONTENT OF CEREALS AND PSEUDOCEREALS AND THEIR ESTIMATED BIOAVAILABILITY

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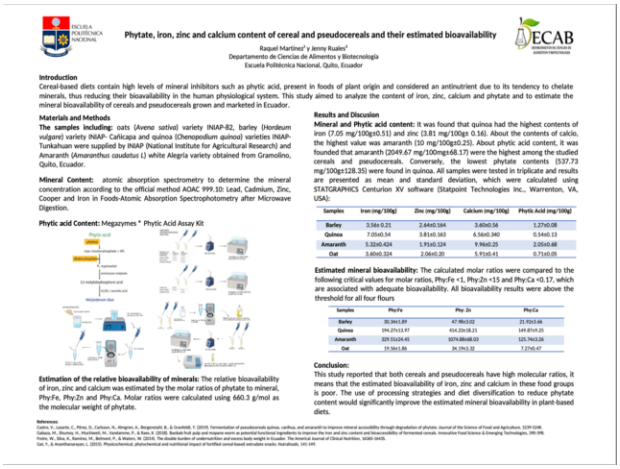
Phytate, iron, zinc and calcium content of cereal and pseudocereals and their estimated bioavailability

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Introduction

Cereal-based diets contain high levels of mineral inhibitors such as phytic acid, present in foods of plant origin and considered an antinutrient due to its tendency to chelate minerals, thus reducing their bioavailability in the human physiological system. This study aimed to analyze the content of iron, zinc, calcium and phytate and to estimate the mineral bioavailability of cereals and pseudocereals grown and marketed in Ecuador.

Materials and Methods

The samples including: oats (*Avena sativa*) variety INIAP-82, barley (*Hordeum vulgare*) variety INIAP- Cañicapa and quinoa (*Chenopodium quinoa*) varieties INIAP-Tunkahuan were supplied by INIAP (National Institute for Agricultural Research) and Amaranth (*Amaranthus caudatus L*) white Alegría variety obtained from Gramolino, Quito, Ecuador.

Mineral Content: atomic absorption spectrometry to determine the mineral concentration according to the official method AOAC 999.10: Lead, Cadmium, Zinc, Cooper and Iron in Foods-Atomic Absorption Spectrophotometry after Microwave Digestion.

Phytic acid Content: Megazymes ® Phytic Acid Assay Kit

Estimation of the relative bioavailability of minerals: The relative bioavailability of iron, zinc and calcium was estimated by the molar ratios of phytate to mineral, Phy:Fe, Phy:Zn and Phy:Ca. Molar ratios were calculated using 660.3 g/mol as the molecular weight of phytate.

References:

Results and Discussion

Mineral and Phytic acid content: It was found that quinoa had the highest contents of iron (7.05 mg/100g±0.51) and zinc (3.81 mg/100gs 0.16). About the contents of calcio, the highest value was amaranth (10 mg/100g±0.25). About phytic acid content, it was founded that amaranth (2049.67 mg/100mg±68.17) were the highest among the studied cereals and pseudocereals. Conversely, the lowest phytate contents (537.73 mg/100g±128.35) were found in quinoa. All samples were tested in triplicate and results are presented as mean and standard deviation, which were calculated using STATGRAPHICS Centurion XV software (Statpoint Technologies Inc., Warrenton, VA, USA):

Samples	Iron (mg/100g)	Zinc (mg/100g)	Calcium (mg/100g)	Phytic Acid (mg/100g)
Barley	3.56± 0.21	2.44±0.164	3.60±0.56	1.27±0.08
Quinoa	7.05±0.54	3.81±0.163	6.58±0.340	0.54±0.13
Amaranth	5.32±0.424	1.91±0.124	9.96±0.25	2.05±0.68
Oat	3.69±0.324	2.06±0.20	5.91±0.45	0.71±0.05

Estimated mineral bioavailability: The calculated molar ratios were compared to the following critical values for molar ratios, Phy:Fe <1, Phy:Zn <15 and Phy:Ca <0.17, which are associated with adequate bioavailability. All bioavailability results were above the threshold for all four flours

Samples	Phy:Fe	Phy: Zn	Phy:Ca
Barley	30.34±1.89	47.98±3.02	21.92±3.66
Quinoa	194.27±13.97	414.23±18.21	149.87±9.25
Amaranth	329.55±24.45	1074.88±68.03	135.74±3.26
Oat	19.56±1.84	34.19±3.32	7.27±0.47

Conclusion:
This study reported that both cereals and pseudocereals have high molecular ratios, it means that the estimated bioavailability of iron, zinc and calcium in these food groups is poor. The use of processing strategies and diet diversification to reduce phytate content would significantly improve the estimated mineral bioavailability in plant-based diets.

Cereal-based diets may contain high levels of mineral inhibitors such as phytic acid, considered an antinutrient due to its tendency to chelate minerals, thus reducing their bioavailability in the human physiological system. This study aimed to analyze the content of iron, zinc, calcium and phytate and to estimate the mineral bioavailability of cereals and pseudocereals. The samples including: oat (Avena sativa) variety INIAP-82, barley (Hordeum vulgare) variety INIAP-Cañicapa and quinoa (Chenopodium quinoa) varieties INIAP-Tunkahuan and amaranth (Amaranthus caudatus L) white Alegría. Flours from cereals and pseudocereals were prepared in a laboratory scale mill and sieved through a 500 µm sieve.

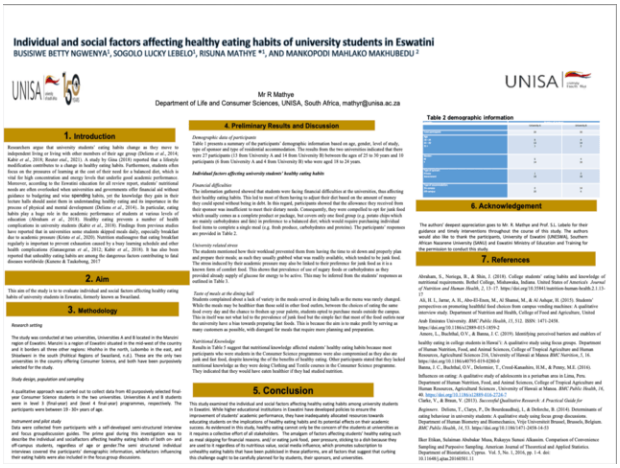
The mineral content was analyzed by atomic absorption spectrometry to determine the mineral concentration according to the official method AOAC 999.10: Lead, Cadmium, Zinc, Cooper and Iron in Foods-Atomic Absorption Spectrophotometry after Microwave Digestion. It was found that quinoa had the highest contents of iron (7.05 mg/100g±0.51) and zinc (3.81 mg/100g± 0.16). About the contents of calcio, the highest value was amaranth (10 mg/100g±0.25). Phytic acid content quantification was assayed with a Megazymes ® Phytic Acid Assay Kit, it was founded that amaranth (2049.67 mg/100mg±68.17) were the highest among the studied cereals and pseudocereals. Conversely, the lowest phytate contents (537.73 mg/100g±128.35) were found in quinoa. All samples were tested in triplicate and results are presented as mean and standard deviation, which were calculated using STATGRAPHICS Centurion XV software (Statpoint Technologies Inc., Warrenton, VA, USA). Mineral bioavailability was estimated using the phytate to

mineral molar ratios for iron (Phy:Fe), zinc (Phy:Zn) and calcium (Phy:Ca). The molar ratio is calculated dividing the phytate content by its molecular weight (660 g mol-1) and this value divided by the ratio between the mineral content and the molecular weight of each mineral respectively (Iron 58.5 g mol-1, Calcium 40 g mol-1 and Zinc 55.4 g mol-1). The calculated molar ratios were compared to the following critical values for molar ratios, Phy:Fe <1, Phy:Zn <15, Phy Ca:Zn <200, and Phy:Ca <0.17, which are associated with adequate bioavailability. All bioavailability results were above the threshold for all four flours. The Phy:Fe ratios obtained were: barley 30.34 ±1.89, quinoa 194.27±13.97, amaranth 329.51±24.45 and oats 19.56±1.86. In addition, the Phy:Zn ratios for barley, quinoa, amaranth and oats were 47.98±3.024, 414.23±18.21, 1074.88±68.03 and 34.19±3.32 respectively. Likewise, for the Phy:Ca ratio, the values were for barley of 21.92±3.66, quinoa 149.87±9.25, amaranth 125.74±3.26 and for oats of 7.27±0.47.

This study reported that both cereals and pseudocereals have high molecular ratios, it means that the estimated bioavailability of iron, zinc and calcium in these food groups is poor. The use of processing strategies and diet diversification to reduce phytate content would significantly improve the estimated mineral bioavailability in plant-based diets.

Keywords: quinoa, amaranth, barley, oat, minerals, antinutrient, Ecuador

#712 RISUNA MATHYE: INDIVIDUAL AND SOCIAL FACTORS AFFECTING HEALTHY EATING HABITS OF UNIVERSITY STUDENTS IN ESWATINI


Individual and social factors affecting healthy eating habits of university students in Eswatini

BUSISIWE BETTY NGWENYA[2], SOGOLO LUCKY LEBELO[1], RISUNA MATHYE *[1], AND MANKOPODI MAHLAKO MAKHUBEDU [2]

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1. Introduction

2. Aim

3. Methodology

4. Preliminary Results and Discussion

Table 2 demographic information

5. Conclusion

6. Acknowledgement

7. References

Healthy eating habits are of paramount importance among university students. This study aims to report on research that was conducted in two institutions of higher learning in Eswatini to understand the eating habits of students and how they influenced their academic performance. This study aims to report on research that was conducted in two institutions of higher learning in Eswatini to understand the eating habits of students. The study was qualitative, with research conducted among forty purposefully sampled Consumer Science final-year students from the two Universities. The study was qualitative, with research conducted among forty purposefully sampled Consumer Science final-year students from the two Universities. Interviews and focus group discussions were used to gather data. The findings of this study revealed that individual and social factors affecting the healthy eating habits of university students were: insufficient income, university-related stress, lack of tasty meals, lack of nutritional knowledge, family members and background, friends and peers, and social media. The findings of this study revealed that individual and social factors affecting the healthy eating habits of university students were: insufficient income, university-related stress, lack of tasty meals, lack of nutritional knowledge, family members and background, friends and peers, and social media. The study established a connection between eating habits and students' academic performance. The lack of adequate meals affected the performance of students. The effort put in studying was found to be affected by the lack of adequate meals eaten. The study concluded that poor eating habits ought to be corrected by a change in university policy, to incorporate adherence to the practice of healthy eating at the universities. These include the change of curriculum to ensure that all students take subjects related to food and nutrition, regulating healthy eating at their eating chambers, and highlighting the financial demands for healthy eating when universities seek sponsors for the programs that they offer.

Keywords: Healthy eating habits, stress, university students, individual factors, social factors

#258 ANELE MAYEKISO[1], AKHONA SKHEPHU[1], AYABONGA TOKO[1]: DRIVERS OF HOUSEHOLD FOOD SECURITY AND CONSUMPTION PATTERNS IN THE POST-COVID-19 PANDEMIC: LESSONS FROM UMZIMVUBU AND NTABANKULU MUNICIPALITIES, SOUTH AFRICA

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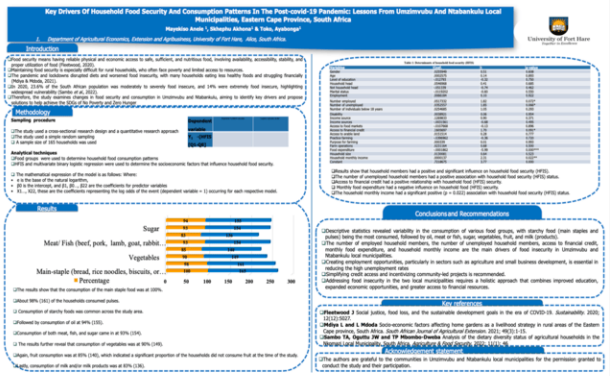

Achieving food security and ensuring the consumption of healthy, nutritious food, and balanced diets for most rural households continues to be a challenge. This poses a significant barrier to achieving SDGs 1 (No Poverty) and 2 (Zero Hunger), disproportionately affecting rural communities and leaving fundamental human needs, such as reliable food access, unfulfilled. The study therefore sought to assess the key drivers of household food security and consumption patterns in the post-COVID-19 pandemic. Primary data was collected from 311 randomly selected rural households through cross-sectional surveys. Descriptive analysis, Household Food Insecurity Experience Scale, and Multivariate binary logistic regression model using Stata 15 software were employed to analyze the data. The results revealed variability in the consumption of various food groups, with starchy food (main staples and pulses) being the most consumed, followed by oil, meat or fish, sugar, vegetables, fruit, and milk (products). The results further indicated that households lack dietary diversification and balanced diets, with limited choice and reliance on affordable starchy foods. This monotonous diet regime has significant implications for micronutrient deficiencies, increased risk of chronic diseases, and compromised overall health and well-being, underscoring the need for targeted nutrition interventions to address the pervasive hunger and malnutrition in these communities. The drivers of food insecurity in the study area are household income, monthly food expenditure, access to financial credit, and the number of employed and unemployed household members. The study emphasizes the urgent need for targeted interventions to address the lack of formal qualifications, and high unemployment across these rural communities. Skill development, economic empowerment, and financial inclusion for rural households are the most important strategic elements that should be considered when developing strategies to eradicate poverty and hunger but be enlightened about the importance of having and consuming balanced diets and the benefits of participating in farming.

#1194 MATILDE MILANA[1], E.D. VAN ASSELT[1], H.J. VAN DER FELS-KLERX[1]: TOWARDS A COMMON FRAMEWORK TO ASSES FOOD SAFETY OF ALTERNATIVE PROTEIN-BASED FOODS

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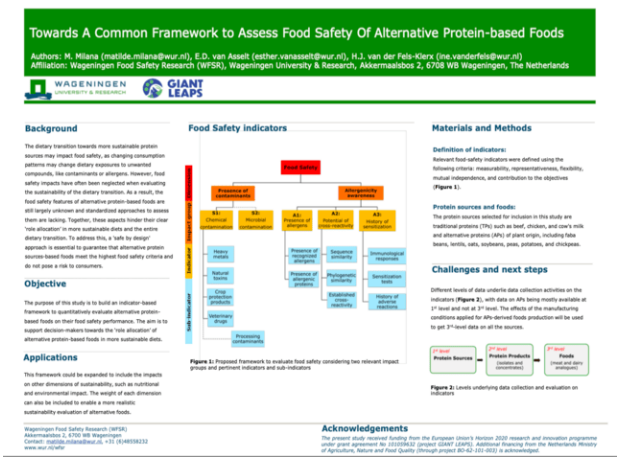

Introduction: The protein transition is expected to face new food safety challenges, as changing consumption patterns may change dietary exposures to unwanted compounds, like contaminants or allergens, presents in foods. However, food safety has always been neglected in the evaluation of more sustainable foods and diets. To address this, a safe-by-design approach is essential to guarantee that alternative protein-based foods meet the highest food safety criteria.

Purpose: For this reason, the purpose of this study is to built an indicator-based framework to quantitatively evaluate a selection of alternative protein-based foods on their food safety performance.

Methods: A preliminary screening of literature was performed to identity the relevant food-safety indicators considering criteria such as measurability, representativeness, flexibility, mutual independence, and contribution to the

specified objectives. Following, processing techniques applied to manufacture meat and dairy analogues have been selected; their impacts have been included by means of the use of transfer factors to get food-level data.

Results: Indicators have been defined as follows; 1) Presence of contaminants including 1a) chemical contamination and 1b) microbiological contamination; and 2) Allergenic potential including 2a) presence of allergenic proteins, 2b) potential of cross-reactivities and 2c) history of sensitization. Data collected on protein sources must be standardized, transfer factors from processing must be applied, and, eventually, data must be aggregated to allow the evaluation of each source against indicators 1) and 2).

Conclusions: The framework presented in this study supports decision-makers towards the prioritization of protein sources to ensure people and planetary health. A framework such as the one presented in this study, could eventually flow into an expanded one by incorporating indicators on other sustainability dimensions, as well as their weights, to enable a realistic and comprehensive impacts evaluation.

#555 MARIANA MORALES-DE LA PEÑA[1], A. ARAGONÉS- MILLÁN[1]; O. MARTÍN-BELLOSO[*1,2], R. SOLIVA-FORTUNY[1,2]: SUSTAINABLE EXTRACTION OF ANTIOXIDANT COMPOUNDS FROM AGRI-FOOD BY-PRODUCTS BY PULSED ELECTRIC FIELDS

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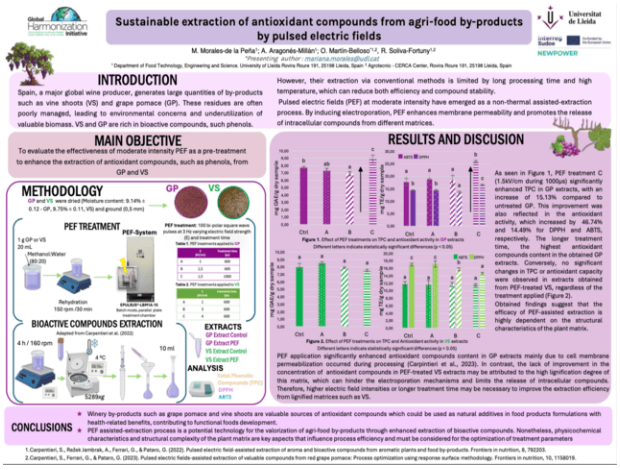

The growing necessity for sustainability has driven the search for viable alternatives for the utilization of agri-food by-products, which not only pose an environmental challenge but also represent a source of high added-value compounds, such as antioxidants. The development of innovative technologies for a sustainable extraction of these compounds remains a key challenge. Pulsed electric fields (PEF) is emerging as a promising technique for enhancing the extraction of bioactive compounds from different matrixes1. By applying short pulses of moderate intensity, PEF alters the permeability of cell membranes, facilitating the release of target compounds2. The aim of this work was to evaluate the efficiency of PEF as assisted-extraction technique in grape pomace (GP) and grapevine leaves (GVL) to obtain antioxidant extracts with improved characteristics. PEF treatments were applied at different electric field strengths (1–5 kV/cm) depending on the electrical conductivity of each product. Immediately after processing, PEF-treated GP and GVL samples were freeze-dried, while untreated ones served as reference. Methanolic extractions (80%) were performed on the freeze-dried by-products, and the resulting extracts were evaluated for total phenolic compounds (TPC) and antioxidant activity (AA) using Folin Ciocalteu, DPPH and ABTS assays3. PEF treatments (1 – 1.5kV/cm and 100 bipolar pulses of 6–10µs at 3 Hz) enhanced TPC (12–19%) and AA (8–33%) of GP extracts, compared to the untreated control. For GVL, the highest TPC extraction (669,0mg of GAE/L) was obtained at the lowest intensity (1 kV/cm and 100 bipolar pulses of 6µs and 3Hz) while AA values remained unchanged compared to control extracts. These findings highlight the potential of PEF technology as an environmentally friendly approach for enhancing the extraction of antioxidant compounds from agri-food by-products, thereby contributing to the sustainability of the agri-food system and supporting the development of improved functional ingredients for being used in food industry.

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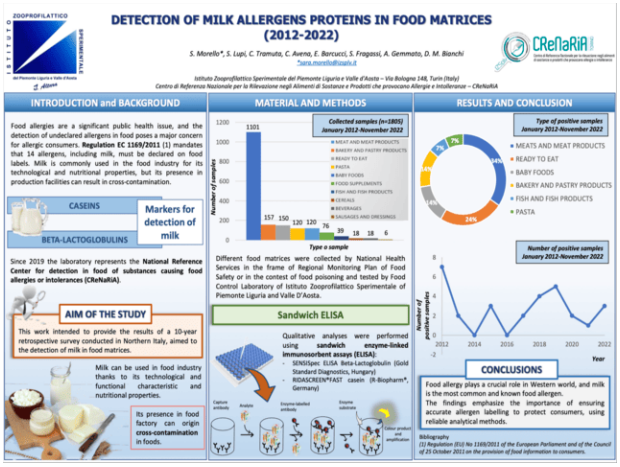
#286 SARA MORELLO, S.[1], LUPI, C. TRAMUTA[1], C. AVENA, E. BARCUCCI, S. [1] FRAGASSI, A. GEMMATO[1], D. M. BIANCHI[1]: DETECTION OF MILK ALLERGENS PROTEINS IN FOOD MATRICES (2012-2022)

1 Istituto Zooprofilattico Sperimentale del Piemonte Liguria e Valle d'Aosta - Centro di Referenza Nazionale per la Rilevazione negli Alimenti di Sostanze e Prodotti che provocano Allergie e Intolleranze – CReNaRiA



Food allergies are a significant public health issue, and the detection of undeclared allergens in food poses a major concern for allergic consumers. Regulation EC 1169/2011 (1) mandates that 14 allergens, including milk, must be declared on food labels. Milk is commonly used in the food industry for its technological and nutritional properties, but its presence in production facilities can result in cross-contamination. This study presents the results of a 10-year retrospective survey conducted in Northern Italy, aimed at detecting milk in various food matrices. Milk proteins that trigger allergic reactions include caseins, lactalbumin, lactoglobulin, immunoglobulins, and bovine serum albumin. Caseins and beta-lactoglobulin were used as markers to identify the presence of milk in food samples. Between January 2012 and November 2022, 1,805 food samples were collected by National Health Services as part of the Regional Food Safety Monitoring Plan or foodborne illness investigations. The samples included meats and meat products (n=1101), bakery and pastry products (n=157), ready-to-eat foods (n=150), pasta (n=120), baby foods (n=120), food supplements (n=76), fish and fish products (n=39), cereals (n=18), beverages (n=18), and sauces and dressings (n=6). Qualitative analyses were performed using sandwich enzyme immunosorbent assays, with the SENSISpec ELISA Beta-Lactoglobulin (Eurofins Technologies) and RIDASCREEN®FAST casein (R-Biopharm®) kits. In total, 29 of 1,805 samples contained undeclared milk, with meats and meat products (n=10) and ready-to-eat foods (n=7), baby foods (n. 4), bakery and pastry products (n. 4), fish and fish products (n. 2) and pasta (n. 2) among the non-compliant categories. This study showed a reduction in undeclared milk over the years, with the highest detection rate of 5% in 2012. The findings emphasize the importance of ensuring accurate allergen labelling to protect consumers, using reliable analytical methods.

Keywords— beta-lactoglobulins, caseins, food safety, milk allergens

References

(1) REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL available from: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:304:0018:0063:en:PDF

#306 REGINA OHLMANN: INTEGRATION OF ARTIFICIAL INTELLIGENCE TO ENHANCE THE EFFICIENCY OF REGULATORY APPROVAL PROCESSES

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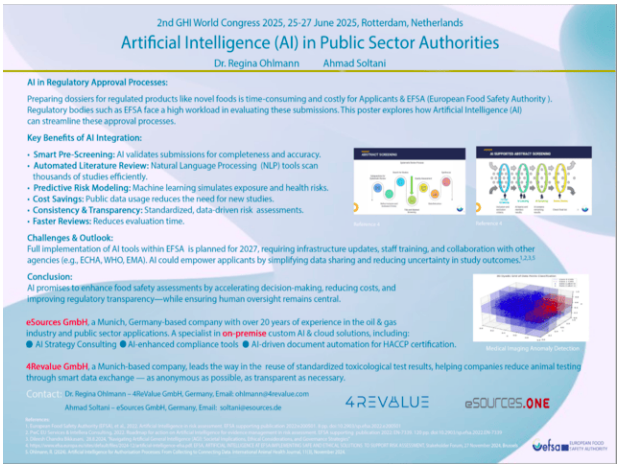

Extensive approval processes for so-called regulated products are essential to ensure consumer safety. Everyone wants food and feed that are safe to consume and have no adverse impact on producers or the environment, including wildlife. To guarantee this, preparing a dossier for the approval of a regulated product (e.g. feed additives, novel foods) is both costly and time-intensive. Regulatory authorities also face a heavy workload, as all documents submitted must be reviewed in every detail. In 2022, the European Food Safety Authority (EFSA) published a concept paper outlining its vision for using AI in risk assessment evaluations. The initial deployment of AI is planned for 2027. By then, adaptations to the data infrastructure for Big Data and AI, along with a trustworthy AI framework (Risk Management Framework), are expected to be in place. Additionally, development and operations management, as well as upskilling employees through continuous training, are vital so that the time-intensive AI implementation process yields quick benefits. It remains uncertain whether, at the outset of AI implementation, EFSA will focus solely on its internal data, as it closely cooperates with other authorities (including ECHA, WHO, and EMA). Collaboration with these entities could lead to even faster and more substantial benefits in risk assessment, as they often share interfaces and face duplicative reporting requirements in their daily operations. There is also hope that introducing AI support at EFSA will benefit applicants. Currently, there are few smart systems that facilitate the preparation of dossiers. However, with a purposebuilt AI, it would be desirable to make data sharing easier (possibly through targeted access to the EFSA database for approved companies), thus saving time and resources and reducing uncertainty about achieving desired study results.

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#290 VIKTORIA OLSSON: STINA-MINA EHN BÖRJESSON OCH[1], VIKTORIA OLSSON[1]: EXPLORING THE CRUCIAL LINK BETWEEN FOOD SECURITY AND FOOD SAFETY

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Introduction

The global agrifood system is complex, involving numerous actors, processes, and unpredictable events. Food security, which ensures access to sufficient, affordable, and nutritious food, is closely tied to food safety. Unsafe food can harm public health by causing illness and impairing nutrient absorption, threatening food security even when food is available. Climate change worsens these challenges, as rising temperatures, extreme weather, and increased humidity promote microbial contamination, such as mycotoxins in crops. Other examples include algae and seafood cultivation that is gaining importance. Warming waters increase the risk of harmful microorganisms, including toxin-producing algae and Vibrio bacteria, which thrive in temperatures above 20°C.

Thus, climate change impacts both food availability food safety through an overall higher microbial activity, pathogen survival rates, and altered distribution, as well as increased vulnerability of agricultural systems. These environmental stresses reduce biodiversity and increase the risk of disease. Addressing these challenges requires integrated strategies. Practitioners in the food system are gatekeepers to the understanding of these complex relationships and novel means of reaching out to food science students and practitioners, informing about these events and risks, are needed.

Purpose

The purpose of this upcoming study is to interview Swedish food producers with different functions in the food system and combine these insights with a literature review. Through a comprehensive popular scientific review, the ambition is to create an accessible and engaging document that highlights the important connection between food security and food safety.

Methods

Based on an interview guide, approximately 6-10 practitioners will be interviewed. The qualitative data will be analysed using thematic analysis.

Results and conclusions

This work, based in food producers' concerns, knowledge and opportunities will provide an innovative and much needed element in food safety training and education. Preliminary results and conclusions will be presented during the conference.

#380 HELEN ONYEAKA: MICRO-ENCAPSULATION OF NISIN-LIKE BACTERIOCINS OBTAINED FROM LACTOCOCCUS LACTIS FOR ENHANCED SPORICIDAL ACTIVITY AGAINST BACILLUS CEREUS SPORES

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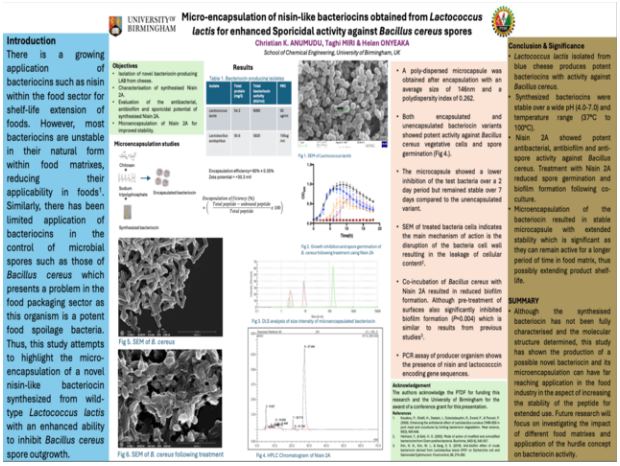

There is a growing application of bacteriocins such as nisin within the food sector for shelf-life extension of foods. However, most bacteriocins have proven to be unstable in their natural form within food matrixes and thus exert limited antimicrobial activities. Similarly, there has been limited application of bacteriocins in the control of microbial spores such as those of *Bacillus cereus* which presents a problem in the food packaging sector as this organism is a potent food spoilage bacteria. Thus, this study attempts to highlight the micro-encapsulation of a novel nisin-like bacteriocin synthesized from wild-type *Lactococcus lactis* with an enhanced ability to inhibit *Bacillus cereus* spore germination/outgrowth. Through fed-batch fermentation using modified de-Mann Rogosa and Sharpe media, a novel nisin-like bacteriocin was synthesized by wild-type *Lactococcus lactis* followed by partial purification by ammonium sulphate precipitation and reverse-phase high-performance liquid chromatography. The bacteriocin was characterized by mass spectrometric methods and subsequently encapsulated using conjugates of chitosan and sodium tripolyphosphate. This nisin-chitosan-sodium-tripolyphosphate conjugate was employed to inhibit *Bacillus cereus* spore outgrowth in vitro. Sporicidal activity was confirmed by phase-contrast microscopy and resuscitation assays. Fed-batch fermentation of wild-type *Lactococcus lactis* yielded thermally and enzymatically stable AMPs. Analysis of these peptides by HPLC-MS revealed the presence of daughter ions similar to nisin following fragmentation using the dynamic multiple reaction monitoring (DMRM) mode. The formulated nisin-chitosan-sodium-tripolyphosphate microcapsules were stable with a polydispersity index of 0.262 and an average size of 146nm. These microcapsules were effective in inactivating *Bacillus cereus* spores, resulting in a 1-log reduction of viable spores and retarding spore germination within an hour. Phase-contrast microscopy confirmed the sensitivity of germinating spores to treatment by micro-encapsulated nisin-like bacteriocins. The results obtained from this study highlight the potential of nisin-chitosan-sodium-tripolyphosphate microcapsules in inhibiting *Bacillus cereus* spore outgrowth which is of immense importance to the food sector as this is a pathogen of concern in packaged foods.

Keywords: Food Safety; Natural preservatives; Food spoilage; Food Safety

#406 ANDREJ OVCA: LARA ERJAVEC[1], JELENA FICZKO[1], ANDREJ OVCA[1]: ADVANCING FOOD SAFETY: THE POTENTIAL OF ARTIFICIAL INTELLIGENCE IN HAZARD ANALYSIS

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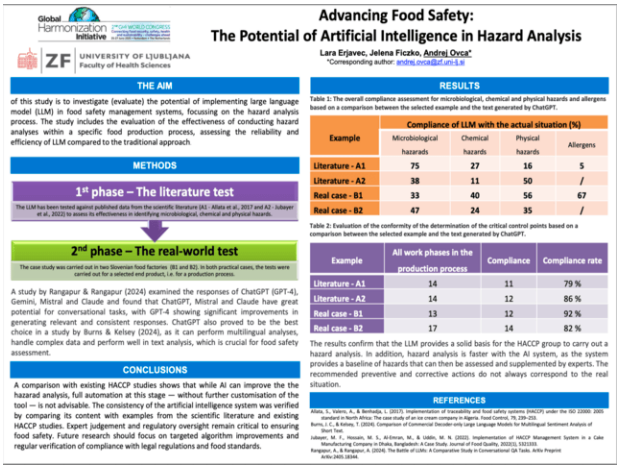


AI could transform the food industry in the context of HACCP management by enabling predictive hazard analysis. Large-scale language models (LLMs) could improve food safety risk assessment. However, their success depends on overcoming challenges such as data bias and ensuring continuous updates.

The aim of this study is to investigate (evaluate) the potential of implementing LLMs in food safety management systems, focussing on the hazard analysis process. The study includes the evaluation of the effectiveness of conducting hazard analyses within a specific food production process, assessing the reliability and efficiency of LLM compared to the traditional approach.

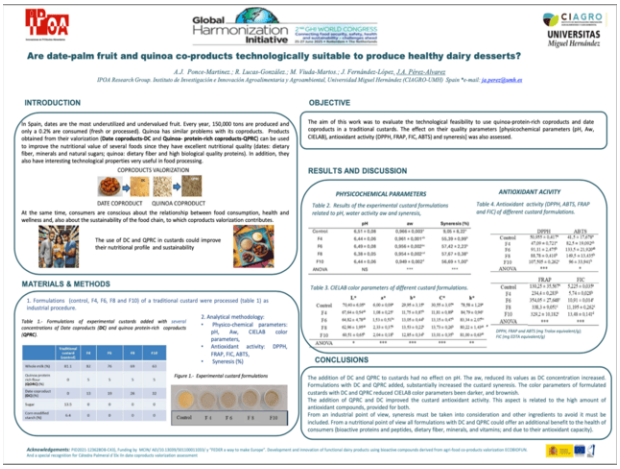
A two-stage assessment approach is used: First, the capabilities of the LLM were tested against published data from the scientific literature to assess its effectiveness in identifying microbiological, chemical and physical hazards. This is followed by a practical case study in a food processing plant where the language model is used to analyse hazards in a specific production process.

The preliminary results show remarkable differences in hazard identification. For literature case #1 (ice cream), the LLM showed high compliance for microbiological hazards (75%), but significantly lower compliance for chemical (21%) and physical hazards (16%). For literature case #2 (cake production), compliance varied with 50% for physical hazards and 38% and 11% for microbiological and chemical hazards, respectively. Critical control point analysis showed compliance rates of 78.6% for case 1 and 85.7% for case 2.

The preliminary analysis reveals important methodological differences between the LLM and the scientific literature. The LLM provided a more comprehensive identification of hazards and preventive measures, taking a broader perspective, while the literature offered a more specific and focussed approach. These observations highlight the potential of LLMs to improve food safety assessment, while emphasising the importance of refining their focus to bring them in line with established industry practises.

#626 JOSÉ ANGEL PÉREZ-ALVAREZ: PONCE-MARTÍNEZ, A.J.[1]; LUCAS-GONZÁLEZ, R. [1]; VIUDA-MARTOS, M. [1]; FERNÁNDEZ-LÓPEZ, J. [1]; PÉREZ-ALVAREZ, J.A.[1]: ARE DATE-PALM FRUIT AND QUINOA CO-PRODUCTS TECHNOLOGICALLY SUITABLE TO PRODUCE HEALTHY DAIRY DESSERTS

[1]IPOA. Research Group. CIAGRO Research Institute. Miguel Hernández University, Orihuela. Alicante Spain.



Spanish palm groves produce more than 150,000 tons/year of edible dates, but only a 0,2% of them, are consumed thus, is the most underutilized and underused crop. Also, Spanish quinoa producers have similar problem with their protein-rich “wastes” (QPRC). Thus, valorization of both “wastes” could be an excellent resource of value-added products. At the same time, consumers are conscious about the relationship between food consumption, health and wellness and, and are aware to the relationship between the agro-industrial coproducts valorization and environmental benefits. With the use of both coproducts, the custards nutritional profile could be improved.

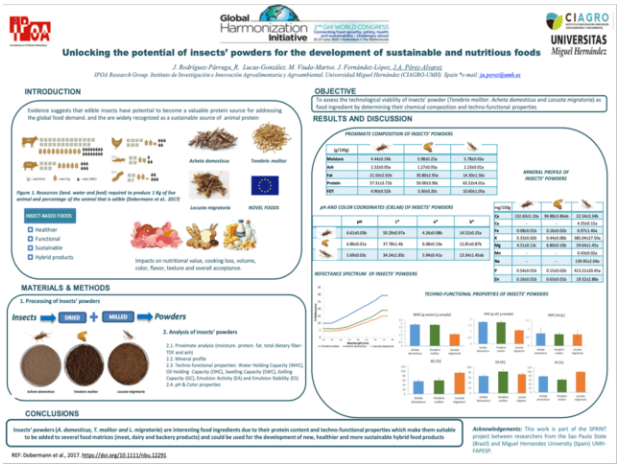
The aim of this work was to evaluate the technological feasibility to use QPRC and date coproducts (DC) in a traditional custard using physicochemical parameters (pH, Aw, CIELAB), antioxidant activity (DPPH, FRAP, FIC, ABTS) and syneresis, as quality parameters.

5 different formulations of a traditional custard were elaborated, one of them without DC and QPRC (control-C), and the others, had an equal concentration of QPRC (5%) with different DC concentrations (13, 19, 26 and 32%).

The increase in DC concentration decreased Aw activity value from 0,966 (C) to 0.949 (32% DC) and syneresis increased from 9.05% (C) to 56.69% (32%DC) ($P<0,05$) resulting in a texture defect and, therefore consumers acceptance. pH was not affected ($P>0.05$) in all formulations. DC addition increased the antioxidant capacity in all assayed methods and dietary fiber ranged from 0.03 (C) to 6.41 (32% DC) the addition of 19-32% produced a dietary fiber-rich custards (>6%). The addition of QPRC improved the custards protein content. On the other hand, L*, a* and b* also decreased in QPRC and DC samples. In custards, the DC and QPRC addition is technologically feasible, and the nutritional profile were improved but, for better consumer acceptance, the syneresis must be improved. Funding PID2021-123628OB-C43 MCIN/ AEI/10.13039/501100011033/ “FEDER”.

#477 JOSÉ PÉREZ-ALVAREZ: RODRÍGUEZ-PÁRRAGA, J.[1]; LUCAS-GONZÁLEZ, R. [1]; VIUDA-MARTOS, M. [1]; FERNÁNDEZ-LÓPEZ, J. [1]; PÉREZ-ALVAREZ, J.A. [1]: UNLOCKING THE POTENTIAL OF INSECTS' POWDER FOR THE DEVELOPMENT OF SUSTAINABLE AND NUTRITIOUS FOODS

[1]IPOA. Research Group. CIAGRO Research Institute. Miguel Hernández University, Orihuela. Alicante Spain



The search for and research into alternative protein sources is on the rise. Insect meals such as *Acheta domesticus* and *Tenebrio molitor* are sustainable, nutritious and functional alternative to developing new products. This need arises from the anticipated stress due to global population growth (Kaneda & Bietsch, 2020). Both are an attractive ingredient due to their nutritional profile, their feed conversion rate compared to animal protein and the environmental benefits of raising them concerning climate change, as they require fewer resources for similar protein quality (FAO, 2021). The aim was to assess their technological feasibility by determining their chemical composition (AOAC Methods), mineral profile (ICP), and techno-functional properties (water holding capacity (WHC), oil holding capacity (OHC), swelling ability (SC), emulsion activity (EA) and emulsion stability (EE)). The major component of both powders was proteins, which values ranged from 40-60%, being the highest values reported in *Acheta domesticus* powder with 57,3%. Regarding mineral profile, the calcium (Ca) and phosphorus (P) content of *Acheta domesticus* powder was higher than *Tenebrio molitor powder*, as well as the magnesium and phosphorus (P) content. Both powders highlighted by their WHC and EA, which could be related by their protein content. Higher protein content has been shown to improve techno-functional properties by acting as an emulsifying agent (Idrogo, 2018).

In conclusion, *Acheta domesticus* and *Tenebrio molitor* powders had similar techno functional properties. Both are potential ingredients due to their protein content and techno-functional properties which make them suitable to be added to several food matrices (meat, dairy and bakery products) and could be used for the development of new, healthier and more sustainable hybrid food products.

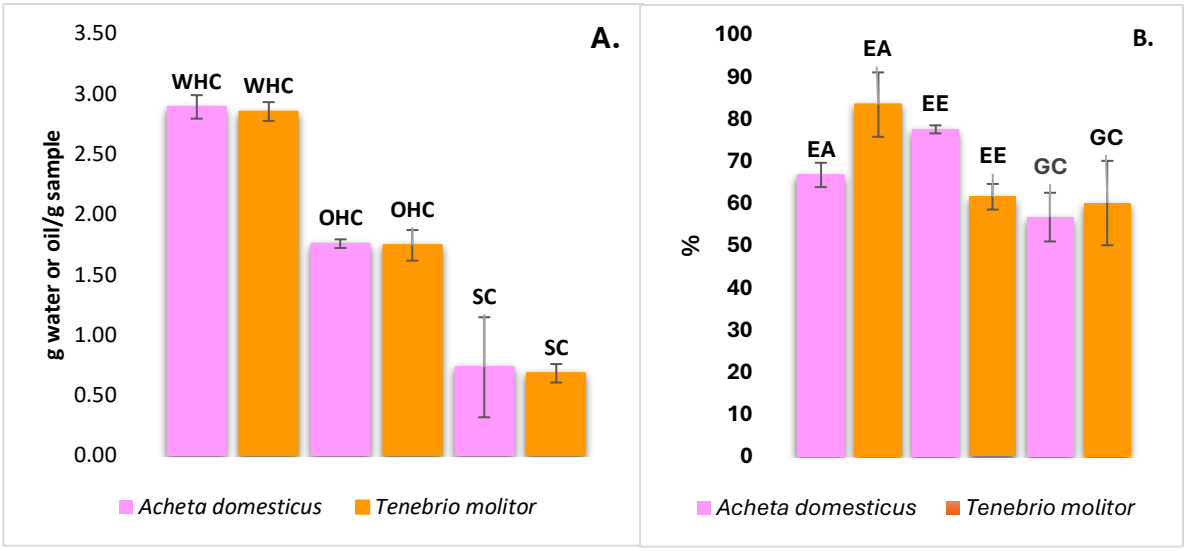


Figure 1. Techno-functional properties of *Acheta domesticus* and *Tenebrio molitor* powers **A.** (WHC: water holding capacity (g water/100 g sample); OHC: oil holding capacity (g oil /100 g sample); SC: swelling capacity (ml/g). **B.** Techno- functional properties (EA: emulsifying activity; EE: emulsion stability; GC: gelling capacity).

Funding: Looking for new sources of ingredients in the development of sustainable meat products. Proyectos internacionales de investigación conjuntos entre personal PDI de la UMH e investigadores del Estado de Sao Paulo-Brazil (UMH-FAPESP).

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#281 ALESSANDRA PROVERA [1], ROMANO A.[1], LIGOTTI C.[1], FLORIS I.[1], GILARDI G.[2], PUGLIESE M.[2], MARTUCCI F.[1], BIANCHI D. M.[1]: RECLAIMED WASTEWATER IN AGRICULTURE: GREENHOUSES SIMULATIONS ASSESSING THE MICROBIOLOGICAL SAFETY IN SHORT-CYCLE LEAFY VEGETABLES

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Introduction: Agricultural irrigation is one of the main drivers of water consumption in Europe. In the context of increasing water scarcity, intensified by climate change, the reuse of reclaimed wastewater in agriculture provides a valuable alternative to reduce pressure on natural resources. Regulation (EU) 2020/741 (1) establishes minimum quality requirements to ensure the safety of water used for agricultural irrigation. However, despite strict quality controls, a recent review shows that psychological factors (e.g., disgust and fear of contamination) influence people's acceptance of products irrigated with recycled water (2).

Purpose: To address these concerns, the "ReneWater" project aimed to evaluate the microbiological safety of short-cycle leafy vegetables irrigated with reclaimed wastewater.

Methods. The study involved experimental trials in greenhouses, using basil (*Ocimum basilicum*), lettuce (*Lactuca sativa*), and rocket (*Eruca vesicaria*) cultivated in a simulated soilless floating system. The nutrient solution in the tanks containing the crops' roots was spiked with non-pathogenic *Escherichia coli*, an indicator microorganism for hygiene, at a concentration of 1 x 10^6 CFU/mL, simulating an extreme condition that significantly exceeds the limits established by the Regulation. Analyses were conducted 24 hours after the inoculation of *E. coli* and subsequently after 40 and 70 days of vegetation growth, corresponding to the period until plants reached commercial maturity.

Results: For both lettuce and rocket, *E. coli* concentrations in the nutrient solution, peat and seedlings were found to be below the detection limit 40 days post-inoculation (< 10 CFU/g). For basil, this result was achieved after 70 days.

Conclusions. The findings suggest that crops cultivated in soilless under our experimental conditions are microbiologically safe by harvest. Therefore, with proper treatment, reclaimed water could be used in agriculture without compromising food safety, offering a potential solution to mitigate the environmental impact of agriculture.

Acknowledgement: Project funded by Italian Ministry of Health; IZSPLV-11/22-RC; CUP-J19I22001200001

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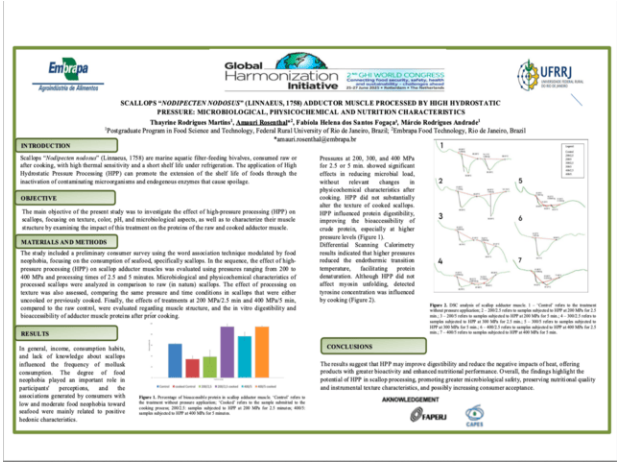
#677 AMAURI ROSENTHAL: T. R. MARTINS[1]; M.R.ANDRADE[1]; F.H.S.FOGAÇA[2]; R.C.BONFIM[1]; C.W.PILER[2]; C.M. SILVA[2]; W.F. LEAL JUNIOR[2]; H.T.G. BARBOZA[2]; A. ROSENTHAL*[2]: SCALLOPS "NODIPECTEN NODOSUS" (LINNAEUS, 1758) ADDUCTOR MUSCLE PROCESSED BY HIGH HYDROSTATIC PRESSURE: MICROBIOLOGICAL, PHYSICOCHEMICAL AND NUTRITION CHARACTERISTICS

[1] *Postgraduate Program of Food Science and Technology; Federal Rural University of Rio de Janeiro, Seropédica, Brazil*
[2] *Embrapa Agroindústria de Alimentos, Rio de Janeiro, Brazil*


SCALLOPS "*NODIPECTEN NODOSUS*" (LINNAEUS, 1758) ADDUCTOR MUSCLE PROCESSED BY HIGH HYDROSTATIC PRESSURE: MICROBIOLOGICAL, PHYSICOCHEMICAL AND NUTRITION CHARACTERISTICS

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INTRODUCTION

Scallops "*Nodipecten nodosus*" (Linnaeus, 1758) are marine aquatic filter-feeding bivalves, consumed raw or after cooking, with high thermal sensitivity and a short shelf life under refrigeration. The application of High Hydrostatic Pressure Processing (HPP) can promote the extension of the shelf life of foods through the inactivation of contaminating microorganisms and endogenous enzymes that cause spoilage.

OBJECTIVE

The main objective of the present study was to investigate the effect of high-pressure processing (HPP) on scallops, focusing on texture, color, pH, and microbiological aspects, as well as to characterize their muscle structure by examining the impact of this treatment on the proteins of the raw and cooked adductor muscle.

MATERIALS AND METHODS

The study included a preliminary consumer survey using the word association technique modulated by food neophobia, focusing on the consumption of seafood, specifically scallops. In the sequence, the effect of high-pressure processing (HPP) on scallop adductor muscles was evaluated using pressures ranging from 200 to 400 MPa and processing times of 2.5 and 5 minutes. Microbiological and physicochemical characteristics of processed scallops were analyzed in comparison to raw (in nature) scallops. The effect of processing on texture was also assessed, comparing the same pressure and time conditions in scallops that were either uncooked or previously cooked. Finally, the effects of treatments at 200 MPa/2.5 min and 400 MPa/5 min, compared to the raw control, were evaluated regarding muscle structure, and the in vitro digestibility and bioaccessibility of adductor muscle proteins after prior cooking.

RESULTS

In general, income, consumption habits, and lack of knowledge about scallops influenced the frequency of mollusk consumption. The degree of food neophobia played an important role in participants' perceptions, and the associations generated by consumers with low and moderate food neophobia toward seafood were mainly related to positive hedonic characteristics.

Pressures at 200, 300, and 400 MPa for 2.5 or 5 min. showed significant effects in reducing microbial load, without relevant changes in physicochemical characteristics after cooking. HPP did not substantially alter the texture of cooked scallops. HPP influenced protein digestibility, improving the bioaccessibility of crude protein, especially at higher pressure levels (Figure 1). Differential Scanning Calorimetry results indicated that higher pressures reduced the endothermic transition temperature, facilitating protein denaturation. Although HPP did not affect myosin unfolding, detected tyrosine concentration was influenced by cooking (Figure 2).

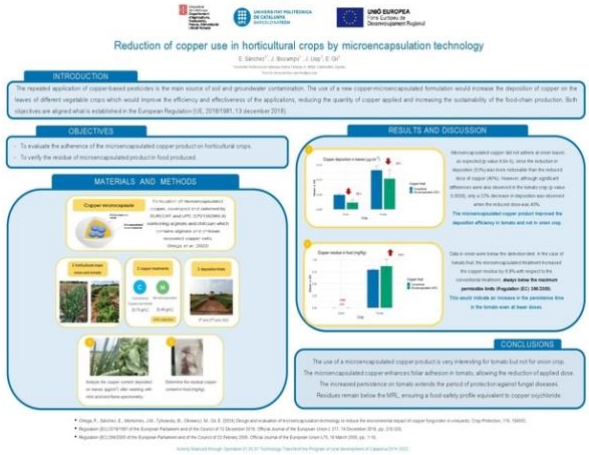
CONCLUSIONS

The results suggest that HPP may improve digestibility and reduce the negative impacts of heat, offering products with greater bioactivity and enhanced nutritional performance. Overall, the findings highlight the potential of HPP in scallop processing, promoting greater microbiological safety, preserving nutritional quality and instrumental texture characteristics, and possibly increasing consumer acceptance.

ACKNOWLEDGEMENT

Scallops "*Nodipecten nodosus*" (Linnaeus, 1758) are marine aquatic filter-feeding organisms, consumed raw or after cooking, with high thermal sensitivity and a short shelf life under refrigeration. The application of High Hydrostatic Pressure Processing (HPP) can promote the extension of the shelf life of foods through the inactivation of contaminating microorganisms and endogenous enzymes that cause spoilage. The effect of the HPP on scallop adductor muscles was studied, using pressures of 200 to 400 MPa and process times of 2.5 and 5 minutes, on color, water activity, water retention capacity, microbiological quality (population counting/detection of mesophilic, psychotropic, total and fecal coliforms, Salmonella ssp.) and physicochemical characteristics of processed and fresh scallops. The effect of processing on texture was also evaluated, comparing the same process conditions on scallops subjected or not to previous cooking. In the sequence, the effects of treatments at 200 MPa/2.5 min and 400 MPa/5 min. were evaluated, compared to the in fresh scallop as control, on the structure, digestibility and in vitro bioaccessibility of adductor muscle protein, subjected to prior cooking. Pressures of 200, 300 and 400 MPa for 2.5 or 5 minutes showed significant effects in reducing microbiological load, without relevant changes in physical-chemical characteristics, after cooking. HPP did not substantially alter the texture of the cooked scallops. HPP influenced protein digestibility, by improving the bioaccessibility of crude protein, especially at higher-pressure levels. DSC indicated that higher pressures reduced the endothermic transition temperature, facilitating the denaturation of proteins. Although APH did not interfere with myosin unfolding, tyrosine concentration was affected by cooking. These results suggest that HPP can improve digestibility and reduce the negative impacts of heat, offering products with enhanced nutritional performance.

#272 SÁNCHEZ, E., BISCAMPS, J., LLOP, J., GIL, E.: REDUCTION OF COPPER USE IN HORTICULTURAL CROPS BY MICROENCAPSULATION TECHNOLOGY.


Reduction of copper use in horticultural crops by microencapsulation technology

INTRODUCTION

OBJECTIVES

MATERIALS AND METHODS

RESULTS AND DISCUSSION

CONCLUSIONS

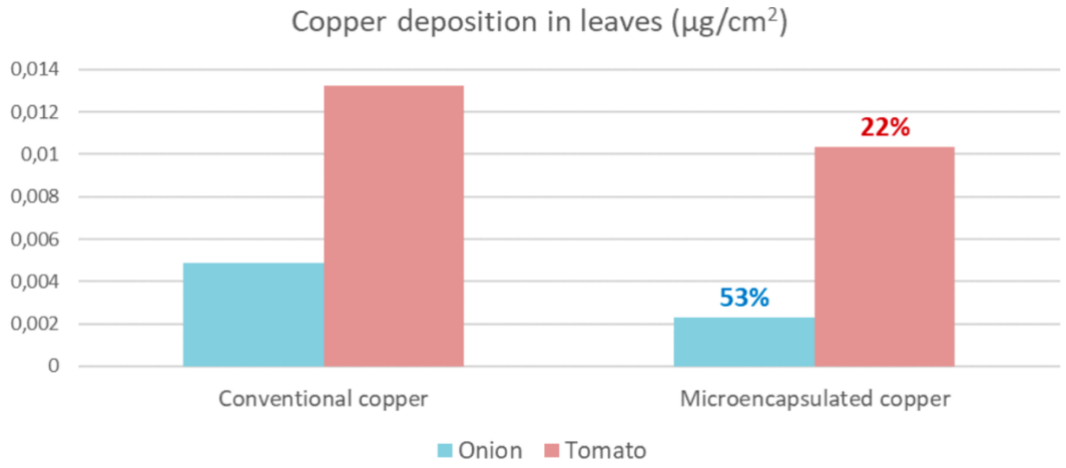
The repeated application of copper-based pesticides is the main source of soil and groundwater contamination. The use of a new copper-microencapsulated formulation would increase the deposition of copper on the leaves of different vegetable crops which would improve the efficiency and effectiveness of the applications, reducing the quantity of copper applied and increasing the sustainability of the food-chain production. Both objectives are aligned what is established in the European Regulation (UE, 2018/1981, 13 december 2018).

The deposition of copper in leaves of onion and tomato crop was doubly studied with a conventional product (copper oxychloride, C) and a microencapsulated copper product (M) at a 40% dose reduction. At the same time, the persistence of copper in onions and tomato fruit at the end of the crop was studied.

The results indicated that microencapsulated copper did not adhere at onion leaves as expected, since the reduction in deposition (53%) was more noticeable than the reduced dose of copper (40%). However, in the tomato crop, only a 22% decrease in deposition was observed when the reduced dose was 40% (Figure 1). That is, the microencapsulated copper product improved the deposition efficiency in tomato and not in onion crop.

With respect to copper residue in food, in onion all data were below the detection limit. In the case of tomato fruit, the microencapsulated treatment increased the copper residue by 8.8% with respect to the conventional treatment, always below the maximum permissible limits. This would indicate an increase in the persistence time in the crop even at lower doses.

Figure 1. Copper deposition in leaves (mg/cm$_2$) and percentage of reduction of copper deposition betw eenmicroencapsulated copper (M, 40% dose reduction) and a conventional copper production (C).



#866 MARITZA SATAMA-BERMEO*,1, LAURA GARCÍA2, LÉA LAMOTTE 3, KAREN RAMIREZ 4, ADRIANA SANTOS 4, GUILLERMO ZAMBRANO 4, ROLAND OLSCHEWSKI 1: DO DELIBERATIVE WORKSHOPS CHANGE COCOA FARMERS' PREFERENCES? A TWO-STEP CHOICE EXPERIMENT APPROACH

[1] WSL Swiss Federal Research Institute, Economics and Social Sciences Unit, Birmensdorf, Switzerland
[2] Universidad Pablo de Olavide, Laboratorio Historia de los Agroecosistemas, Sevilla, Spain
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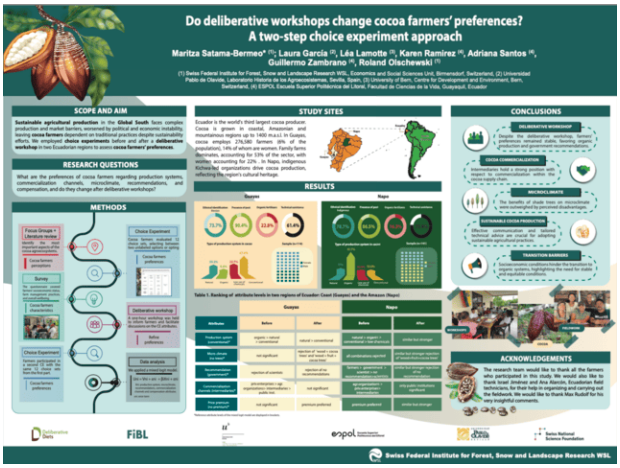

The transition to sustainable agricultural production poses significant global challenges, particularly for farmers in the Global South. These farmers often face intertwined production and commercialization constraints, exacerbated by political and economic instability. Despite various efforts to promote sustainable agriculture, many farmers, including cocoa farmers, remain dependent on conventional agricultural practices and established trading systems. To better understand cocoa farmers' preferences and explore potential pathways for transition to sustainable agricultural practices, we conducted a two-stage choice experiment (CE) in two regions of Ecuador - the Coast and the Amazon. The CE was conducted before and after a deliberative workshop to assess farmers' preferences and to identify feasible options for change.

Keywords: food system, cocoa production, sustainable agricultural practices, mixed logit, deliberation workshop, intermediaries, Ecuador

Poster Presentation: This poster will present detailed statistical analyses, and visual representations of data. Attendees will have the opportunity to discuss potential recommendation in the cocoa value chain and implications for future research.

#474 ADRIANA STERIAN*: MIHAELA GEICU-CRISTEA[1], ELISABETA-ELENA POPA[1], MIHAELA-CRISTINA DRĂGHICI[1], PAUL-ALEXANDRU POPESCU[1], ION NIȚU[1], ADRIANA-GEORGIANA STERIAN[2], AMALIA-CARMEN MITELUȚ[1], MONA-ELENA POPA[1]: CONSUMER PERCEPTION REGARDING FOOD INNOVATION THROUGH FUNCTIONAL INGREDIENTS DERIVED FROM FOOD WASTE - TRENDS AND PERSPECTIVES

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Food innovation through the incorporation of functional ingredients derived from food waste has emerged as a promising strategy to address both sustainability, circularity and health challenges in the global food system. This study explores consumer perceptions, attitudes, and acceptance of such innovations, focusing on their awareness, preferences, and potential barriers. By analyzing current trends, this research identifies key drivers influencing consumer behavior, including environmental concerns, nutritional benefits, and ethical considerations. Additionally, the study highlights the role of education, marketing, and regulatory frameworks in shaping consumer trust and fostering adoption.

Findings suggest that while consumers generally support sustainable food practices, skepticism around safety, quality, and taste remains a significant obstacle. Demographic factors such as age, education, and cultural context also play critical roles in shaping perceptions. The integration of storytelling, transparent labeling, and co-creation strategies between manufacturers and consumers is identified as effective in enhancing consumer acceptance.

This research contributes to the growing discourse on sustainable food systems, demonstrating how targeted efforts in consumer education and engagement can transform waste into value-added products.

Keywords: food innovation, functional ingredients, food waste, consumer perceptions

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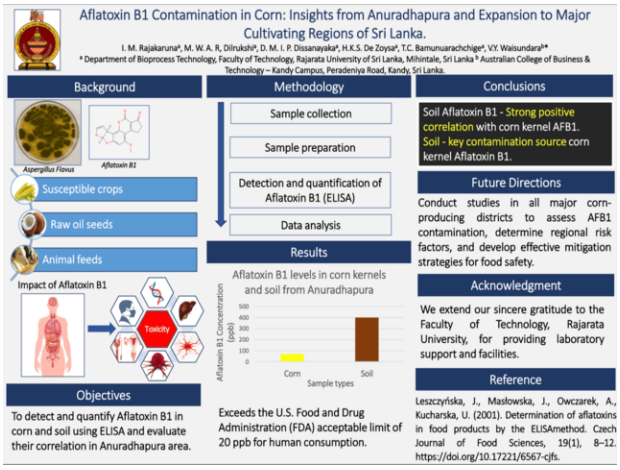
#681 VIDURANGA WAISUNDARA: I. M. RAJAKARUNA[1], M. W. A. R, DILRUKSHI[1], D. M. I. P. DISSANAYAKA[1], H.K.S. DE ZOYSAA, T.C. BAMUNUARACHCHIGE[1], V.Y. WAISUNDARA[2]: AFLATOXIN B1 CONTAMINATION IN CORN: INSIGHTS FROM ANURADHAPURA AND EXPANSION TO MAJOR CULTIVATING REGIONS OF SRI LANKA

[1] Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, Sri Lanka c Department of Physical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale, Sri Lanka
[2] Australian College of Business & Technology – Kandy Campus, Peradeniya Road, Kandy, Sri Lanka



Aflatoxin B1, a potent toxin produced by some *Aspergillus* species, significantly threatens human health by negatively impacting long-term physical and cognitive development. Corn, a key cereal crop in Sri Lanka, is particularly vulnerable to Aflatoxin B1 contamination due to favorable environmental conditions that foster fungal growth. Initial research in the Anuradhapura district, responsible for 33% of Sri Lanka's corn production, revealed alarming levels of Aflatoxin B1 contamination. This study measured Aflatoxin B1 levels in corn and the soils where it is grown using the Enzyme-Linked Immunosorbent Assay (ELISA). Results showed contamination levels as high as 60–70 ppb in corn kernels, well above the acceptable limit of 20 ppb, while soil samples exhibited concentrations of 350–400 ppb. These results indicate a direct link between contamination levels in soil and kernels, likely due to inadequate farming practices and environmental factors. However, contamination was not evenly spread across Anuradhapura, suggesting variability linked to soil type, crop management practices, and other local conditions. The study also highlights the need to expand investigations to include other major corn-producing districts such as Ampara (17%), Moneragala (16%), Badulla (11%), and Kurunegala (4%), which together account for nearly 80% of Sri Lanka's corn output. These areas showcase diverse agro-ecological conditions that may influence the distribution and extent of Aflatoxin B1 contamination. Given the critical role of these districts in national corn production and the health risks associated with Aflatoxin B1, further research is essential to assess contamination levels, recognize contributing factors, and develop effective mitigation strategies. Such efforts are vital for ensuring food safety, fostering sustainable agricultural practices, and protecting public health in Sri Lanka.

Keywords: Mycotoxins, Kernels, Soil, Safety, Food

#561 MARISOL TAPIA: AGUDO-GUEVARA, R.[1] AND TAPIA, MARÍA S.[1]: CHALLENGES OF THE MILK VALUE CHAIN AND FOOD SECURITY OF VENEZUELANS

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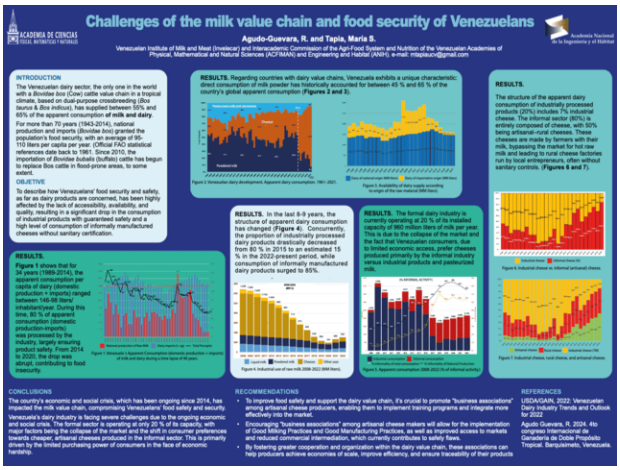


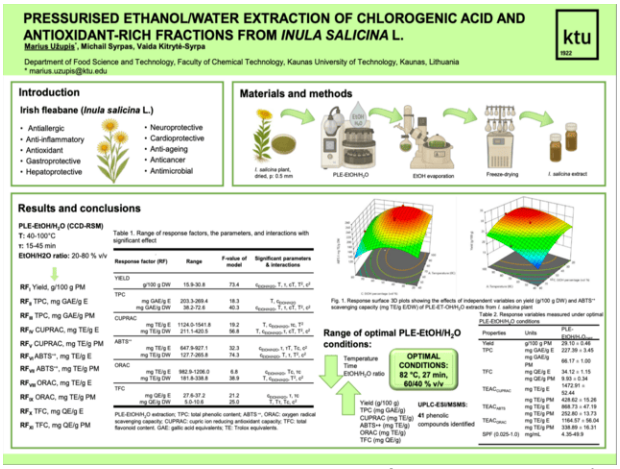
The Venezuelan dairy sector, the only one in the world with a value chain in a tropical climate based on dual-purpose livestock, has supplied between 55% and 65% of the apparent consumption. In terms of dairy products, for more than 50 years (1961-2014), national production and imports have guaranteed food security of the population: 95-110 l/per capita/year). Concerning countries with dairy value chains, Venezuela exhibits a unique characteristic: direct consumption of milk powder has historically been between 45% and 65% of the country's global apparent consumption.

The economic and social crisis that the country has been experiencing since 2014 has impacted the milk value chain, compromising the food safety and security of Venezuelans. The structure of apparent dairy consumption has been transformed from 85% of industrially processed products in 2015 to an estimated consumption of industrially processed products for the current year (2024) of 20%, while informal manufacturing rose to 80%.

The objective of this work is to describe how Venezuelans' food security, as far as dairy products are concerned, has been highly affected by the lack of guarantee of accessibility, availability, and quality. This has resulted in a significant drop in the consumption of industrial products with guaranteed safety and a high level of consumption of informally manufactured cheeses (80%) without sanitary certification.

#291 MARIUS UŽUPIS[1], MICHAIL SYRPAS[1], VAIDA KITRYTĖ-SYRPA[1]: PRESSURISED ETHANOL/WATER EXTRACTION OF CHLOROGENIC ACID AND ANTIOXIDANT-RICH FRACTIONS FROM *INULA SALICINA L.*

Department of Food Science and Technology, Kaunas University of Technology, Kaunas, LT-50254, Lithuania



Inula salicina L., commonly known as the willow-leaved yellowhead, is abundant across Europe, Asia, and Africa [1]. In folk medicine, plants of the genus *Inula* have been used for a wide range of pharmacological properties – antioxidant, antiallergic, antimicrobial, anti-inflammatory, anticancer, hepatoprotective, gastroprotective, cardioprotective, neuroprotective, etc. [2]. However, the extraction of potential bioactive compounds from *I. salicina* has not been widely studied, and there is limited information on the properties of its extracts.

This work was aimed to optimise the pressurised ethanol/water extraction (PLE-EtOH/H_2O) parameters for obtaining polar *I. salicina* extracts with high yield and *in vitro* antioxidant capacity. The central composite design was employed alongside a response surface methodology (CCD-RSM) to evaluate the impact of temperature (T, 40-100 °C), time (τ, 15-45 min) and ethanol/water ratio (EtOH/H_2O, 20-80 % v/v) on the extract yield, antioxidant activity measured by three different *in vitro* assays ($ABTS^{\bullet+}$, CUPRAC, ORAC), also total phenolic and flavonoid content (TPC and TFC). Obtained results indicate increases in extraction yields from 15.9 to 30.8 g/100 g DW using PLE-EtOH/H_2O at various conditions, significantly higher than those obtained by the Soxhlet extraction with ethanol (10.8 g/100 g). The extract produced under the optimised PLE-EtOH/H_2O conditions (80-82 °C, 25-27 min, 55-60 % EtOH) resulted in high TPC content (224-259 mg GAE/g extract), TFC (31-34 mg QE/g extract) and *in vitro* antioxidant capacity $ABTS^{\bullet+}$ (856 -915 mg TE/g extract), CUPRAC (1360-1483 mg TE/g extract), ORAC (1062-1200 mg TE/g extract) under a significantly shorter extraction time compared to standard extraction methods. The major phenolic compounds in PLE-EtOH/H_2O extracts were chlorogenic acid, followed by 3,5-, 1,5-, and 4,5-dicaffeoylquinic acids. The results of this study indicate the potential of optimised PLE for obtaining higher added-value fractions from *I. salicina* with multipurpose pharmaceutical, nutraceutical, and cosmetic applications.

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#423 MARTA VENTURA 1,2,*, SUSANA JESUS1, INÊS DELGADO1,4, ANDREIA REGO1,4, SANDRA GUEIFÃO1, MARIANA RIBEIRO1,4, ORQUÍDIA NEVES3, INÊS COELHO1: INORGANIC CONTAMINANTS IN FOODS NEAR THE ALVARRÕES MINE: A STUDY CASE

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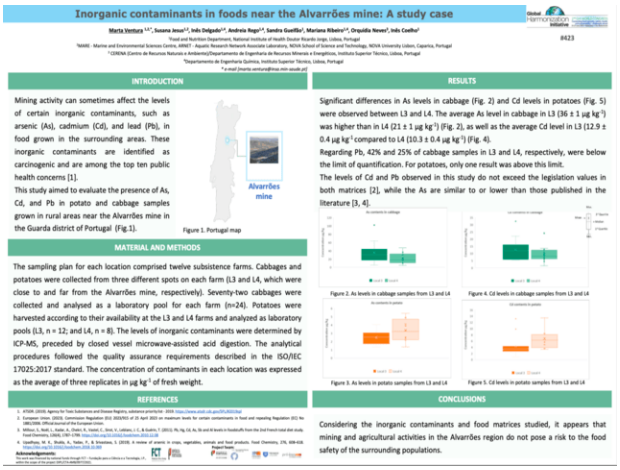

The mining activity can sometimes affect the levels of some inorganic contaminants, such as As, Cd and Pb, in food grown in the surrounding areas. These contaminants are included in the list of the top ten contaminants of public health concern [1]. This study aimed to evaluate the presence of these elements in potatoes and cabbages grown in rural areas near the Alvarrões mine (Guarda district, Portugal). Twelve subsistence farms constituted the sampling plan in each location. Cabbages and potatoes were collected from three different spots on each farm. Seventy-two cabbages were collected and analysed as a laboratory pool for each farm (n=24). Potatoes were harvested according to farm availability in L3 (n=36) and L4 (n=24) and analyzed as laboratory pools (L3, n=12, and L4, n=8). The levels of the inorganic contaminants were determined by ICP-MS, preceded by microwave-closed vessel acid digestion. The analytical procedures followed the quality assurance requirements described in the ISO/IEC 17025:2017 standard. The contaminants' concentration in each location was expressed as the average of three replicates in µg/kg of fresh weight.

Significant differences were observed between L3 and L4 for As in cabbage and Cd in potatoes. In L3, the average levels of As (36 ± 1 µg/kg) and Cd (12.9 ± 0.4 µg/kg) in cabbages were higher than those from L4. Regarding Pb, 42% and 25% of cabbage samples in L3 and L4, respectively, were below the limit of quantification; for potatoes, only one result was above it.

The levels observed in this work for Cd and Pb do not exceed the legislation values in both matrices [2], while As are similar or lower than those published in the literature [3], [4]. Considering the contaminants and the vegetables studied, the mining and agricultural activities in the Alvarrões region do not appear to affect food security.

Acknowledgements: This work was financed by national funds through FCT – Fundação para a Ciência e a Tecnologia, I.P., under the project EXPL/CTA-AMB/0977/2021

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#666 CASIANA BLANCA VILLARINO, J. *, LIM, RILEY LEROY T, TANGCUECO[1], VANESSA GAYLE T, SOLOMON[1], RAPHAEL LUIS C, BASINANG[1], AIRISSE RAE P., PAGULAYAN[1], JIN MARK DG.[1], AND VELASQUEZ, MARY MICHELLE[1]: RELATIONSHIP OF BITTER TASTE PERCEPTION TO THE PROP (6-N-PROPYLTHIOURACIL) TASTER STATUS, AND FOOD PREFERENCE AND CONSUMPTION OF FILIPINO YOUTH ALCOHOL DRINKERS AND NONDRINKERS

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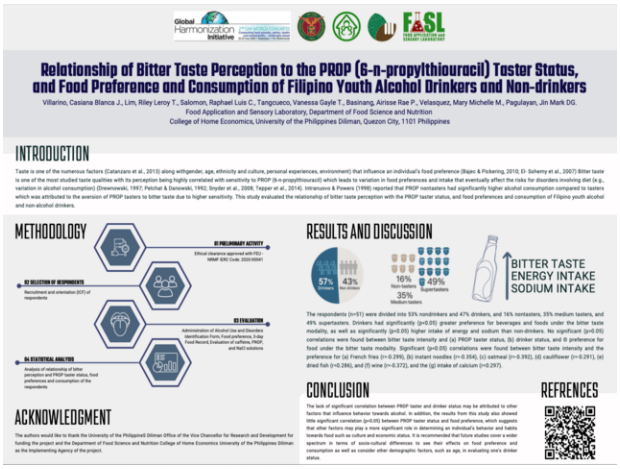

Introduction: Taste is one of the primary factors that affect food selection and consumption and the bitter taste is one of the most studied taste qualities. Its perception has been highly correlated with PROP (6-n-propythiouracil) taster classification and alcoholism. PROP taster status was found to impact food consumption, preferences and health status, as well as alcohol intake.

Objective: This study evaluated the relationship of bitter taste perception with the PROP (6-n-propylthiouracil) taster status, and food preferences and consumption of Filipino youth alcohol and non-alcohol drinkers.

Methods: The respondents accomplished a food preference checklist, a 3-day food record, and were classified into nondrinkers and drinkers according to their alcohol use disorder identification test (AUDIT). Sensory evaluation of PROP/NaCl and caffeine solutions was also conducted.

Results: The respondents (n=51) were divided into 53% nondrinkers and 47% drinkers, and 16% nontasters, 35% medium tasters, and 49% supertasters. Drinkers had significantly ($p<0.05$) greater preference for beverages and foods under the bitter taste modality, as well significantly ($p<0.05$) higher [VJC2] intake of energy and sodium than nondrinkers. No significant ($p>0.05$) correlations were found between bitter taste intensity and (a) PROP taster status, (b) drinker status, and (c) preference for food under the bitter taste modality. Significant ($p<0.05$) correlations were found between bitter taste intensity and the preference for (a) French fries ($r=-0.299$), (b) instant noodles ($r=-0.354$), (c) oatmeal ($r=-0.392$), (d) cauliflower ($r=-0.291$), (e) dried fish ($r=0.286$), and (f) wine ($r=-0.372$), and the (g) intake of calcium ($r=0.297$).

Conclusion: Results of the study, in general, imply that bitter taste perception is not associated to alcohol consumption, PROP taster status, and preference for the bitter taste modality. It was shown however that it can influence the intake of calcium, and the preference for certain food items, i.e., cauliflower and wine as supported by previous studies

#554 SUTEE WANGTUEAI: SUPANSA SAIWONG[1], UTOOMPORN SURAYOT [1, 2], NARONGCHAI AUTSAVAPROMPORN[3], CHARIN TACHAPAN[1], YUTHANA PHIMONSIRIPHOL[1], SANG GUAN YOU[4], HUI HONG[5], SUN YOUNG LIM[6], SUTEE WANGTUEAI[1,2*]: CHARACTERIZATION OF ANTICANCER AND ANTIOXIDANT PEPTIDES FROM SEA CUCUMBER (HOLOTHURIA SCABRA) HYDROLYSATES AND EVALUATION OF IN VITRO GASTROINTESTINAL DIGESTION EFFECTS ON THEIR BIOACTIVITIES

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Sea cucumber is a rich source of protein, which can be utilized to produce bioactive peptides with potential health benefits. This study aimed to characterize prepared sea cucumber hydrolysate containing antioxidant and anticancer activities as well as in vitro gastrointestinal digestion effect on bioactivity. Sea cucumber hydrolysate with antioxidant and anticancer properties was prepared using papain hydrolysis. The protein hydrolysate was fractionated into peptide groups of <1, 1–3, 3–10, and >10 kDa using ultrafiltration membranes. The antioxidant and anticancer properties of both crude and fractionated hydrolysates were evaluated. Among these, the 1–3 kDa fraction (SCPH III) exhibited the strongest antioxidant properties, with DPPH, ABTS, H2O2, and OH radical scavenging activities recorded at 88%, 79%, 39%, and 80%, respectively. The anticancer activities of the four fractions showed no significant differences ($P>0.05$). Therefore, the SCPH III fraction was selected for peptide characterization using LC-MS/MS with de novo sequencing. A total of 21 peptides were identified, among which three peptides demonstrated strong antioxidant and anticancer potential: Thr-Ser-Asp-Gly-Gln-Asn-Tyr-Leu-Leu-Leu-Lys, Phe-His-Val-Glu-Asp-Leu-Gln, and Phe-His-Val-Asp-Glu-Leu-Lys. The SCPH III fraction induced morphological changes and apoptosis in HepG2 cells, with 87% of the cells undergoing apoptosis. Furthermore, the SCPH III fraction was subjected to in vitro gastrointestinal digestion to assess its effects on antioxidant and anticancer properties. The results showed a slight decrease in DPPH and OH radical scavenging activities, whereas ABTS radical scavenging activity and anticancer activity increased.

Keywords: Sea cucumber, Anticancer, Antioxidant, Simulated gastrointestinal digestion, Protein hydrolysate

#391 ZINAIDA YEGOROVA, ANGELINA BUTKO, ELENA ZELENKOVA, LUDMILA OSMOLOVSKAYA: EFFECT OF FOOD ADDITIVES ON THE FORMATION OF HYDROXYMETHYLFURFURAL IN CARROT JUICE

Carrot juice is one of the main products of carrot processing. During the heat treatment of carrot juice, hydroxymethylfurfural may form, high concentrations of which are associated with negative consequences for the health of the consumer. Various studies have found that adding certain sugars and organic acids to processed fruit and vegetable products can contribute to the intensification of the formation of hydroxymethylfurfural.

The aim of this work was to establish the degree of influence of adding sucrose, glucose, ascorbic and citric acids on the formation of HMF in carrot juice.

The objects of the research were industrial samples of directly squeezed carrot juice with pulp (carbohydrate content of at least 7.0 g/100 g of product, HMF content – 5.5 mg/kg), to which sucrose, glucose (in the amount of 1.5 % and 10 % of the product weight), ascorbic acid in the amount of 0.25 g/l and 0.75 g/l and citric acid in the amount of 3 g/l were added. To ensure uniform distribution of the added components, the samples were thoroughly mixed and kept for 20 min at temperatures of 20 °C, 80 °C and 120 °C.

The concentration of hydroxymethylfurfural, pH, titratable acidity, soluble dry substances, moisture content and water activity were determined in the objects of study. Standardized testing methods were used in the studies.

It was found that the main factor influencing the rate of formation of OMF in all experimental samples was the temperature of 120 °C, although accumulation of OMF was observed at 20 °C and 80 °C. Comparing the effect of the type and concentration of added sugars in carrot juice, we did not find any significant differences. However, it was found that the addition of citric acid promotes a higher rate of formation of HMF compared to ascorbic acid.

Keywords: Carrot juice, Sugars, Organic acids, Hydroxymethylfurfural

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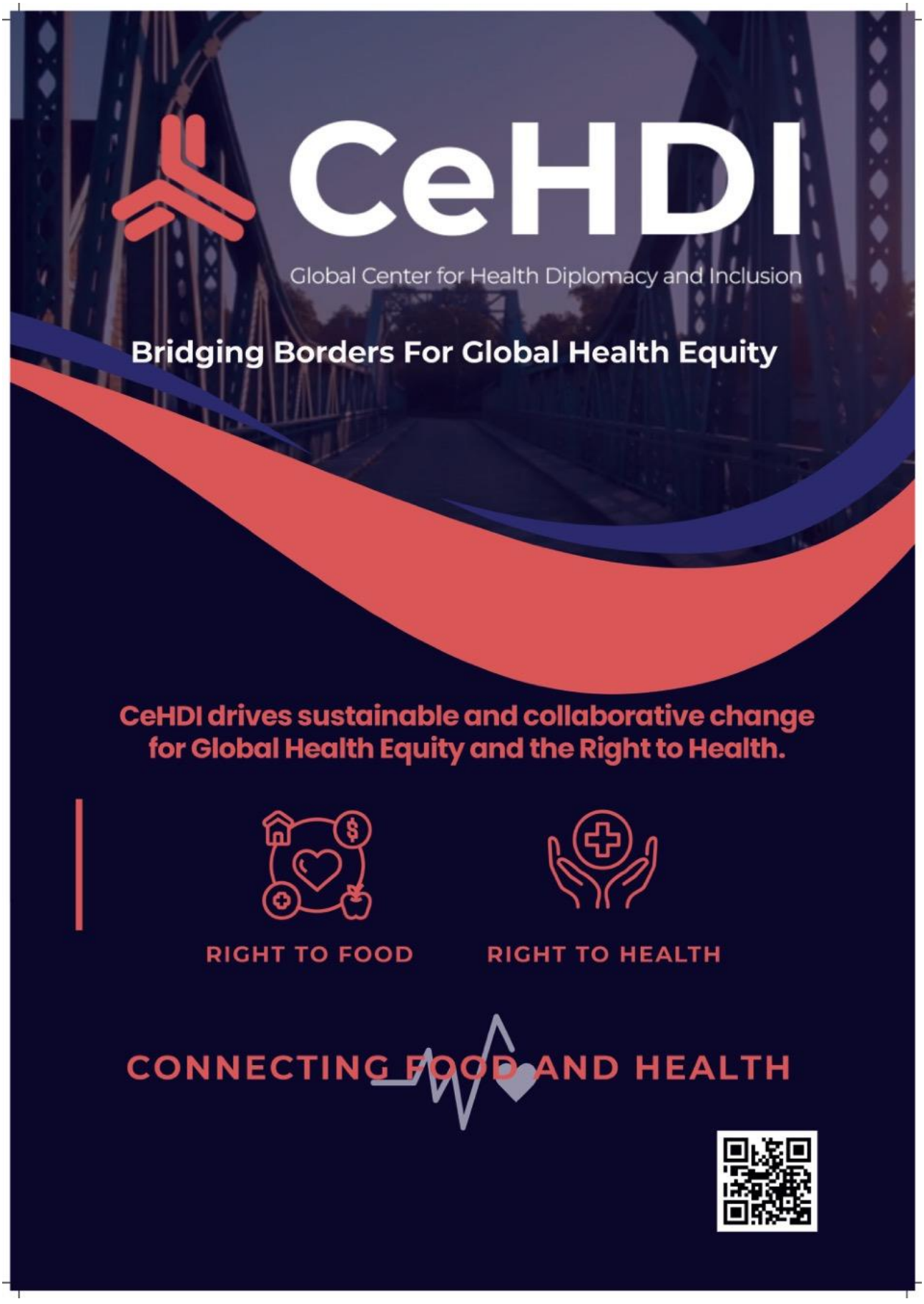
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