UNIVERSITATEA LUCIAN BLAGA DIN SIBIU

ISEKI-FOOD ASSOCIATION

FACULTY OF FOOD ENGINEERING 1990 TIMIŞOARA

6th ISEKI-FOOD E-Conference

"Food production based on food safety, sustainable development and circular economy"

Book *of* Abstracts

22 -24 NOVEMBER 2023

ONLINE

Book *of* Abstracts

SUPPORTED BY ISEKI FOOD ASSOCIATION

Main organiser: University Lucian Blaga Sibiu, Romania
Co-organiser: University of Life Sciences Mihai I Timișoara, Romania

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Publishing House
Editura Universităţii „Lucian Blaga“ din Sibiu

ISBN (online) 978-606-12-1997-1

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ISEKI-FOOD
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6th ISEKI-FOOD E-Conference

"Food production based on food safety,
sustainable development and circular economy"

DAY 1

22 november 2023

CONFERENCE OPENING

Moderator
Dr. Andreia Pinheiro-Torres (Portugal)

Welcome from ISEKI and presentation of the organization
Secretary general of ISEKI Food Association
Professor Rui Costa

Welcome message from the University "Lucian Blaga" from Sibiu, Romania
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Welcome message from the University of Life Sciences "King Mihai I" from Timişoara, Romania.
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SESSION 1

Invited Speakers

Moderators:
Prof Rui Costa, ISEKI Food Association
Prof Ovidiu Tiţa, Romania
Prof Adrian Riviş, ISEKI Food Association
Assoc. Prof. Habil. Liliana Tudoreanu, ISEKI Food Association

“Extractive fermentation of biobased compounds for food and non-food applications in the frame of bioeconomy”
Prof. Marwen Moussa
AgroParisTech, France
(Institute of Technology for Life, Food and Environmental Sciences)

"The relevance of phytonutrients for human health"
Prof. Máthé Endre
University of Debrecen, Hungary

"Basic concepts in Nanotechnologies and some applications.”
Prof. Victor Acha
Institut Polytechnique UniLaSalle, France

"Development Trends of Cold-Pressed Oils in Food and Health Research"
Ass. Prof. Milan Vukić
University of East Sarajevo, Bosnia and Herzegovina

SESSION 2

Industry Invited Speakers

Moderators:
Assoc. Prof. Cecilia Georgescu, Sibiu, Romania
Assoc. Prof. Monica Mironescu, Sibiu, Romania

Presentation of the Association of Food Industry Specialists from Romania
Professor Petru Alexe
ASIAR

Presentation of Solina Company, Romania
Dipl. Food Ing Tiberius Opruța
Dipl. Food Ing Cristina Oana Piper
Dipl. Food Ing Georgiana Iacsa
Solina, Romania

Presentation of Scandia Food company, Romania
Dipl. Food Ing. Oana Maria Popa
Scandia Food, Romania

Presentation of the Annabella Can Factory Râureni SA, Romania
Dipl. Food Ing Sandra Jianu
Dipl. Food Ing Dan Arjocan
Annabella Fabrica de Conserve Râureni SA, Romania

SESSION 3

Short Oral Presentations

Moderators
Prof Nicoleta Gabriela Hădărugă, Timisoara, Romania
Lecturer Olga Draghici, Sibiu, Romania

SHORT ORAL RESENTATIONS OF POSTERS
ALL POSTER PRESENTERS WERE ALSO PRESENT IN THEIR DEDICATED ZOOM BREAKOUT ROOMS

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

THE EFFECTS OF *FETEASCĂ NEAGRĂ* WINE ON THE RIPENING PROCESS OF THE CHEESE

Moga Valentina Madalina; Tița Mihaela; Tița Ovidiu

„Lucian Blaga" University of Sibiu, Sibiu, Romania

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Short oral and poster presentation author: Moga Valentina Madalina

The ripening process of cheeses is the main key in obtaining quality products. In this research, we set out to obtain an assortment of cheese, the ripening process of which should be carried out in *Fetească Neagră* red wine. *Feteasca Neagră* is an old autochthonous grape variety from Romania. The obtained wine has an aroma of berries, cherries, prunes and is slightly spiced, reminiscent of cinnamon, pepper, allspice or vanilla. The ripening of cheeses is a complex process in which physico-chemical, biochemical and microbiological transformations take place, and by ripening the cheese in *Fetească Neagra* red wine, we want to obtain an assortment of cheese that enjoys the color and the bouquet of aromas that the wine imparts to the cheese. In order to carry out this study, the fresh cheese, after salting, was placed in *Fetească Neagră*

red wine for maturation (9 and 11 days), also part of the cheese was kept as such under normal maturation conditions. To carry out a comparative study, the 3 types of cheese obtained were analysed on the 7th day of storage and on the 14th day from the point of view of sensory and physico-chemical qualities (chloride content, dry matter, acidity). The sensory analysis was performed by a group of 5 tasters who evaluated the aroma, color, consistency and texture and taste of the products.

Keywords: ripening process, cheese, *Fetească Neagra* wine, Romanian wine

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

COMPARATIVE STUDY REGARDING ANTIOXIDANT ACTIVITY OF LEAVES AND FRUITS EXTRACTS OF SOME FOREST BERRY PLANTS

Corina Nicoleta Predescu; Georgeta Ştefan; Gheorghe Valentin Goran; Emanuela Badea; Petronela Mihaela Roșu; Camelia Papuc

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Short oral and poster presentation author: Corina Nicoleta Predescu

The most commonly used parts of berry plants are the fruits. Usually, the leaves are neglected and often wither and are left to fertilize the soil. They are rarely used as animal feed. The aim of this research is to compare the polyphenol concentrations and antioxidant activity of fruits and leaves of *Rubus fruticosus L., Sambucus nigra L., Vaccinium myrtillus L., Ribes nigrum L., and Aronia melanocarpa*. The vegetal matrices were collected, checked for integrity, and used fresh for hydroethanolic extract preparation. The extracts were used for polyphenols content determination using the Folin Ciocâlteu method, and antioxidant activity using 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging assay. Total polyphenol contents (TPC) were expressed as mg Acid Galic Equivalents per 100 g of fresh weight (mg GAE/100 g FW).

Total antioxidant activity (TAA) was expressed as mg Trolox Equivalents per 100 g of fresh weight (mg TE/100 g FW). The results showed that both fruits and leaves have important concentrations of polyphenols (78 – 412 mg/100 g for fruits; 196-532 mg/100 g for leaves). The antioxidant activity of the berry fruits ranged from 74.77 to 614.18 mg TE/100 g FW.
On the other hand, the antioxidant activity of the five tested berry plant leaves varied between 276.92 and 883.53 mg TE/100 g FW. Fruits and leaves of both blueberry and aronia presented the highest antioxidant activity and the largest phenolic content, whereas most fruits had a moderate TE value compared to leaf extracts. In conclusion, the results of the study showed that fruit polyphenol content was strongly correlated with antioxidant properties, and the highest concentration of polyphenols was presented by leaves.

Acknowledgment: This work was supported by the Romanian UEFISCDI project PN-III-P2-2.1-PED2021-2001, no. 631PED/2022.

Keywords: *Rubus fruticosus L., Sambucus nigra L., Vaccinium myrtillus L., Ribes nigrum L.,* and *Aronia melanocarpa*, animal feed

TOPIC: HEALTH AND NUTRITION

ANTIOXIDANT CAPACITY AND TEXTURAL PARAMETERS VARIATION IN ARONIA MELANOCARPA FRUITS

Laura Pop(Carpescu)[1,2]; Corina Nicoleta Predescu[1,3]; Adrian Asănică [1,4]; Stelica Cristea[1,5]; Dana Tăpăloagă[1,2]; Alberto A.E. Ciobanu[1,2]; Liliana Tudoreanu[1,2]

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Aronia melanocarpa fruits are a bioactive-rich functional food that have been linked to a variety of health benefits, including antioxidant, antiviral, and anti-inflammatory properties. With a high content of anthocyanins, proanthocyanidins, flavonols and phenolic acids, aronia consumption has the potential of lowering the risk of some non-communicable diseases like
diabetes or metabolic syndrome.
The main objective of this paper is to determine how the harvest date impacts the antioxidant capacity of *Aronia melanocarpa* berries and their textural parameters. A total of 12 samples of Aronia berries have been harvested twice per week during the month of August and first half of September.
The following parameters have been measured: the total polyphenol content (TPC) was measured using a modified Folin-Ciocalteu method; the total flavonoid content (TPC) was evaluated by spectrophotometric method; the total antocyanin content (TA) was determined by pH differential method; the total antioxidant capacity (TAC) was evaluated using 1,1-diphenyl-2-picrylhydrazyl (DPPH•); a spectrophotometric method was used to estimate the ferric reducing antioxidant power (FRAP). Maximum extrudation force and energy were measured using a Kramer shear cell on Lloyd Instruments TA Plus Texture Analyzer.
TPC increased by 35.24% by the end of August compared to the first harvest date and decreased in mid-September by 29.4% compared with the end of august (peak date).TFC peak increase was in mid-August (36.24%) compared to the first day of harvest and decreased by 24.61% in mid-September. TAC had the highest value (41,58 mmol TE/100g) at the end of August. The maximum extrudation shear force was significantly lower at the beginning of September (402,8 N) compared to the harvest start time (515.8 N).

Keywords: aronia, antioxidants, polyphenols, flavonoids, anthocyanins, textural parameters

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

PREPARATION AND CHARACTERIZATION OF HEMOGLOBIN MICROENCAPSULES USING IONIC GELATION METHOD

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Fortifying products with heme iron (hemoglobin) is an attempt that has been made to reduce the incidence of iron deficiency anemia in the population, adding chocolate and sweeteners to mask its sensory aspects. It is known that microencapsulation techniques can protect and stabilize hemoglobin obtained from slaughters, as to improve its bioavailability. The aim of this research was to obtain and characterize hemoglobin microcapsules suitable for fortifying foods. The solubility of microencapsulates was preliminarily evaluated for the spray-drying (SD, with maltodextrin) and ionic gelation (IG, with alginate) methods, where SD's solubility was higher than IG's (71.5% and <1.0%, at room temperature respectively), and had faster color release and medium's pH modification. Given the imperceptible variations obtained by the IG method (Jeong et. al., 2020), it was used for the treatments of porcine hemoglobin (HbP), bovine (HbB) and encapsulant only (HbN), HbN was used to take into account changes by the calcium alginate formed. The characterization of the microcapsules was compared by total iron content, size, color and sphericity. Additionally, microencapsules's safety was evaluated according to ICSMF (2000) and FDA methodologies (*mesophilous aerobes*, *coliforms, Bacillus cereus, Clostridium perfringens* and *Salmonella* sp). The size of the HbB microcapsules (826.981μm) was significantly smaller than HbP (889.957μm) due to its greater solubility in the cross-linking solution during encapsulation.
The iron content, color and sphericity between both hemoglobins were not significantly different ($p<0.05$). The microbiological quality of the microcapsules was within the criteria established by R.M. 591-2008/MINSA (Peruvian law), being suitable for human consumption. In conclusion, with both hemoglobins can be

obtained safe microcapsules, spherical, black in color and with high iron content (HbB: 237.1 and HbP: 249.4 mg Fe/100g sample; AOAC 944.02, 1990) suitable for the fortification of products without causing alterations due to hemoglobin solubility.

Keywords: Ionic gelation, Bovine hemoglobin, Porcine hemoglobin

SESSION 3

Virtual Poster Sessions

Introduction to the poster session
Prof Nicoleta Gabriela Hădărugă, Timişoara, Romania

THE VIRTUAL POSTER ROOM WAS HELD IN ZOOM
ALL POSTER PRESENTERS WERE PRESENT IN THEIR DEDICATED ZOOM BREAKOUT ROOMS

TOPIC: BIOPROCESSING AND BIO-REFINING FOR THE CONVERSION OF FOOD WASTE AND BY-PRODUCTS INTO VALUE-ADDED FOODS

USE OF AGUAJE (*MAURITIA FLEXUOSA*) PEEL FLOUR IN COOKIES

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Aguaje is one of the most consumed fruits in the Peruvian Amazon, mainly in the preparation of ice creams. One of the residues is the shell, which has sensory characteristics mainly of hardness. The main objective of this work was to

evaluate the effect of temperature and particle size in obtaining aguaje shell flour, and its application in cookies, in order to take advantage of this residue. The aguaje shell was separated, dried, ground, and roasted at different temperatures (120, 130, and 140°C), and then pulverized. The total polyphenol content of the ground and pulverized flours was measured. The flour with the highest polyphenol content was characterized in crude fiber and dietary fiber and selected to make cookies. These cookies were made with four levels of substitution (8, 10, 15 and 20%) and were evaluated for general acceptability by a semi-trained panel. Likewise, the compressive strength was measured instrumentally. The flour with the highest polyphenol content was toasted at 120°C and pulverized, and in the preparation of cookies it was possible to replace up to 15% with a good acceptability on average and an appropriate hardness. In conclusion, it can be affirmed that the lower roasting temperature and the reduction in particle size (pulverization) improve the extraction of polyphenols in the process of obtaining aguaje shell flour, with a high fiber content and that can be applied in biscuits with an acceptable sensory acceptance.

Keywords: *Mauritia flexuosa*, dietary fiber, total polyphenols, aguaje byproducts

TOPIC: BIOPROCESSING AND BIO-REFINING FOR THE CONVERSION OF FOOD WASTE AND BY-PRODUCTS INTO VALUE-ADDED FOODS

THE CHARACTERISTIC OF BY-PRODUCT OF BEER PRODUCTION AND THEIR USES

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Modern food science and technology aim to valorise food industry by-products for the production of chemicals, raw materials, and other value-added compounds (Helkar, Sahoo & Patil, 2016). Waste generated during manufacture of

beer is hot trub. Hot trub is the second solid residue generated in the brewing process during wort boiling, which results predominantly from insoluble coagulation of mainly high molecular weight proteins. According other researches, hot trub contains protein 50-70%, hops bitter substances non isomerized 10-20%, polyphenols 5-10%, carbohydrates 4-8%, of which pectins, glucans and starch, minerals 3-5% and fatty acids 1-2% (Mathias et.at., 2014).
The objective of the study was determined chemical composition, including amino acids of hot trub of randomly chosen breweries.
Materials – hot trub were collected from four randomly selected breweries with different sediment separation technology, named T, V, C and Z. The chemical analyses of by-products of beer producing for protein, fat, microelements Mg, K, P, total phenolic compounds and β-glucans were carried out at the Laboratory of Cereal Technology and Agricultural Chemistry of the Institute of Agricultural Resources and Economics.
Content of protein range from 14.54% in Sample T to 33.27% in Sample C1 that is lower than reported in literature sources – 50-70% (Mathias et.al., 2014). Content of fat range from 1.33% in Sample T to 4.77% in Sample Z. Fat and protein content of hot trub was significantly differed among breweries. But content of β–glucans are similar in all breweries, from 0.20 g/100g (sample Z) to 0.51 g/100g (sample C1). Significant differences between samples causes by different sediment separation technology. Hot trub can be used in animal feeding or as food additive according to beneficial composition, relatively high fiber content, and mostly the presence of proteins.

Keywords: beer by-product, hot trub

TOPIC: DEVELOPMENT OF SUSTAINABLE BUSINESS MODELS IN THE FOOD SECTOR

HOSPITAL FOOD WASTE ASSESSMENT: A CASE STUDY

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Food waste economically and environmentally impacts every industry including healthcare systems. Food, however, is a major waste stream component produced every day by patients, healthcare workers, and visitors. The association between waste/loss and need represents a major social and environmental problem. This case study was conducted in a catering unit in a general hospital from the north of Portugal aiming at monitoring its waste and classify according to the type of served meals, namely breakfast, lunch, snack, dinner, and supper. Meals are distributed to patients admitted to the hospital unit, as well as external customers (canteen). Methods included recording and subsequent evaluation of the waste in the different types of meals and monitorization quantities in a digital platform. Daily records were carried out over a complete week (5 days) per meal type, by weighing the quantities of produced food, as follows: before preparation, final product, distribution and consumption. Weight of food served to patients and that returned after the meal allowed to estimate the plate waste for each average meal. Results revealed that intermediate meals (supper) represent a high amount of waste, largely associated with beverages, barley and tea, with wastes of around 70% and 47%, respectively, wasted mainly before distribution. The components of main meals with highest waste production were soap and soft or thickened liquids diets, that represents a final waste of more than 50% in liquid diets, especially during the dinner meal. These results can help to point out some preliminary measures for food waste combat, such as to produce barley and tea in more accurate quantities promoting personal training and having that it is necessary to estimate an adequate daily production. Regarding the consumption of liquid and puree diets, a more personalized follow-up is suggested, where it is possible to estimate the amounts consumed.

Keywords: Waste reduction, Hospital, Meal delivery

TOPIC: CONSUMER PERCEPTION AND MARKET NEEDS

FEEDING THE FUTURE: EXPLORING INSECTS AS NOVEL PROTEINS IN ANIMAL FEED

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The escalating global demand for animal feed has spurred concerns regarding the sustainability and ecological ramifications of conventional protein sources. In response to these challenges, insects have emerged as a promising alternative protein source for animal nutrition, a subject extensively explored in recent studies Current research are primarily centered on two well-studied insect species: *Hermetia illucens* (commonly known as the black soldier fly) and mealworm larvae, both of which have showcased immense potential as reservoirs of protein and vital nutrients for animals.

A salient advantage of incorporating insects into animal diets is their remarkable nutritional content. Insects are inherently rich in protein, boasting essential amino acids and vital minerals, making them a fitting substitute for conventional protein sources such as soybean meal and fishmeal. Additionally, the amino acid profile of insects aligns favourably with the requirements for optimal animal growth and development.

Furthermore, insects can be reared efficiently using organic waste materials, including agricultural by-products. This practice not only curtails the environmental footprint associated with waste disposal but also aligns with the principles of a circular economy by converting waste into invaluable protein resources. Insects exhibit superior feed conversion efficiency, surpassing traditional livestock in the transformation of feed into body mass, rendering them an environmentally sound and resource-efficient choice for animal feed production.

The review delves into the potential stumbling blocks and opportunities linked to insect-based feed. These challenges span regulatory complexities, consumer acceptance hurdles, and the imperative for further investigation into the safety and quality of insect-derived feed. Nonetheless, the study underscores that meticulous processing and rigorous quality control measures can ensure the safety and viability of insect-based feed for animal nutrition.
In summation, current research underscores the transformative potential of insects as a sustainable and nourishing protein source for animal feed.

Keywords: Insect-based feed, alternative protein sources, animal nutrition, sustainable agriculture, environmental impact

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

BIGEL FORMULATIONS AS HEALTHIER FAT ALTERNATIVES IN SEMI-DRY SAUSAGES

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Semi-dry sausages are popular meat products manufactured from minced meat and pork backfat. They have characteristic organoleptic properties, with small, visible and distinct fat particles entrapped in a meat protein matrix. Pork backfat plays a significant role in the processing and quality characteristics of semi-dry meat products. However, the consumption of large amounts of saturated fat increases the risk of some diseases. Therefore, fat replacement is a challenge for the meat industry. Bigels can be utilized as a novel fat alternative. Bigel systems are composed of two phases, a hydrogel and an oleogel, exhibiting better physicochemical characteristics than each gel alone, and being capable of resembling animal fat.

The objective of the study was to evaluate the effects of the partial substitution of pork backfat by bigels on the physicochemical and microbiological characteristics of semi-dry sausages. Bigels were prepared by mixing olive oil – monoglycerides oleogels with hydrogels structured with either 2% w/w κ-carrageenan (K) or 2% w/w κ-carrageenan plus 4% w/w gelatin (G). Three sausage treatments were prepared: a control with 20% pork backfat and two treatments with 50% substitution of backfat with K and G bigels. Microbial counts, physicochemical and nutritional characteristics of the different treatments were evaluated. The substitution of pork backfat by bigels resulted in increased weight loss, moisture content and water activity of the substituted products. The microbial counts did not show significant differences among the different treatments. Sausages formulated with bigels exhibited a reduction in energy (20%), fat (27%), saturated fatty acids (30%) and cholesterol (~6%) content. Sensory evaluation did not identify differences between control and K treatments.
The results support that bigels can be utilized for the formulation of healthier meat products with acceptable microbiological, physicochemical, and organoleptic characteristics.
The research work was supported by Hellenic Foundation for Research and Innovation (Project Number:3601).

Keywords: Bigels, fat alternative, oleogels, semi-dry sausages

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

MICROSTRUCTURE AND PHYSICAL PROPERTIES OF BIGELS FORMED WITH AGAR, K-CARRAGEENAN, CANDELILLA WAX AND MONOGLYCERIDES IN DIFFERENT EDIBLE OILS

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Bigels consist of two gelled phases, namely oleogel and hydrogel, creating a biphasic system, which can be used as alternative structured fat in foods, reducing the negative effects of consuming saturated and trans fats. The objective of the study was to investigate the physicochemical properties of bigels structured with agar and κ-carrageenan in the hydrogel phase and candelilla wax (CDW) and monoglycerides (MGs) in the oleogel phase. Varying concentrations of structurants and different edible oils were evaluated as fat replacements in vegan products. Initially, hydrogels were structured using 2% w/w agar and 0%, 0.5% or 1% w/w κ-carrageenan. Subsequently, oleogels were structured using i) 15%w/w MGs, ii) 15% w/w CDW, or iii) 7.5% MGs and 7.5% CDW in olive, sunflower, sesame and soybean oils. To create bigels, the aforementioned phases were mixed in a ratio of oleogel to hydrogel 20/80. The resulting bigels were assessed based on optical microscopy, texture analysis and Fourier-transform infrared spectroscopy. The results showed that increasing the κ-carrageenan concentration in the hydrogel, increased the hardness of the resulting bigel. Microscopy showed that at higher κ-carrageenan concentrations, the average oil droplet size in the bigels increased. Furthermore, an increase in MGs concentration in the oleogel phase led to larger oil droplets in the bigel, while the bigel's hardness decreased. Regarding the use of different oils, olive oil created harder bigels and no statistically significant differences were observed in terms of other textural parameters and microstructure. These results indicate that the composition of the hydrogel and oleogel phase significantly affected the microstructural and the mechanical characteristics of the resulting bigels. The formed bigels were self-stable and could be utilized as fat substitutes in a plethora of foods, including vegan products.
Acknowledgement: The research work was supported by the Hellenic Foundation for Research and Innovation H.F.R.I. Project Number 3601.

Keywords: bigels, candelilla wax, monoglycerides, agar, edible oils

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

DEVELOPMENT OF DIFFERENT STRUCTURED FOOD-GRADE DOUBLE EMULSIONS WITH *L. PLANTARUM*

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Probiotics are live active cultures that improve the balance of the gut microbiota composition to specific effects, in particular, the immunomodulatory potential of clearly defined strains [1]. However, probiotics are sensitive to acidic environments, gastrointestinal enzymes, and high temperatures. To ensure successful probiotics release and survive in human mucosal environment, the major challenge in their encapsulation is to choose the right coating materials and sufficient formation method. To address this challenge, we investigated differently structured food-grade water-in-oil-in-water (W/O/W) emulsions (gelled external water phase with whey protein isolate and calcium chloride, gelled oil phase with carnauba wax and combination of both) that can serve as a vehicle for the delivery of *L. Plantarum* bacteria. Physical and microbiological stability of the W/O/W emulsions loaded with *L. Plantarum* during storage at +4°C for 2 months were examined. Rheological shear sweep and frequency sweep tests indicated that structured W/O/W emulsions loaded with *L. Plantarum* cells demonstrated gel-like (G` > G`` throughout the entire frequency range) and non-Newtonian shear thinning behaviour during the entire storage time. As for the microbiological properties, encapsulated *L. Plantarum* cells were viable for 56 days and their total count varied between 106.5-108 CFU/g. Stability determined by the centrifugation method revealed that W/O/W emulsions with a structured oil phase were more stable (above 95%) than emulsions with a structured external aqueous phase (90-95%). pH indicated that all emulsions were slightly acidic (6.2-6.6) and during the storage time it was quite stable. To sum up, structured W/O/W emulsions were well-applied for *L. Plantarum* encapsulation and characteristics were strongly affected by the type of structural materials and formation method.

1. Isolauri E, Salminen S, Ouwehand AC (2004) Probiotics. Best Pract Res Clin Gastroenterol 18:299–313. https://doi.org/10.1016/j.bpg.2003.10.006

Keywords: double emulsions, probiotics, rheology, encapsulation

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

EFFECT OF MIXTURE COMPOSITION OF HONEY AND OAT BASED COCOA POWDERS ON POLYPHENOL BIOAVAILABILITY

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Introduction: Cocoa is a rich source of bioactive compounds, mostly polyphenols, with high antioxidant and anti-inflammatory effects and various health benefits. Honey is also used for medical purposes, as an anti-inflammatory, antioxidant and antibacterial agent, in addition to its use as a natural sweetener, while oat is one of the healthiest cereals as an excellent source of nutrients. In this work honey and oat based cocoa powders containing different ratios of honey/oat (60/40, 50/50 and 40/60) were produced and the effect of mixture composition on bioavailability was analysed.
Materials and methods: Three cocoa powders containing 7.5 grams of cacao and 60%, 50% and 40% of honey were produced by drying at 70˚C.The bioavailability of the produced mixtures was determined immediately after drying and after 6 months of storage, by simulating in vitro conditions of the digestive system (mouth, stomach and intestines). Total polyphenols (TPC) and antioxidant activity by DPPH and FRAP method were analysed.
Results: For extracts prepared immediately after drying, the highest value of TPC and correspondingly the highest antioxidant activity by DPPH and FRAP method

was measured for sample with the lowest amount of honey and the highest amount of oat. The same trend was noticed for extracts prepared after 6 months of storage. Results also showed that for all analysed extracts, increase in TPC as well as antioxidant activity by DPPH and FRAP method can be noticed after each step of in vitro digestion This can be explained by changes in pH resulting in bioactive molecule release form its natural matrix.
Conclusions: The obtained results show that, higher amount of oat has a positive effect on bioavailability and that the bioavailability does not change with increased storage time of the mixtures.

Keywords: honey, cocoa powder, oat, bioavailability

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

INNOVATIVE APPROACHES TO PERSIMMON BALSAMIC VINEGAR PRODUCTION: IMMOBILIZED VS. FREE YEAST CELLS IN CONCENTRATED PERSIMMON JUICE FERMENTATION

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The new generation of balsamic vinegars (BVs), traded worldwide the last decade, benefit from technological advances in their production line and the use of starting materials other than grapes. As a part of our ongoing effort to develop high quality new generation BVs by implementing principles adopted in the Traditional Balsamic Vinegar (PDO) production, we focused on the alcoholic fermentation of the concentrated persimmon juice (CPJ) for BV production. CPJ is a challenging substrate to ferment due to its high sugar content, low pH value and the presence of furanic derivatives which counteract yeast survival and growth. The use of immobilized cells (IC) can offer a solution considering their

numerous advantages such as protection against stress factors (e.g. toxic compounds) that delay the fermentation onset, easier product separation, biocatalyst reuse, high cell density and volumetric yield. In the present study, the effectiveness of immobilized yeast cells was evaluated comparatively to that of free cells in terms of yeast survival, fermentation efficiency and physicochemical characteristics of the final alcoholic product. To achieve this, CPJ was fermented by mixed cultures of indigenous osmophilic yeasts from the collection of the LCFT as free cells or after immobilization of the single strain on sodium alginate beads. The CPJ demonstrated a satisfying fermentation potential resulting in an alcoholic product with desired levels of sugars (150 g/Kg), alcohol (63 g/kg) and total acidity (0.83% w/v). The IC were successfully reused at least 2 consecutive times in successive fermentations confirming the robustness of the fermentative capacity of the cells and the immobilization vector. Though the fermentation time was halved by the reused IC, the process efficiency was significantly reduced, and the characteristics of the alcoholic product were adversely affected, mainly the concentration of sugars (105 g/kg) highlighting the need for further optimization.

Keywords: persimmon, balsamic vinegar, immobilization, alcoholic fermentation

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

DEVELOPMENT OF A CREAM CHEESE PRODUCT WITH YOGURT: CORRELATION BETWEEN SENSORY AND INSTRUMENTAL RESULTS

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The aim of this work was to examine the possibility of making a cream cheese product using yogurt as the main raw material, and to study its properties. For this, eighteen different samples of cream cheese product were prepared using

traditional Greek yogurts (6 with cow's, 6 with sheep's and 6 with goat's yogurt). Butter (10 or 20%), whey protein concentrate (0, 5 or 10%), salt (1%) and xanthan gum (0.8%) were added to the samples. Sensory properties, rated by 57 panellists on 16-point scales, were color intensity, sour taste, consistency and spreadability. Properties determined by instrumental methods in triplicate were brightness (HunterLab Colorimeter), pH value (Hanna Instruments pH meter), hardness and compression work (TA.XTPlus Texture Analyzer). All 18 samples were stable spreadable emulsions with a pleasant cream cheese texture and flavor. Nevertheless, among the three categories of samples, the panellists preferred the samples with goat yogurt the most, and the ones with cow yogurt the least. High correlations were obtained between color intensity and brightness (r=-0,93), sour taste and pH value (r=-0,91), consistency and hardness (r=0,93), and spreadability and compression work (r=-0,91). Therefore, the corresponding regression equations can be statistically significant psychophysical relationships. In conclusion, the research showed the feasibility of developing a wide variety of innovative cream cheese products with yogurt as the main raw material, as well as the possibility of predicting selected sensory properties from related instrumental properties.

Keywords: Cheese cream, yogurt, sensory assessment, instrumental measurements

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

ORIGANUM VULGARE ESSENTIAL OIL IN BROILER NUTRITION: A REVIEW OF PERFORMANCE-BOOSTING EFFECTS

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Oregano essential oil (*Origanum vulgare*) has garnered considerable attention as a potential antibiotic alternative in broiler nutrition due to its remarkable performance-enhancing effects. This paper presents a comprehensive review of the extant literature, delving into the utilization of oregano oil in broiler nutrition and its profound influence on broiler performance. The review encompasses studies investigating the ramifications of oregano oil on growth performance, antioxidant status, and intestinal health in broilers.
The amassed evidence collectively suggests that oregano oil supplementation within broiler diets can substantially enhance growth performance, encompassing increased body weight gain and feed conversion efficiency. Additionally, oregano oil exhibits antioxidant properties that can significantly contribute to the overall health and well-being of broilers. Furthermore, this natural additive exhibit beneficial effects on intestinal health, including the reduction in the incidence of intestinal diseases and the fortification of gut integrity.
Comparative analyses have been undertaken to assess the efficacy of oregano oil compared with conventional antibiotics. These comparative studies have demonstrated that oregano oil can be just as effective as antibiotics in promoting broiler performance, while circumventing potential adverse effects associated with antibiotic usage, notably antimicrobial resistance.
In sum, the utilization of oregano oil in broiler nutrition presents a promising avenue as a natural and sustainable substitute for antibiotics. Nonetheless, further research is imperative to optimize dosage regimens and elucidate the long-term consequences of oregano oil supplementation. The insights gleaned from this review contribute substantively to the burgeoning body of knowledge surrounding oregano oil's application in broiler nutrition, offering valuable guidance to poultry producers seeking to bolster broiler performance while diminishing resistance on antibiotics.

Keywords: essential oils, meat production, nutrition, natural alternatives

TOPIC: FOOD SAFETY & RISK ASSESSMENT

NON-THERMAL TECHNOLOGIES FOR THE INACTIVATION OF EMERGING VIRAL, BACTERIAL AND PROTOZOAN PATHOGENS ON FRUIT AND VEGETABLE PRODUCTS - TECH4PATH

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Foodborne diseases have long represented a considerable burden to public health and continue to challenge health systems worldwide. Besides the traditional food borne hazards, safety of the food chain is facing new and unprecedented challenges, for emerging pathogens that have been underdiagnosed and underreported so far. The TECH4PATH project is principally aimed to study, optimize and create basic protocols for the application of 2 non-thermal technologies (cold plasma-CP and High Hydrostatic Pressure-HHP) as strategies for the decontamination of emerging pathogens of fruit and vegetable food products (FVPs). *E. coli* has been chosen as reference bacterium, while *Cronobacter* and *Arcobacter* spp. will be considered as emerging pathogens. Moreover, as emerging safety hazards, the protozoan parasites *Giardia intestinalis* and *Cryptosporidium* spp. and the foodborne viruses *Norovirus* and *Hepatitis A* (HAV) will also be considered. Beside the decontamination efficacy, effects of the tested technologies will be evaluated on the quality and nutritional aspects of FVPs in order to ensure safe, healthy and high-quality products; the overall

environmental impact will be also assessed. Information gained by this project will be useful in assessing the potentialities of non-thermal technologies for this purpose, representing a good opportunity for extending their use beside the microbial decontamination and fostering their adoption in the food supply chain as suggested by SDG 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". Potential applications of TECH4PATH are also related to support robust food safety regulatory frameworks, in providing information about possible strategies for preventing food-borne diseases caused by new and emerging food safety risks.
The project "TECH4PATH - Non-thermal TECHnologies FOR the inactivation of emerging viral, bacterial and protozoan PATHogens on fruit and vegetable products" is founded by MUR - Ministero dell'Università e della Ricerca - PRIN: Progetti di Ricerca di Rilevante Interesse Nazionale, Bando 2022.

Keywords: High Hydrostatic Pressure, Cold Plasma, decontamination, nutritional quality, Environmental assessment

TOPIC: FOOD SAFETY & RISK ASSESSMENT

EU CONSUMERS' POSITIONING ON ORGANIC FOOD, EU FOOD IMPORTS, COMMON AGRICULTURAL POLICY, AND USE OF ANTIBIOTICS TO TREAT LIVESTOCK IN RELATION TO THEIR KNOWLEDGE ABOUT THE EU BAN ON ANTIBIOTICS AS GROWTH PROMOTERS IN LIVESTOCK

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Food safety regulation compliance is intended to be the cornerstone of a relationship of trust between food stakeholders and consumers. Unfortunately, the food safety history is full of food-borne health issues arising from

microorganisms and toxins, and the globalization of information allows the quick spread of emerging problems. Apart from the usual suspects (*Salmonella, Escherichia coli, Campylobacter, Listeria monocytogenis*, and others), new challenges are continuously appearing; Examples are BSE, the Nile virus and monkey-pox, and even in relation to COVID-19 the WHO suggests its origin from bats in a wet food market in Wuhan, China. Other situations arise from the adulteration of products and the olive oil scandal or the melamine scandal of infant powder milk The aim of this study was to establish a relationship between the EU consumers' awareness of the ban on antibiotic use as growths promoters in animal production, and their positioning about organic food, EU imports of food, antibiotic use to treat sick farm animals, and the objective of the Common Agricultural Policy of promoting the of production of safe, healthy and sustainable food of high quality. Using a survey containing n = 26502 interviews with EU citizens a multi-variable logistic model was successfully fitted ($p < 0.001$), allowing the following conclusion. EU citizens aware of the antibiotic ban for growth promotion in food animals are more sceptical in relation to the use of antibiotics to treat sick farm animals; are more aware of the limitation in the use of agrochemicals including antibiotics in organic food; are more in agreement with limiting the imports into the EU of food originated in third countries to products complying with EU food standards; and are more in agreement that the Common Agricultural Policy is fulfilling its role of providing safe, healthy and sustainable food of high quality.

Keywords: antibiotic resistance, Common Agricultural Policy, European food standards, food safety, growth promoters, international food trade

TOPIC: FOOD SAFETY & RISK ASSESSMENT

EU CITIZENS' PERCEPTION OF FOOD SECURITY RISKS IN RELATION TO THE CLIMATIC CHANGE

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With the aim of understanding the EU citizens' perception of the risks posed to food security in the EU in relation to climate change, data retrieved from the European Eurobarometer 97.1 survey conducted between February 21 and March 22, 2022, and containing n = 26502 interviews with European citizens from all 27 EU countries was used. As dependent variable, the sentence 'Extreme weather events (severe droughts, floods, etc…) and climate change' was used to answer the question 'What do you think are the most important risks to food security in the EU?' This answer was the most common among the interviewees (14263 picks). As independent variables, several demographic, political, and socio-economic variables were used. A multivariable logistic regression was adjusted via the PLUM routine of the statistical package IBM Corp.® SPSS® Statistics. It was found that the probability of this option being chosen by an EU citizen tends to: increase if this citizen is a man; increase with the age of the individual; increase as the education level tends to be higher; decrease as the political positioning of the individual tends to the right; decrease as the community of the individual tends to be larger; decrease as the social class tends to be higher; increase as the economic status tends to be wealthier; decrease as the individual tends to think the EU moving in the right direction; decrease in individuals tending to think the EU as a more negative image. Women are more attached to nature and evolved as carers. More educated and older individuals are more concerned about this issue. Individuals with more conservative political tendencies, and also associated with higher social classes, have shown to be less concerned with climate change. More optimistic individuals also showed to be less concerned.

Keywords: food security, EU citizens, gender effects, age effects, education effects

TOPIC: FOOD SAFETY & RISK ASSESSMENT

ENSURING MICROBIOLOGICAL SAFETY OF FOOD PRODUCTS IN SOFT PACKAGING

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Currently in Belarus, ready-to-eat food products (vegetables, legumes, vegetable soups and solyanka) in soft packaging are becoming increasingly popular among consumers. The safety of these products is ensured by heat treatment regimes, which are aimed at destroying vegetative forms of microorganisms and their spores.
The purpose of these studies was to determine the effectiveness of heat treatment of ready-to-eat food products in soft packaging.
The object of the study were samples of vegetables (carrots, beets, potatoes), legumes (beans and chickpeas), vegetable soups and solyanka, packed in a three-layer polymer film under vacuum with a net weight of 300 and 500 g after heat treatment under industrial conditions. The lethality of the heat treatment regime (F0) and microbiological parameters in each research object were determined and, based on the results, the sterilization formula was justified. The work used generally accepted research methods.
The following results were obtained. The actual lethality of the sterilization regimes we developed for food products in soft packaging exceeded the standard by an average of 13.0%. The studied samples met the requirements of industrial sterility and had acceptable sensory properties.
The sterilization regimes we developed for food products in soft packaging were implemented at three canning enterprises.

Keywords: soft packaging, food products, microbiological safety

TOPIC: HEALTH AND NUTRITION

EVALUATION OF THE IN VITRO AND IN VIVO ANTIHYPERTENSIVE EFFECT OF PROTEIN HYDROLYSATES DERIVED FROM RED MACROALGAE

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Hypertension is considered a risk factor for coronary heart disease, and its prevalence has increased substantially. Angiotensin-converting enzyme (ACE) plays a crucial role in the regulation of blood pressure as well as cardiovascular function. Also, inhibition of its enzymatic activity mainly results in an overall antihypertensive effect, making it an excellent treatment for hypertension. Red macroalgae protein-derived bioactive peptides possess several beneficial nutraceutical and pharmacological properties; among them, the ability to act as antihypertensive agents. In this study, peptidic hydrolysates, namely SCPH and GSPH were prepared from two red macroalgae species, *Sphaerococcus coronopifolius* and *Gelidium spinosum*, respectively. Macroalgae proteins were hydrolyzed by pepsine for 2 h at 40°C and the resulting hydrolysates were investigated for ACE inhibitory activity in vitro. The antihypertensive effect in vivo of both protein hydrolysates was also investigated in spontaneously hypertensive rats (SHR) and compared to that of captopril (10 mg/mL), commercial drug used as a reference. SCPH and GSPH showed strong in vitro ACE inhibitory activity of the IC50 values of 260 and 640 µg/mL, respectively. However, both hydrolysates have moderate ACE inhibition effect in comparison with a synthetic drug captopril (69.78 µg/mL). A significant decrease in systolic blood pressure in SHR was observed following a single oral administration of both hydrolysates at a dose of 200 mg/kg of body weight. After 4 h post-administration of SCPH and

GSPH, systolic blood pressure was significantly reduced by about 21 and 17 mmHg, respectively. Interestingly, these values were similar to those measured with Captopril (21 mmHg) at the same time. These results suggest that in vitro ACE inhibitory activity and in vivo antihypertensive effect could be generated from red macroalgae protein by enzymatic hydrolysis. Thus, SCPH and GSPH would be bioactive ingredients for nutraceuticals acting against hypertension and its related diseases.

Keywords: ed macroalgae; protein hydrolysates; ACE inhibitory activity; Antihypertensive effect; Spontaneously hypertensive rats.

TOPIC: HEALTH AND NUTRITION

FABRICATION AND CHARACTERIZATION OF THE CHICKEN-FAT OLEOGELS AND BIGELS AS HEALTHIER SOLID FAT ALTERNATIVE

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Due to high percentage of unsaturated fatty acids (> 65 %), chicken fat is healthier than naturally-saturated fats or hydrogenated oils but semi-solid form at room temperature limits its application in food products. In order to overcome this problem, this study was focused on chicken fat structurisation with carnauba wax and beeswax (7.5, 10.0, 12.5 %) by developing oleogel and bigel systems. The hydrogel phase of bigels was additionally structured with gelatin (5 %) or callogen (50 %) and bigels were formulated by using different oleogel and hydrogel ratios (20:80; 30:70; 40:60; 50:50; 60:40; 70:30; 80:20). Physical and chemical stability, oil and water binding capacity, colour, rheological, thermal and textural properties were accessed.
An increased concentration of carnauba or beeswax led to a increase in stability, hardness and brightness (L*) values in oleogels. At lower tested

concentrations (7.5, 10.0 %) beeswax formed stronger gel-like networks with a higher hardness values, in comparison with carnauba wax. Regarding bigels, an increased proportion of oleogel affected increase in hardness (from 2.0-2.5 to 5.8-8.4 N), decrease in whiteness index (from 29.90-37.40 to 11.51-17.32) as well as lower elastic (G') and loss modulus (G") values. Gelatin bigels showed stronger gelling, better oil and water binding capacity as well as oxidative stability than those produced with callogen at the same oleogel: hydrogel ratios. Thus, findings indicated that chicken-fat could be potentially re-used as healthier solid fat alternative with a more favorable fatty acid profile by solidifying it in the composition of oleogel and bigel systems. However, bigel formulations had more potential to be used because of the easier modifying properties.

Keywords: oleogel; fat; chicken

TOPIC: HEALTH AND NUTRITION

PHENOLIC CHARACTERIZATION OF MEDITERRANEAN RICE VARIETIES AND DEVELOPMENT OF PREDICTIVE MODELS BY NIR AND FTIR

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Rice is a staple food for more than half of the world's population, with 90 % of the total global production originating from Asia. However, the harvested rice seeds and subsequent processed products are highly prone to adulteration due to the difficulty to differentiate rice varieties based solely on visual observation. The TRACE-RICE PRIMA Project targets the adoption of cost-effective tools and analytical techniques for the chemical characterization of Mediterranean rice varieties to ensure its traceability and authenticity. In this work high-performance liquid chromatography coupled to diode array, fluorescence, and electrochemical detector (HPLC-DAD-FLD-ECD) was used for the quantification of phenolic compounds in brown rice varieties. The obtained results were further correlated with the determination of the antioxidant activity using the ORAC assay. The insoluble phenolics fraction showed higher antioxidant activity when compared to the free soluble and conjugated soluble phenolic fractions. In addition, Near Infrared (NIR) and Fourier Transform Infrared Spectroscopy (FTIR) were used as a fast-screening methodology to develop predictive models of parameters related to rice quality and authenticity. The characterization of rice varieties and the development of predictive tools for the discrimination and selection of Mediterranean rice varieties are of utmost importance in rice breeding allowing to speedily evaluate important chemical parameters with nutritional and health impact to the consumer.
Acknowledgments: Project TRACE-RICE -Tracing rice and valorising side streams along Mediterranean blockchain, grant no. 1934, of the PRIMA Programme, supported under Horizon 2020, the European Union’s Frame-work Programme for Research and Innovation; CB and CP also acknowledge Research Unit, UIDB/04551/2020 (GREEN-IT, Bioresources for Sustainability); and PhD grant number 2020.09555BD.

Keywords: Rice, Fast screening methodologies, Chemical characterization, HPLC, Rice authenticity

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

CHARACTERIZATION OF *ROSA CANINA* LEAF EXTRACTS WITH DIFFERENT POLARITY FOR BIOACTIVE COMPOUND AND ANTIOXIDANT ACTIVITY

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Usually, Dog rose (*Rosa canina*) is part of spontaneous vegetation, it isn't cultivated like others forest berry. Leaves are rarely used for tea, frequently are vegetable waste by-products and can be used as valuable sources of cheap polyphenols. The aims of this study were to obtain extracts from Dog rose leaves in different solvents, to quantify the concentrations of some active compounds in the extracts, (like total phenolic content (TPC), chlorophyll contents, carotenoids content), and to test its antioxidant activity (AA) by beta carotene bleaching assay. Water, hydro-ethanol (60% ethanol in water), methanol, acetone and chloroform were used as extraction solvents. TPC was assayed by a colorimetric method using the Folin-Ciocâlteau reagent. The antioxidant activity (AA) was evaluated by beta carotene bleaching assay, and compared with the AA of the synthetic antioxidants BHA. The order of decreasing capacity of solvents to extract soluble phenolics was ethanol 60% > methanol > water > acetone > chloroform. The result is explained by the fact that water facilitates the breakdown of plant matrix walls, while ethanol has the ability to extract polyphenols, but small concentration of chlorophylls and less carotenoids. Temperature of 60°C, 3 h, and 1:10 ratio maximized the corelation of TPC and AA ($p<0.01$). Different type of the solvents influenced antioxidant activity, due to the different phenolic, chlorophyll and carotenoid compositions. Results showed that the investigated Rosa

canina leaf waste by-products can be used as important sources of polyphenols with antioxidant activity comparable with BHA. Ethanol-water mixture is recommended to extract maximum concentration of polyphenols compared to water alone, pure methanol, acetone and chloroform. On the other hand, carotenoids contents are highly extracted in chloroform compared to other type of extracts.
Acknowledgment: This work was supported by the Romanian UEFISCDI project PN-III-P2-2.1-PED2021-2001, no.631PED/2022.

Keywords: polyphenols, chlorophyll, β-carotene bleaching test, solvent extraction, antioxidant activity

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

THE CIRCULAR FOOD REVOLUTION: EVALUATING CONSUMER PERCEPTION AND BEHAVIOR

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The food industry is undergoing a transformative shift towards circularity, driven by environmental concerns and a need for sustainable resource management. This paper delves into the heart of this transition by evaluating consumer perception and behavior in the context of the Circular Food Revolution. Circular food systems aim to minimize waste and maximize resource efficiency, presenting a promising approach to reduce the environmental footprint of food production and consumption. This research employs a multi-method approach, combining statistical analysis on the current evolution of consumption indicators regarding circular economy and behavioral and perceptions surveys to assess consumer attitudes and actions related to circular food practices. Our findings reveal that

consumers are increasingly aware of circular food concepts and are generally receptive to such practices. The analysis uncovered key factors influencing consumer willingness to engage with circular food systems, including environmental consciousness, convenience, and cost considerations. Furthermore, this study highlights the significance of communication strategies and educational initiatives in enhancing consumer participation in circular food models. By examining the interplay between consumer perception and behavior, this paper provides valuable insights for policymakers, food industry stakeholders, and sustainability advocates seeking to promote and advance the Circular Food Revolution. Ultimately, the research underscores the potential for circular food systems to foster sustainable consumption patterns, reduce food waste, and promote environmental conservation.

ISEKI-FOOD
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"Food production based on food safety,
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DAY 2

23 november 2023

Welcome to day 2 of the conference

Prof. Ovidiu Tiţa
University Lucian Blaga from Sibiu, Romania

SESSION 4

Student Competition – Oral Presentations

Moderators
Assoc. Prof. Corina Megyesi, Timişoara, Romania
Lecturer Mariana Păcală, Sibiu, Romania

TOPIC: BIOPROCESSING AND BIO-REFINING FOR THE CONVERSION OF FOOD WASTE AND BY-PRODUCTS INTO VALUE-ADDED FOODS

SUSTAINABLE USE OF COFFEE ROASTING BY-PRODUCTS: DEVELOPMENT OF HIGH VALUE-ADDED GUMMY CANDIES

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The sustainable utilisation of by- product from agri-food industrial sector is an increasing challenge for scientific community and modern society.
The aim of this work is to enhance coffee silverskin, only by-product of coffee roasting process, by using it in the formulation of gummy candies.
Firstly, the experimental plan envisaged the extraction of bioactive compounds from coffee silverskin. The extraction was carried out by mixing coffee silverskin powder with hydroalcoholic solvent (EtOH 30%) at 60 °C with constant stirring for 60 minutes. The obtained extract was characterised for its antioxidant and microbiological characteristics. Subsequently, coffee silverskin extract was used in

the formulation of gummy candies at different concentrations (1%,2% and 4%). The control test was formulated without enrichment with extract. The influence of enrichment was evaluated on chemical, physical, microbiological, structural and sensory gummy candies characteristics up to 120 storage days at 25 °C. Statistical analysis was performed by analysis of variance (one-way ANOVA) and Tukey's comparison test.
The results obtained suggest that coffee silverskin extract, determine a beneficial effect on the chemical, physical, microbiological and sensory characteristics of the gummy candies. Higher quality, in terms of antioxidant activity and textural characteristics, was observed in candies formulated with 1% and 2% of coffee silverskin extract up to 120 days at 25 °C. In addition, at the end of storage the candies with 2% of extract were most appreciated by consumers in terms of total acceptability.
Candies enriched with compounds obtained from by-product of the coffee roasting industry could be an incentive to enhance the waste of coffee production, one of the most drunk beverages in the world and, at the same time, offer consumers a product formulated and preserved using compounds obtained respecting the environment, hoping to see a rapid transition from a linear to a circular economy.

Keywords: coffee roasting by-products, bioactive compounds, gummy candies, value-added foods, sustainable management by-products

TOPIC: BIOPROCESSING AND BIO-REFINING FOR THE CONVERSION OF FOOD WASTE AND BY-PRODUCTS INTO VALUE-ADDED FOODS

CLEMENTINE PEELS: FROM A BY-PRODUCT TO A FUNCTIONAL INGREDIENT THROUGH MICROBIAL FERMENTATION AND PULSED ELECTRIC FIELDS

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Introduction

Italy yearly produces over 120,000 tonnes of clementine by-products, rich in valuable compounds, e.g., pectin, vitamin C, fibres and polyphenols, with potential biological functions.

Aims

This study aimed to valorise organic clementine juice residues through microbial fermentation and a pulsed electric field (PEF) pre-treatment to produce a functional food ingredient.

Materials and Methods

An initial screening was performed on 28 yeast and 12 lactic acid bacteria (LAB) strains for their growth on a clementine peel medium and impact on phenolic content (TPC), antioxidant activity (AA) and volatile profile (VP). Eight strains were selected and exposed to two PEF treatments prior to the fermentation to check the combined effects on the VP, AA, vitamin C and β-carotene. The peels fermented by the best-performing strain, a *Saccharomyces cerevisiae*, were freeze-dried and added to an orange–carrot–lemon juice which was analysed for colour, sensory, vitamin C, β -carotene, AA and VP.

Results

Preliminary screening showed high variability among the strains in their growth and influence on TPC and VP. The 8 selected strains (5 yeasts and 3 LAB) exhibited good growth potential, contributing to increase TPC and AA, and enhance the product's aroma. Conversely, PEF treatments affected strains viability. Depending on the conditions, microbial growth was stimulated or sublethal damages were caused to the inoculated and indigenous microbiota. Nonetheless, inoculated strains rapidly recovered. Also higher carotenoid extraction or increased TPC over fermentation were detected suggesting a stimulation of microbial activity. The addition to the juice of the peels fermented by the best yeast resulted in an enrichment in TPC, vitamin C and β -carotene, and slightly influenced the product's bitterness without affecting its colour.

Conclusion

The proper combination of microbial fermentation and PEF treatments demonstrated to be a promising strategy to valorise clementine by-products into a functional ingredient for healthy beverages.

Keywords: clementine by-products, non-thermal technologies, microbial fermentation, bioactivities, functional food

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

BUFFALO WORM (*ALPHITOBIUS DIAPERINUS*) LARVAE POWDER AS A PROMISING ALTERNATIVE SOURCE OF NUTRIENTS FOR FOOD APPLICATIONS

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Edible insects are loaded with nutrients but are still poorly exploited and underutilized in human diets and nutrition. However, they may become a source of food in the future due to the intensely growing population and projected running out of food supplies. Edible insects are a new trend in food production in terms of their rich source of protein, fat, vitamins, minerals, and antioxidants. More than 2,000 species of insects are considered edible, and the most commonly

consumed include beetles, bees, wasps, grasshoppers, and locusts. Due to their high health-promoting potential, edible insects are considered a good substitute for protein and other nutrients. The aim of the study was to evaluate the content of amino acids, minerals, and antioxidant properties of buffalo worm (*Alphitobius diaperinus*) larvae powder as a new alternative food compound. *Alphitobius diaperinus* powder was purchased via the online market. The amino acid content was determined using the Quick Easy Cheap Effective Rugged Safe (QEChERS) and high-performance liquid chromatography (HPLC) technique. In turn, the antioxidant properties were analysed in extracts prepared using two different extraction methods (conventional and ultrasound-assisted extractions). Mineral components were measured using atomic absorption spectrometry (AAS).
The obtained results demonstrate that the powder from buffalo worm larvae has a high potential for consumption as an alternative to animal protein because of its high content of essential amino acids. The insect powder was notable for its glutamic acid content. In addition, it contained relatively high amounts of aspartate, glutamine, and lysine. Furthermore, it was a valuable source of minerals and had high antioxidant potential. Among minerals, it showed higher potassium and calcium contents. The high antioxidant activity was confirmed in extracts obtained with the use of ultrasound-assisted extraction.

Keywords: insects, buffalo worm, alternative source, nutrients

TOPIC: HEALTH AND NUTRITION

DEVELOPMENT AND CHARACTERIZATION OF A CHEESE SPREAD INCORPORATING THE NEXT GENERATION PROBIOTIC *AKKERMANSIA MUCINIPHILA*

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Akkermansia muciniphila, a commensal gut bacterium, has gained attention as a probiotic due to its significant biological benefits in various human diseases. To be used as a live biotherapeutic industry's primary challenge is to create effective delivery vectors to maintain its viability and stability during product manufacture, shelf-life, and consumption, particularly throughout the digestive system. This research focused on developing a delivery system for *A. muciniphilausing,* a dairy-based mixture consisting of 77% Portuguese whey cheese and 23% Greek-style yogurt. Subsequently, this food product was analysed for its microbiological and physicochemical properties, total phenolic content, as well as its antioxidant, antidiabetic, and antihypertensive effects. Additionally, the study assessed how well this delivery system protected *A. muciniphila* viability during 21 days of refrigerated storage at 4ºC and exposure to simulated gastrointestinal conditions. The findings indicated that the probiotic cheese spread maintained high microbiological quality, contained low total phenolic content (0.365 mg gallic acid equivalents/g dried cheese), and exhibited intriguing biological effects, such as a 98.10% inhibition of α-glucosidase (indicating potential antidiabetic benefits) and a 49.18% inhibition of angiotensin-converting enzyme (suggesting potential antihypertensive benefits). Moreover, it ensured a high level of *A. muciniphila* availability (> 108 CFU/g) during the 21-day refrigerated storage and simulated gastrointestinal conditions. Furthermore, this product displayed similar characteristics in terms of texture, color, water activity, and pH compared to the cheese control (without *A. muciniphila*), indicating potential acceptance by consumers. In conclusion, the cheese spread composed of Portuguese whey cheese and Greek-style yogurt holds promise as an effective carrier for *A. muciniphila*, safeguarding its viability against adverse conditions during refrigerated storage and the passage through the gastrointestinal tract.

Keywords: Cheese spread, *Akkermansia muciniphila*, simulated gastrointestinal conditions, viability

TOPIC: FOOD SAFETY & RISK ASSESSMENT

INNOVATIVE PROTECTION OF SEED MATERIAL AGAINST MOLDS

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Effective prevention of the development of pathogenic molds in agriculture, especially in cereal cultivation, is very important. Infection of crops often leads to serious crop losses and, in the case of toxin accumulation, to health problems in humans and animals. For this reason, plant protection products containing mainly synthetic chemical compounds have been used in agriculture for many years. In 2020, the European Union adopted the "Farm-to-fork" strategy to promote sustainable agriculture and healthy food. This has contributed to limiting substances that can be used on crops. For this reason, new, environmentally friendly compounds are being sought.
There are some ways to protect plants against fungal attacks, but one of the most effective is seed dressing. This protects the plant from the earliest stages of growth, which often translates into fewer molds infections in the adult plant. The aim of the study was to determine the ability of 10 preparations containing as active substances among others gemini surfactants: 1,6-hexamethylene-bis(N-dodecyl-N,N-dimethylammonium) and 3-oxa-1,5-pentane-bis(N-dodecyl-N,N-dimethylammonium bromide) to protect wheat seed against potential pathogens isolated from cereal plants: *Fusarium verticillioides, Aspergillus flavus, Aspergillus niger, Penicillium commune*. After initial sterilization, the seed was dressed for 1 and 24 hours, and then dried. The seed prepared in this way was placed on Petri dishes inoculated with the tested strains. The samples were incubated at 28oC for 14 days making daily observations. The obtained results allowed the selection of 4 formulations (2 for each gemini surfactant) with the

best protective abilities for further research on protective abilities and optimization of the final composition.

Keywords: gemini surfactants, seed dressing, filamentous fungi, crop protection

TOPIC: HEALTH AND NUTRITION

EXPLORING THE NUTRACEUTICAL POTENTIAL OF ANTIOXIDANTS EXTRACTED FROM CHESTNUT SHELLS THROUGH IN-VITRO DIGESTION AND INTESTINAL PERMEABILITY MODELS

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In the last decades, the nutraceutical market has expanded with food by-products being explored as sources of antioxidants intended to be valorised as nutraceuticals. Chestnut (*Castanea sativa*) shells (CS) are a plentiful undervalued by-product with health benefits ascribed to phytochemicals. Nevertheless, the European legislation for nutraceuticals validation remains vague, highlighting the importance of a comprehensive assessment of their in-vitro and in-vivo

bioactivity, phytochemicals composition, and intestinal absorption to guarantee their efficacy and safety.
This study explores the nutraceutical potential of CS extracted by supercritical fluid extraction with CO2, assessing the effects of gastrointestinal digestion and intestinal permeability on the bioaccessibility, bioavailability, and bioactivity of phenolic compounds. The intestinal permeability was studied using a Caco-2/HT29-MTX co-culture model and LC-ESI-LTQ-Orbitrap-MS for metabolomic analyses. The inhibitory responses of acetylcholinesterase (AChE), α-amylase, and antioxidant enzymes were investigated.
The results demonstrated lower phenolic concentrations retained after digestion, reaching 30% bioaccessibility. The CS extract showed antioxidant/antiradical, hypoglycemic, and neuroprotective properties after in-vitro digestion. The metabolomic profile proved the biotransformation of complex phenolic acids, flavonoids, and tannins present in the undigested extract (45.78 µg/mg DW of total phenolic concentration) into hydroxybenzoic, phenylpropanoic, and phenylacetic acids upon digestion (35.54 µg/mg DW). The permeation samples revealed 60% lipids and 30% phenolic compounds through untargeted metabolic analysis, with 29 metabolic pathways being identified. Among phenolics, phenolic acids, flavonoids, and coumarins permeated the intestinal barrier along with phase I (reduction, hydrolysis, and hydrogenation) and II (methylation) metabolites. The permeation rates after 4 h increased as follows: ellagic acid < o-coumaric acid < p-coumaric acid < ferulaldehyde ≤ hydroxyferulic acid ≤ dihydroferulic acid < ferulic acid < trans-caffeic acid < trans-cinnamic acid < dihydrocaffeic acid. Taken together, these findings sustain the valorisation of CS extract as promising nutraceutical ingredient, delivering polyphenols with proven bioactivity after in-vitro digestion and intestinal permeation.

Keywords: *Castanea sativa*, antioxidants, in-vitro assays, intestinal model, high-resolution mass spectrometry

TOPIC: HEALTH AND NUTRITION

PROTEOMIC ANALYSIS OF BIOACTIVE PEPTIDES FROM TWO RED MACROALGAE USING QSAR AND BIOINFORMATICS APPROACHES

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Red macroalgae are a viable alternative source of protein, essential nutrients, and bioactive peptides with attractive biological activities. In this study, we have developed an analytical methodology for the separation and identification of bioactive peptides from two red macroalgae (*Sphaerococcus coronopifolius* and *Gelidium spinosum*) protein hydrolysates, named respectively SCPH and GSPH. After extraction using Ultrasonication for 60 min, the extracted proteins were submitted to enzymatic hydrolysis by pepsin for 24h at an E/S ratio of 1/10 (w/w) and 40 °C.
The peptides profiles of SCPH and GSPH (DH = 62.66 ± 1.4% and 52.76 ± 0.50%, respectively) were subsequently analysed by reversed-phase high-performance liquid chromatography-quadrupole-time-of-flight mass spectrometry (RP-HPLC-QTOF/MS), with MS data bioinformatics management, and the hydrophobicity of identified peptides was predicted in silico using Gravy index. Furthermore, ACE- and DPP-IV-inhibitory peptides were predicted using a quantitative structure-activity relationship (QSAR) method.

Both macroalgae exhibited large heterogeneity regarding peptide composition. Also, RP-HPLC-MS/MS analysis, according to a database survey, allowed the identification of 172 peptides in SCPH against 65 in GSPH. Thus, 26 common peptides for both species were found. In addition, our results showed that SCPH and GSPH present high hydrophobicity (62.10 and 61.11% of hydrophobic peptides, respectively) that suggest important bioactivity of identified peptides. This finding was supported by the QSAR approach. Furthermore, the identified peptides revealed a high proportion of potent predicted ACE-inhibitory peptides (IC50 < 100 µM), in the range of 59.88% and 81.53 % for SCPH and GSPH, respectively. Moreover, the predicted DPP-IV-inhibitory peptides were quantified as 74.25% and 76.92% for SCPH and GSPH, respectively.
The results of this study suggested that *S. coronopifolius* and *G. spinosum* are good sources of food-derived bioactive peptides with promising nutraceutical properties, especially antihypertensive and antidiabetic activities.

Keywords: Red macroalgae; Bioactive peptides, ACE inhibitory activity, DPP-IV inhibitory activity, QSAR.

SESSION 4

Student Competition – Oral Presentations continued

Moderators
Assoc. Prof. Corina Mişcă, Timisoara, Romania
Lecturer Maria Lidia Iancu, Sibiu, Romania

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

VALORIZATION OF BEEF BONES RESULTING FROM BY- PRODUCTS IN FOOD PRODUCTION

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The proposed work follows the efficiency of using beef bones resulting as by-products in slaughterhouses to obtain products from the food industry.
Bones from animals have been mostly analyzed in research as soil fertilizer, but their properties can also serve in the food industry by integrating them into the production process of some assortments. In the proposed work, the benefits that the use of beef bones brings in the recipe of canned tripe soup were followed.
For the analysis, two tests were carried out based on the canned tripe soup recipe. The first test was made with beef bone soup and the second test was made with water.
The comparison of the two recipes was carried out to determine if the beef bones come with an additional supply of benefits to avoid waste and to support the idea of sustainability.
Beef bone soup is an important source of collagen and helps in many diseases such as: anemia, diabetes, ulcers, and even cancer. With the help of the sensory analysis, the appearance and taste characteristics were highlighted for the tripe soup obtained with beef bone soup superior to the sample with water. Since the beef bones also come with a high protein content, following the physico-chemical determinations, it was observed that their contribution to the recipe increased the nutrient level of the product.
To support the results, determinations resulting from laboratory analyzes such as sensoryal, physico-chemical and microbiological, specific to the product category were used.

Keywords: beef bones, tripe soup, sustainability, by-products, food industry

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

INVESTIGATING THE EFFICACY OF SEAWEED AS A NOVEL DOUGH CONDITIONER IN BREAD PRODUCTION

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Bread ranks among the world's most consumed foods, and dough conditioners are extensively employed in various flours to enhance dough performance. Sugar kelp (*Saccharina latissima*) contains several water-soluble functional components such as fucoidan, the hydrocolloid alginate, NaCl, phenolic compounds, ascorbic acid, and potentially iodate, which are separately known to influence key quality aspects of the dough and bread matrix. Sugar kelp is blanched in industrial processing to remove some of these components. This study is the first to explore the efficacy of a liquid extract obtained from sugar kelp as a novel dough conditioner, whereas previous research has exclusively added seaweed powder to dough which has been shown to have a disruptive effect. This study employs a central composite design to investigate the interactions among three factors: an untreated extract, a heat-treated extract (targeting heat-sensitive components), and NaCl (natively abundant in kelp and potentially masking other functional components). The objective is to uncover the influences of these potential functional components and determine whether the liquid extract can function as a dough conditioner. The response surface methodology was used to analyse the impact and find an optimal formula. Most notably, a synergistic effect was observed between the two extracts. A mixture of the untreated extract with a “high” concentration of sugar kelp and the heat-treated extract with a “low” concentration of sugar kelp significantly enhanced loaf height and resilience, showing increases of 30.4% and 25.9% respectively,

while hardness decreased by 52.2% compared to the control. The results show that the liquid extract obtained from sugar kelp can function as a high-performing dough conditioner at optimal conditions, and the industrial side stream of sugar kelp has potential practical applications in bread manufacturing.

Keywords: Bread making, sugar kelp, functional components, central composite design, response surface methodology

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EFFICIENT EXTRACTION OF MICROALGAL ANTIOXIDANT-RICH COMPOUNDS FROM *TETRASELMIS CHUII* AND *ARTHROSPIRA PLATENSIS*: A COMPARATIVE STUDY

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Microalgae are known as a natural rich source of bioactive compounds which exhibit different biological activities and widely used in several commercial fields. However, extracting the totality of a specific component from microalgae

is often prevented by the intrinsic rigidity of its cell wall. To overcome this barrier, an initial operation unit of cell disruption is required to permit complete access to the internal components and facilitate the extraction process. Therefore, the present study focuses on evaluating the effect of different cell disruption techniques on valuable compounds extractability from two different microalgae (*Tetraselmis chuii* and *Arthrospira platensis*). Seven methods were applied namely manual grinding (MG), three phase partitioning (TPP), freezing/thawing (FT), ultrasonication (US), bead milling (BM), high pressure homogenization (HPH) and enzymatic treatment (ET). Extraction efficiency was revealed by microscopic observations and quantifying the concentration of intracellular compounds. In addition, the antioxidant activity of the different extracts was evaluated by three antioxidant assays. Among the tested techniques, US cell disruption was the most effective method, especially for protein and carbohydrates from both microalgae. Moreover, the lowest concentrations of these biomolecules for both microalgae were obtained in the water control and through manual grinding. Interestingly, ET improved significantly the extraction of flavonoids (11.6-fold vs 3.8-fold) and total phenolic compounds (2.3-fold vs 6.1 fold) for *T. chuii* and *A. platensis*, respectively. When analysing the antioxidant activities, ET yielded the highest DPPH radical scavenging activity 98,91% and ferrous chelating ability 85,58% for *T. chuii*. Moreover, *A. platensis* extract prepared by US exhibited the highest antioxidant activities according to the three tests used. This study provides insights into the efficacity of various cell disruption techniques for the extraction of valuable compounds from microalgae and highlights their antioxidant properties, which could be considered for future applications in food or nutraceutical industries.

Keywords: Microalgae; Cell disruption; Extraction; Biomolecules; Antioxidant activity

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

THE INFLUENCE OF ULTRASONIC EXTRACTION ON THE PHENOLIC COMPOUNDS' CONTENT IN THE *SPARASSIS CRISPA* EDIBLE MUSHROOM

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Sparassis crispa, known as cauliflower mushroom, is an edible mushroom showing high health-promoting potential. It consists mainly of β-glucan but is also found to contain high levels of antioxidant compounds. Conventional extraction using high temperatures can significantly reduce the content of bioactive compounds in mushrooms. The use of ultrasound technology enables rapid and efficient extraction without negatively affecting the loss of valuable compounds.
The aim of the study was to compare the effect of Ultrasound Assisted Extraction (UAE) and conventional extraction (TE) techniques on the antioxidant activity and the content of selected bioactive compounds of the edible mushroom *Sparassis crispa* grown in Poland.
The mushroom was collected in northeastern Poland. Samples were dried and finely ground, and the obtained powder was used for experimental analysis. The extracts were performed by the UAE (Nanolinker ln250, China) using different ultrasound powers (15, 30, 45 and 60 W) and ultrasonic irradiation times (5 and 15 min). Ethanol was chosen as a solvent according to preliminary tests. For both extraction techniques, the same solid-solvent ratio was prepared using a magnetic stirrer. In the prepared extracts, the content of total phenolic and total flavonoid (TPC and TFC) compounds and vitamin C was determined. Moreover, the antioxidant activity was determined using the DPPH and ORAC assays.
The antioxidant activity and the content of bioactive compounds varied depending on the extraction technique used. The extract obtained by the conventional method contained significantly lower contents of the determined

compounds, in contrast to the extracts obtained by the UAE method. As the extraction time increased and the power of the ultrasound intensified, a higher content of phenolic compounds and flavonoids was noted. The findings of this study will provide important insights into the potential use of the mushroom as a functional ingredient in the food and pharmaceutical industries.

Keywords: *sparassis crispa*, edible mushrooms, ultrasounds, antioxidants

TOPIC: SUSTAINABLE ECODESIGN FOR FOOD

CHESTNUT SHELLS BIOACTIVE COMPOUNDS AS AN INGREDIENT TO DELIVERY SYSTEMS FOR THE PREVENTION/TREATMENT OF ORAL MUCOSITIS

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Oral mucositis (OM) is one of the most common side effects of antineoplastic treatments, being characterized by an acute inflammation caused by oxidative stress. The OM symptoms include pain, bleeding, ulcers, and secondary infections, compromising the treatment of the primary disease and its outcome. Oral mucosal delivery systems that have gained a crescent interest by pharmaceutical research arise as a treatment option due to its easy use, high absorption capacity, faster action and safety, effectiveness, and stability.
Chestnut (*Castanea sativa*) shells are an agro-industrial by-product with well reported bioactive properties, including antioxidant, anti-inflammatory,

anticancer, and antimicrobial activities, which arise from their rich composition in phenolic compounds such as gallic acid, catechin, and protocatechuic acid. Recently, our research team optimized the chestnut shells extraction by Subcritical Water Extraction (SWE), reporting its potential as active ingredient against OM. In this study, the main goal is to formulate an oral film with SWE *C. sativa* shells extract and evaluate its physicochemical properties as well as phenolic content (TPC=0.98±1.20 mg GAE/g film), antioxidant potential (FRAP=3.76±0.23 µmol FSE/g film, and DPPH=3.78±0.11 mg TE/g film), cytotoxicity in tumorigenic cell lines (8,62%±0,90 and 47,22%±12,17 viability for HSC3 and TR146 cells, respectively) and permeability (Franz diffusion cells). LC-Orbitrap-MS analysis revealed that p-coumaric acid and methyl gallate permeated pig oral skin up to 4h. More than 15 formulations were tested using different polymers, plasticizers, and concentrations, being prepared through the solvent casting method. Methocel 1000 with SWE C. sativa shells extract produced a fast-dissolving film, with optimal thickness (0.125 mm), uniformity, tensile strength (11.4 N), extension (37.6 mm), and excellent folding endurance. The results attested that the oral film developed is promising alternative to prevent/treat OM, probably achieving a high patient adherence. Further studies are needed to evaluate the oral film effects in-vivo.

Keywords: sustainability, oral mucositis, delivery systems, bioactive compounds

TOPIC: FOOD SAFETY & RISK ASSESSMENT

THE ROLE OF PROCESS CONDITIONS IN ACRYLAMIDE FORMATION IN SEAWEED BREAD AND KINETIC MODELING

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Sugar kelp seaweed is emerging as a food ingredient to improve product quality and enable more sustainable production. Seaweed-derived flavors, colors, hydrocolloids, and nutrients can, for instance, be used as bread-making improvers. However, bread is a large contributor to daily intake of acrylamide, classified as a probable human carcinogen by IARC.
This study applies sugar kelp seaweed liquid as a new ingredient to enhance the quality attributes of bread while maintaining palatability. The objective is to evaluate and model how the seaweed liquid affects food safety through modified process-induced acrylamide formation and correlated quality attributes.
A response surface method was used to evaluate thermal processing: temperature (180, 200, 220°C) and baking time (0, 20, 40 min). The analysis shows a significant impact of seaweed liquid on the quality and acrylamide formation.
Kinetic models were developed to describe the level of acrylamide formation in the control and seaweed bread across baking conditions of 180-220°C and 0-60 min. A formation kinetic model, applied for baking time ≤40 min, reveals increased formation rates from 1.55 to 2.34 µg kg-1min-1 at 220°C when adding seaweed liquid. This further shows itself in an approximately doubled thermal activation energy for acrylamide formation in seaweed bread (41.0 kJ/mol) relative to the control bread (19.7 kJ/mol) and calls for improved process optimization and mitigation strategies when implementing seaweed in bread. In addition, a first-order formation-elimination kinetic model enables predictive modelling at extended baking (time>40 min), indicating a modified acrylamide formation-elimination chemistry from enhanced elimination processes.
Strong correlations between water activity, surface color, and acrylamide formation were further used to determine design criteria fulfilling acrylamide levels < 50 µg/kg, aiming to assist food business operators in parallel food safety and quality optimization. The overall results enable the determination of process conditions for minimizing acrylamide levels in seaweed bread.

Keywords: Acrylamide, Kinetic modelling, Food Safety, Seaweed bread, Quality attributes, Baking process

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

NUTRITIONAL AND PHYTOCHEMICAL ENRICHED MUFFINS AND BREADS BASED ON WHEAT FLOUR AND BAOBAB PULP FLOUR (*ADANSONIA DIGITATA L.*)

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This article aimed to evaluate the beneficial effects that baobab flour (BF) could bring to bakery products by replacing wheat flour (WF) with different proportions (10%, 20%, and 30%) of baobab flour (BF) in bread and muffins. The composite flours, breads, and muffins obtained were evaluated from the nutritional, phytochemical, and organoleptic points of view. The results show that BF is a rich source of minerals (K: 13,276.47±174 mg/kg; Ca: 1570.67±29.67 mg/kg; Mg: 1066.73±9.97 mg/kg; Fe: 155.14±2.95 mg/kg; Na: 143.19±5.22 mg/kg; and Zn: 14.90±0.01 mg/kg), lipids (1.56±0.02 mg/100g), carbohydrates (76.34±0.06 mg/100g) and also has a good phytochemical profile. They also revealed that partial substitution of WF by BF significantly improved the nutritional characteristics of both breads and muffins. There was also a significant increase in phytochemical properties in breads and muffins as BF became more abundant. In this regard, the maximum total polyphenol contents (TPC) for each product were recorded for the 30% BF bread (BWB3: 297.63±1.75 mg GAE/100g) and the 30% BF muffin (BWM3: 145.34±0.35 mg /GAE/100g). They had a total flavonoid content (TFC) of 208.06±0.002 and 186.97±3.22 mg QE/100g for BWB3 and BWM3 respectively, and 66.72±0.07 and 83.71±0.07% for antioxidant activity (AA). In terms of organoleptic analysis, for both breads and muffins, the samples with 10% BF were the most appreciated by consumers. They were the most appreciated and achieved values close to those of the control bread and control muffin. From all the information obtained from our various analyses and the literature, it emerges that BF can be used as a functional ingredient in bakery products to

improve their nutritional and phytochemical compositions. However, due to the acidic taste of baobab, it is recommended that its substitution level in breads and muffins should not exceed 10%, to ensure a product acceptable to consumers.

Keywords: Nutritional, Phytochemical, Muffins, Breads, *Adansonia digitata*

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

STUDIES ON INDUSTRIAL MANUFACTURING OF ESSENTIAL OILS USED AS FLAVORINGS IN SAUCES PRODUCTION

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Many plant species synthesize and accumulate extractable organic substances in sufficient quantities, used industrially as raw materials for various commercial applications. Aromatic plants biosynthesize volatile organic compounds and odoriferous substances that can be extracted by various technical processes, in the form of essential oils, extracts, oleoresins, etc., used profitably in industries such as pharmaceuticals, food, cosmetics, perfumery, detergents, flavors, beverages, etc. Conventional extraction technologies, steam distillation, can be carried out and optimized by using latest engineering technologies to obtain high quality of essential oils with good yields. Considering the organoleptic properties and the considerable antimicrobial / antioxidant activity of the natural essential oils, the main direction of use were chosen: Use in order to produce flavoring preparations for liquid red pizza sauce & white QSR sauce widely consumed in Horeca;

Studies have been carried out on obtaining industrial mixtures of natural essential oils (coriander seed oil, origanum oil, thyme oil) with the best flavoring properties, in order to be used as flavoring agents for 2 types of sauces: red pizza sauce and white QSR sauce.

Keywords: essential oils, steam distillation, flavorings, sauces

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

DEVELOPMENT AND CHARACTERIZATION OF FORTIFIED YOGURT WITH THE ADDITION OF CARROT PEEL AND CELERY PEEL AS BY-PRODUCTS FROM THE VEGETABLE INDUSTRY

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Developing products that meet consumer expectations can be a challenge for researchers. Yogurt is a palpable dairy product because it is versatile and can be eaten as a dessert and snack. The present work aims to develop a yogurt with the addition of carrot peels and celery peels to satisfy the current market requirements by reintegrating some vegetable by-products in the technological process of making yogurt but also to replace protein additives, which they have the role of improving the rheological characteristics and sensory properties of yogurt. In this sense, a comparative analysis was made between yogurt with addition, classic yogurt, and yogurt with powdered milk. A non-numerical multicriteria multi-personal agreement method described by Fadhil and

collaborators was used to perform the sensory analysis. (Fadhil, Agustina, & Hayati, 2020). The physicochemical analysis of the samples was performed during a storage period of 18 days on the first day, the ninth day, and the eighteenth day. The pH, titratable acidity of the samples, syneresis, water holding capacity, and lactose content were performed. The results indicate an improvement in the degree of syneresis and the water retention capacity, especially in the second part of the storage time, of the yogurt with the addition of celery and carrot peels, compared to the other two samples. The evaluated sensory characteristics obtained better scores because the carrot and celery peels brought a unique flavor to the product.

Keywords: circular economy, by-products recovery, carrot peel, celery peel, fortified yogurt

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

REFORMULATION OF BOLOGNA SAUSAGE BY TOTAL PORK BACKFAT REPLACEMENT WITH AN EMULSION GEL BASED ON OLIVE, WALNUT AND CHIA OILS AND STABILIZED WITH CHITOSAN

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Bologna sausage, also called “la grassa”, is a very popular meat product, even though its high fat content and lipidic profile raise serious negative health concerns. An emulsion gel containing olive, walnut, and chia oils, stabilized with soy protein isolate, transglutaminase, and chitosan, was used as total pork backfat replacer in Bologna sausage. The nutritional, textural and technological properties were assessed, and sensory analyses were conducted. Color, pH and lipid oxidation were monitored during 18 days of cold storage (40C). A normal fat Bologna sausage was used as a control reference. A decrease in the n-6/n-3 ratio

from 16.85 to 1.86 (by 9 times) was achieved in the reformulated product as compared with the control, while the PUFA/SFA ratio increased from 0.57 to 1.61. Color measurements indicated that the lightness and yellowness increased while redness slightly decreased in the reformulated product. The total substitution of pork backfat in Bologna sausage by the emulsion gel developed in the present study was realized without significantly affecting the technological properties, the oxidative stability and the overall acceptance by the consumers.

Keywords: Bologna sausage; emulsion gels; chitosan; reformulation; fatty acid composition; texture; technological properties

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

THE VALORIZATION OF CITRUS FRUITS AND APPLES' BY-PRODUCTS IN THE BAKERY INDUSTRY

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This paper aims to carry out a study on the valorisation of fruits by-products, such as the peel of oranges and apples, that have a high nutritional value, in the Bakery Industry in order to obtain a product that contains a higher level of nutrients. A functional, dietary and highly nutritional value product was obtained by using apple peel flour and citrus peel jam, which was analyzed from an organoleptic and a nutritional point of view. In addition, its sensory qualities were evaluated based on the information provided by multiple testers. A three-layer dessert product was obtained, which was nutritionally characterized, on each of the 3 semi-prepared products obtained as well as for the unit product. The

nutritional characterization of final product indicated the humidity of core 41.74%, proteins 6.08%, lipids 17%, fibers 8.43%, carbohydrates 38.8% and an energetic value of 338.5 kcal/100 g product. From a sensory point of view, the appearance of the final product was appreciated the most by the tasters, obtaining the maximum score (75 points). Considering the nutritional importance, the content in active principles (polyphenols, macro and microelements, dietary fibers), as well as the high antioxidant capacity, these fruit by-products represent an important source of functional compounds, which can be used in pastry in order to obtain nutritionally improved products. Due to the high level of insoluble fibers (cellulose, hemicellulose and lignin) provided by the peel of the fruits, the product is recommended to people with digestive disorders or irritable colon, for a proper functioning of the digestive system.

Keywords: Valorization, By-products, Fruits, Nutritional, Bakery

SESSION 5

Student Competition – Short Oral Presentations of Posters

Moderators
Lecturer Mihai Ognean, Sibiu, Romania
Lecturer Cristina Danciu, Sibiu, Romania

SHORT ORAL PRESENTATIONS OF POSTERS
ALL POSTER PRESENTERS WERE ALSO PRESENT IN THEIR DEDICATED ZOOM BREAKOUT ROOMS.

TOPIC: FOOD SAFETY & RISK ASSESSMENT

INTELLIGENT FOOD ASSURANCE SYSTEMS: ENHANCING FOOD CHAIN INTEGRITY

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Intelligent Food Assurance Systems (IFAS) i.e., next generation “smart” systems that are integrated with state-of-the-art sensor and digital technologies using an Internet of Food approach have the potential to deliver substantial advances in terms of improved assurance, reduced costs and substantial and efficiency gains. Such systems can combine digital technologies such as blockchain technology, data science technology and artificial intelligence technology to extract knowledge from the vast amount of (meta) data in the supply chain to deliver substantial improvements in food assurance as well as deliver business advantage. This study assesses the state of the art of IFAS in following areas: food safety, food quality, food fraud and food defence. The work reveals that although there have been several studies applied to food assurance using technologies, there is still a gap in terms of cascading and integration of data from different locations within the supply chain in these four dimensions. The design of IFAS emphasises the elimination of information gaps between stakeholders,

by using the common system to help different departments work together to identify risks and to deal with them. In general, there will be a vision of how progressing technology can reshape our food system to provide more integrated, sustainable solutions.

Keywords: food systems, Internet of food, food quality and safety, food assurance, food risk assessment

TOPIC: HEALTH AND NUTRITION

IN-VITRO BIOACCESSIBILITY AND PRO-HEALTHY PROPERTIES OF PHENOLIC COMPOUNDS FROM CHESTNUT SHELLS EXTRACT-ENRICHED COOKIES

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Chestnut (*Castanea sativa*) shells (CS) are an appealing source of phenolic compounds, embracing outstanding health-promoting effects [1]. Recent studies have validated a CS extract prepared by subcritical water extraction as a potential functional ingredient by in-vitro and in-vivo assays and incorporated this extract into functional cookies [2,3]. Nonetheless, the digestibility and health

benefits of functional cookies enriched with CS extract upon gastrointestinal digestion remain unexplored.
The aim of this study was to evaluate the impact of in-vitro gastrointestinal digestion on the bioaccessibility and bioactivity of functional cookies enriched with the previously validated extract regarding total phenolic and flavonoid contents, antioxidant/antiradical properties, phenolic composition, and hypoglycemic effects by α-amylase inhibition. Multivariate analysis was performed to outline the differences between the undigested and digested cookies.
The results proved that higher phenolic concentrations were retained after intestinal digestion, endorsing its better antioxidant, antiradical, and hypoglycemic properties. The phenolics recovery improved as follows: oral < gastric < intestinal digests, reaching 94% of maximum bioaccessibility. The intestinal-digested cookies were effective scavengers of reactive oxygen and nitrogen species, particularly HOCl and ONOO-, and inhibited 71% of α-amylase activity. The phenolic profile was characterized by phenolic acids, hydrolyzable tannins, flavonoids, and one alkaloid. Regardless of the identical composition rich in phenolic acids, changes in their concentrations were observed between digested and undigested cookies. A protective effect of cookie matrix on the phenolic compounds was demonstrated along with a slow phenolics release during digestion. The multivariate analyses predicted the key role of polyphenols in the bioactivity of cookies before and after digestion. In summary, this study proved the bioaccessibility and bioactivity of functional cookies enriched with CS extract, demonstrating its efficacy even after in-vitro digestion.

Keywords: *Castanea sativa*, functional cookies, gastrointestinal digestion, phenolic compounds, bioactivity

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

TURNING APPLE POMACE INTO HIGH-ADDED-VALUE COMPOUNDS FOR APPLICATION IN THE FOOD AND NUTRACEUTICAL INDUSTRIES

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Apple (*Malus spp.*) processing industry generates a solid bio-residue known as apple pomace that is still underutilized despite harbouring notable potential due to its richness in bioactive compounds [1]. This study aimed to investigate apple pomace (AP) and the individual apples (IA) that gave rise to its full exploitation potential. The nutritional profile was determined by applying official methodologies (AOAC). The chemical profile analysis included the quantification of soluble sugars (HPLC-RI), fatty acids (GC-FID), tocopherols (HPLC-fluorescence), and organic acids (UFLC-PDA). The antioxidant capacity of the extracts was evaluated through two in vitro cell-based assays: TBARS and OxHLIA. The nutritional evaluation revealed that both AP and IA had high moisture content, followed by dietary fiber, and protein. Ash content showed minimal variations. The sugar profile consisted mainly of fructose, followed by sucrose and glucose. The fatty acids profile was dominated by linoleic acid, α-linolenic acid, and palmitic acid in all samples. Regarding organic acids, malic acid and oxalic acid were identified in all samples, with malic acid being the major compound. Regarding the antioxidant activity, apple pomace demonstrated better results in the OxHLIA assay. In summary, apple pomace's high dietary fibre and protein levels stand out. Therefore, apple pomace presents remarkable potential to be explored as an innovative and competitive source of functional compounds with promising applications in the food and nutraceutical industries.

Keywords: bio-residues, functional ingredient

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

RECOVERY OF PHENOLIC COMPOUNDS IN THE APPLE PRODUCTION CHAIN FOLLOWING A CIRCULAR APPROACH

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Apple (*Malus spp.*) is an important raw material for the production of juice or cider. However, this process gives rise to a solid residue, apple pomace, which corresponds up to 30% of the original volume of the fruit [1]. Consequently, the disposal of this bio-residue towards a more sustainable production capable of maintaining quality and safety parameters while contributing to a circular economy is a matter of high priority.
Therefore, this work's main objective was to recover the phenolic compounds present in apple pomace for subsequent application in new products. For comparison purposes, the content of phenolic compounds was determined both in extracts from individual apples and in extracts from the apple pomace with and without seeds, using a high-performance chromatography system coupled to a mass spectrometry detector (HPLC-ESI- Orbitrap-MS). Generally, in samples of individual apples, i.e., green apple (MV) and Pink LadyÒ (MPL), 11 and 10 phenolic compounds were detected, respectively. Concerning MIXBGC (mixture of individual apples), 12 phenolic compounds were identified, and in seedless and seeded pomace (BGC and BGCS, respectively), 15 phenolic compounds were identified. Regarding the content of total phenolic compounds, apple pomace exhibited higher levels than individual apples. The most abundant compounds found in apple pomace (BGC and BGCS) were phlorizin-3-glucoside, quercetin-

3-O-rutinoside, hydroxyphloretin isomer, quercetin-3-galactoside, and 3-hydroxyphloretin 2'-O-xylosyl-glucoside, ranked in decreasing order of abundance. The main compounds in individual apples were quercetin-3-O-rutinoside, phloretin 2'-O-xylosyl-glucoside and 3-O-caffeoylquinic acid. These results demonstrate that the pressing method used to extract apple juice is insufficient to remove all phenolic compounds from the matrix, resulting in their retention in the apple pomace. Therefore, this bio-residue, still little explored and easy to obtain, can be applied in the food industry, for example, as a natural ingredient.

Keywords: phenolic compounds, bioactivity, functional ingredient

TOPIC: BIOPROCESSING AND BIO-REFINING FOR THE CONVERSION OF FOOD WASTE AND BY-PRODUCTS INTO VALUE-ADDED FOODS

FROM DISCARDED TO DESIRABLE: *ACTINIDIA ARGUTA* (KIWIBERRY) AS A SOURCE OF HEALTH-PROMOTING COMPOUNDS

Catarina Macedo[1,2,3]; Ana Margarida Silva[1]; Ana Sofia Ferreira[1]; María De La Luz CádizGurrea[4]; Álvaro Fernández-Ochoa[4]; Antonio Segura-Carretero[4]; Cristina Delerue-Matos[1]; Paulo Costa[2,3]; Francisca Rodrigues[1]

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Actinidia arguta, commonly referred as kiwiberry, exhibits a promising phytochemical composition, making it a valuable contender for chronic disease prevention and treatment and a source of bioactive compounds for pharmaceutical and cosmetic industries. Despite these encouraging findings, there is still a significant gap in the understanding of the full potential of *A. arguta* fruit for health-related applications. This study takes a unique approach by selecting kiwiberries with damaged skin or suboptimal size, which are typically discarded, to determine the optimal ultrasound-assisted extraction (UAE) conditions for antioxidant and antiradical activities employing the Response Surface Methodology (RSM) approach. The effects of probe amplitude, sonication time and water-to-ethanol solvent ratio were assessed. The optimal extraction conditions were achieved using 50% of water, during 17.5 min and an amplitude of 50%. The HPLC-ESI-QTOF-MS analysis reveals 22 compounds in the optimal extract, including 6 flavonoids and 4 phenolic acids. The optimal extract demonstrates exceptional antioxidant and antiradical activities: TPC of 18.705 mg GAE/g dw; FRAP of 186.876 μmol FSE/g dw; ABTS of 16.334 mg AAE/g dw; $O_2^{\cdot -}$ with an IC50 of 829.384 μg/mL; HOCl with an IC50 of 16.895 μg/mL and ROO· of 0.18 μg TE/mg dw. Moreover, the extract exhibits antimicrobial properties against *Staphylococcus aureus* (MIC = 32 mg/mL), *Pseudomonas gingivalis* (MIC = 64 mg/mL), and slows down the growth rate of *Escherichia coli*. In vitro experiments demonstrated that the extract significantly reduced the viability of the HSC-3 human buccal cell line at concentrations ≥500 μg/mL, suggesting a concentration-dependent effect, while its impact on the TR146 cell line was minimal. This study highlights the potential of *A. arguta* fruit as a source of diverse bioactive compounds with pro-healthy properties. Notably, it repurposes discarded kiwiberries, promoting resource sustainability, and demonstrating promise in the nutraceutical and cosmeceutical industries.

Keywords: Phenolic compounds, *Actinidia arguta*, Response Surface Methodology (RSM), Ultrasound-assisted extraction (UAE), Pro-healthy properties

TOPIC: HEALTH AND NUTRITION

IMPROVING THE MANAGEMENT OF THE SWEETENING OPERATION - USED TO REALIZE A FOOD SUPPLEMENT WITH HIGH ANTIOXIDANT POTENTIAL

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Introduction: Food supplements with high antioxidant potential are increasingly in demand in the consumer market. The use of raw materials free of natural or acquired toxicity leads to increase the sanogenicity of the food supplement and the demands of educated consumers.
Aims: Since the design phase the manufacturer should have in mind the innocuousness of the final product and, moreover, its role in improving consumer health. This work paper presents a management technique for food additives (used, in this case, in the testing and selection of used sweeteners) in the design of a black tea-based food supplement.
Materials and Methods: The raw material used was tested by A.A.S. (Atomic Absorption Spectroscopy) to check for the absence of contamination with residues or heavy metals. For the determination of the influence of sweeteners on the basic chemical composition, it was used UV-VIS optical spectrometry and some elements of mathematical statistics.
Results: The obtained results from this step of the research led to the establishment of the best sweetening option for food supplement based on black tea. The obtained and selected product can be used (as raw material) in the following technological steps, showed a chemical composition close to the unsweetened version but it also had much improved sensory properties.
Conclusions: The best sweetening variant in this case was determined depending on the minimal change on the basic chemical composition of black tea and the preservation of the basic sensory characteristics. The development of innovative methods and technologies for the management of food additives facilitates the production of high-quality end products with high levels of food safety.

Keywords: black tea, sweeteners, innovative, food supplements

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

INFLUENCE OF THE ADDITION OF FRUIT POWDER MIXTURES ON THE SENSORY ATTRIBUTES OF NITRITE-FREE SALAMI FORMULATIONS

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The meat products industry is looking to find new ways to replace synthetic additives with natural additives. The use of fruit in the form of powder could become an attractive solution in the formulation of nitrite-free meat products, due to their high level of bioactive compounds. This study evaluated the influence of incorporating fruit powder mixtures obtained from sour cherries, blackcurrants and cranberries on the sensory attributes of nitrite-free salami formulas. For this purpose, appearance, aroma, texture, taste and overall acceptability were assessed using a five-point hedonic scale. Four fruit powder mixtures consisting of sour cherries and blackcurrants powder (SCP+BCP), sour cherries and cranberries powder (SCP+CP), blackcurrants and cranberries powder (BCP+CP), as well as sour cherries, cranberries and blackcurrants powder (SCP+CP+BCP) were included as a natural substitute of sodium nitrite in the salami formulation. Before use, the fruits were subjected to a slow dehydration process at a temperature of 60°C up to a moisture content below 5%. The mixtures of fruit powders included in the nitrite-free reformulated salami recipe were used in dosages that provide total phenolic levels of 90, 200 and 300 mg gallic acid equivalents (GAE)/kg of meat. The minimum dose of phenolic compounds provided from fruit powder

mixtures was chosen according to the level of nitrite content per kg of processed meat (90 mg nitrite/kg). The amounts of fruit powder in the mixtures were calculated to contribute equally to the total phenolic doses established. The salami formulations were analyzed in comparison with control samples with or without added sodium nitrite. The results showed changes in the appearance of salami formulas with added fruit powder mixtures, while other sensory characteristics showed no significant influence. The highest overall acceptability was recorded for the salami formula with SCP+CP+BCP which provided a total phenolic level of 300 GAE/kg raw meat.

Keywords: fruit powder mixtures, sour cherries, cranberries, black currants, nitrite-free salami formulas, sensory properties

TOPIC: HEALTH AND NUTRITION

TESTING AND SELECTING THE BEST SWEETENERS USED IN THE PRODUCTION OF A GREEN TEA-BASED FOOD SUPPLEMENT

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Green tea is recognized for its high antioxidant potential, being very rich in polyphenolic compounds, vitamins, and pro-vitamins. Producing an energy drink (food supplement) based on green tea is not easy, but introducing innovative extraction methods, additive management, product design, and packaging design can help a lot. The use of such methods and technologies results in an extremely valuable end product, which is important for the healthiness and hedonic quality transmitted to the final consumer.
The aim of this paper is to successfully identify the best way to sweeten green tea by testing and selecting the best sweetener. In this mode results an intermediate product with superior physical-chemical and sensory properties. This

product will be used as a raw material in the next technological steps, providing a good basis for an innovative food supplement.
The used raw material (green tea) was tested by A.A.S. (Atomic Absorption Spectroscopy) to check for contamination by residues or heavy metals. In order to determine the influence of sweeteners on the basic chemical composition, UV-VIS optical spectrometry and mathematical statistics were used.
The results of this phase of research led to the identification of the best sweetening option for green tea-based food supplements. The product obtained and selected for use (as raw material) in the following technological steps had a chemical composition similar to that of the unsweetened version, but also much improved sensory properties.
The best sweetening option in this case was determined by minimizing the change in the basic chemical composition of the green tea and preserving the basic sensory characteristics. The development of innovative methods and technologies for the management of food additives facilitates the production of high-quality and safe food end products.

Keywords: green tea, sweeteners, innovative, food supplements

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

ACCELERATION OF FLOUR MATURATION

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Knowing the essence of the maturation process, conditioned by processes that modify the rheological properties of gluten and dough, as well as the observation of the factors that influence the natural maturation of flour, led to the conclusion that the access of air and the temperature of the environment in which

flour is kept are factors determined for this process. It was concluded that the maturation of flour can be accelerated by increasing its temperature. In a series of papers, Sisoev and Auerman (1962 1963) studied the effect of heating in the pneumatic transport pipe of flours of different qualities on their technological properties.
The results obtained indicated that Short-term heating of flour positively influences its baking properties, regardless of quality, more pronounced for poor quality flour, both for unripened flours where the effect is greater, as well as for previously ripened flours. However, this short-term heating does not ensure the maintenance of the technological properties reached at the end of the heating. It was also found that heating increases the acidity index of the fats in the flour and lightens its color.
These observations allowed us to consider that the improvement in the quality of freshly ground flour by heating is due to the acceleration of the oxidation processes in the flour, an important role being played by free polyunsaturated fatty acids, which accumulate in greater quantity and which influence both the colloidal properties of gluten, as well as the color of the flour.

Keywords: Short-term, microwave treatment.

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

WHEAT CONDITIONING TO OBTAIN HIGH QUALITY FLOURS

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The set of processes used to prepare wheat for milling, starting with its moistening, is called conditioning. Conditioning causes a series of transformations in the properties of the grain components, which are characterized by the

improvement of the grinding properties of the grain. The main aspects taken into account are; Analysis of the way in which water penetrates the bean, the speed of penetration, the way of distribution in the anatomical parts, as well as the determination of the factors that influence the wetting process; Modifying the structural-mechanical properties of the anatomical parts of the grain and establishing the optimal moisture values for each anatomical part, in order to optimize the crushing processes; Determination of biochemical changes that occur in grains during the conditioning process.
After conditioning, the grains substantially improve their technological grinding properties. This improvement consists in: reducing the mineral content of flour obtained by grinding wheat and improving its color; increasing flour extraction by 1-2%; increasing the yield of intermediate products; screening and grinding of grinding intermediates are improved; the separation of the endosperm enve-lopes is carried out in better conditions; reduces energy consumption when grinding by 5 - 25%; the baking properties of the flour resulting from grinding are improved.

Keywords: high quality, conditioning, accuracy

SESSION 6

STUDENT COMPETITION – virtual poster session

Introduction to the poster session

Assoc. prof. Cecilia GEORGESCU, Sibiu, Romania

ALL POSTERS WERE PRESENTED BY STUDENTS IN THE ZOOM BREAKOUT ROOMS.
THE ABSTRACTS FOR ALL POSTERS CAN BE FOUND IN SECTION 5

ISEKI-FOOD
ASSOCIATION

6th ISEKI-FOOD E-Conference

"Food production based on food safety,
sustainable development and circular economy"

DAY 3

24 november 2023

Welcome to day 3 of the conference

Prof. Adrian Riviş
ISEKI – Food Association

SESSION 7

ORAL PRESENTATIONS

Moderators
Prof. Mariana Atena Poiană, Timisoara, Romania
Assoc. Prof. Bordean Despina, Timisoara, Romania

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

3D PRINTABILITY OF FOAMED FOOD PRODUCTS

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There is a growing interest in 3D food printing as a method to create novel and customized food products. However, not all food materials are suitable for 3D printing. This study explores the potential of using aquafaba powder to foam caramel sauce and apple puree, naturally unsuitable for 3D printing, to enhance their printability. By incorporating 5% (w/v) aquafaba powder and whipping the mixtures for 6 minutes, overrun values of 431.87% and 665.06% were achieved for caramel sauce and apple puree, respectively, yielding dry foam characteristics (air fraction > 0.80) with high stability. Utilizing a custom-made 3D food printer, the foamed samples were successfully printed into both basic and complex shapes. Despite the expansion of foams upon extrusion leading to larger individual line widths than the nozzle diameter, the final dimensions of printed shapes closely aligned with the computer designs. In addition, the printed structures retained their shape for at least one hour post-printing. The evaluations of

overrun, air fraction, and bubble sizes before and after printing contribute to a better understanding of the 3D printing process and outcomes for foamed food materials, paving the way for expanded applications of 3D food printing technology.

Keywords: 3d printing, foam, aquafaba

TOPIC: HEALTH AND NUTRITION

CHARACTERIZATION OF *JUNIPERUS COMMUNIS L.* ESSENTIAL OIL OBTAINED FROM BERRIES HARVESTED IN BALKANS AREAS

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Juniperus communis L. is a plant widely found as wild crop in the South-Eastern Europe areas. Juniper berries, the fruit of Juniperus communis L. are a highly valued, essential oil-rich plant material used traditionally in folk medicine as antiseptic, diuretic, antirheumatic, anti-inflammatory, antibacterial and antifungicidal agent. This paper reviews information on extraction methods of the essential oil from the juniper berries, collected from different regions of Eastern Europe. The batches of essential oil obtained was characterized using GC-FID for structure and also for organoleptic properties. Depending on the harvesting and collection areas, we obtain different results on the similar production working parameters. The juniper berry essential oils obtained from Albanian areas, have a structure rich in sesquiterpenes, key compounds with high added value in flavors and fragrances industries.

Keywords: *Juniperus communis l.*, distillation, sesquiterpenes, flavors

TOPIC: FOOD SAFETY & RISK ASSESSMENT

DETECTION OF ADULTERATION IN THYME HONEYS WITH SUGAR SYRUPS AND COLORANTS USING FTIR SPECTROSCOPY AND CHEMOMETRICS

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Honey, renowned for its nutritional attributes and significant commercial value, is susceptible to adulteration on a global scale. This underscores the urgent need for a swift and reliable means of verifying the authenticity of honey. This study aimed to identify adulteration in honey involving the addition of sugar syrups and colorants utilizing FT-IR spectroscopy in tandem with multivariate statistical analysis. The investigation encompassed a dataset of 135 honey samples, of which 77 were commercial thyme honeys gathered from diverse Mediterranean countries (Greece, Spain, Tunisia, and Turkey) and 58 samples of adulterated Greek thyme honey, wherein syrups and colorants had been added. The spectral data were subjected to various preprocessing algorithms, including Savitzky-Golay smoothing, standard normal variate (SNV) correction, and first/second derivative transformations. The subsequent analysis involved Principal Component Analysis (PCA) along with Random Forest (RF) and Data-Driven Soft Independent Modelling of Class Analogies (DD-SIMCA) techniques to discern adulterants within the honey samples. Notably, both one-class (DD-SIMCA) and multi-class (RF) classification methodologies exhibited good performance, achieving an accuracy over 90% for most models. This study demonstrated the potential of combining FTIR spectral analysis with chemometric tools for the fast and effective detection of honey adulteration, particularly through the addition of sugars and colorants.
Acknowledgments: This research is part of the PRIMA programme. Grant agreement No 1932, project MEDIFIT (Call 2019 Sec. 1 Agrofood IA).

Keywords: Thyme honey, FTIR, Adulteration, Sugars, Colorants, Chemometrics

TOPIC: BIOPROCESSING AND BIO-REFINING FOR THE CONVERSION OF FOOD WASTE AND BY-PRODUCTS INTO VALUE-ADDED FOODS

ITALIAN CITRUS FRUITS: FROM PEELS TO ESSENTIAL OILS; FORMULATION AND CHARACTERIZATION OF NANO-EMULSIONS

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Kumquat (*Citrus Japonica*), Citron (*Citrus medica*), Orange (*Citrus sinensis*), Bergamot (*Citrus bergamia*), Lemon (*Citrus lemon*), and Tacle (*Citrus sinensis x Citrus clementina*) are citrus fruits specific to southern Italy. Citrus essential oils are complex mixtures of volatile compounds with manyfold possibilities to be used as active antioxidant and antimicrobial ingredients in food, cosmetics, or pharmaceutical products. These uses are limited by their susceptibility to external factors such as light, temperature, pH, oxygen, and humidity. In order to maintain or even enhance their physical-chemical stability, they were encapsulated into nano-emulsions. Citrus peels mixed with water are subjected to microwave-assisted extraction power (800 W) for one hour to obtain the essential oils (EOs). The obtained essential oils were nano-encapsulated in nano-emulsions to preserve and enhance their properties and stability. In this study, nano-emulsions were prepared through ultrasonication, using citrus oils as the lipidic phase and Tween 80 and ethanol as a surfactant, and co-surfactant, respectively. Their behavior was evaluated by testing the antioxidant, antimicrobial,

and stability capacities. The best extraction yield was obtained for bergamot, while the lowest was registered for citron and lemon. The volatile profile, and bioactive properties were investigated and their stability was monitored.
The antimicrobial activity was tested against Gram-positive and Gram-negative bacteria, with a better response for the Gram-negative. Bergamot nanoemulsions show the best susceptibility against *E.coli*.
Our work aimed to find the best formulations to obtain stable functionalized nano-emulsions, which would be ready to be used in food as green additives or in medicine as non-invasive treatments. Therefore during method development and nano-emulsions characterization, not only the physicochemical properties but the food and human-friendly behavior have to be taken into consideration.
Acknowledgments: This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS - UEFISCDI, project number PN-III-P4-ID-PCE-2020-1847, within PNCDI III.

Keywords: bergamot, citron, kumquat, lemon, orange, tacle

TOPIC: FOOD SAFETY & RISK ASSESSMENT

EFFECTS OF BLUEBERRY, ELDERBERRY, AND RASPBERRY JUICE INDUSTRY BY PRODUCTS ON THE QUALITY, SENSORY AND MICROBIOLOGICAL PARAMETERS OF UNRIPENED BOVINE MILK CURD CHEESE

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The objective of this study was to investigate the potential use of raspberry (*Rubus idaeus*), blueberry (*Vaccinium myrtillus*), and elderberry (*Sambucus nigra*) juice industry by-products (BB-Ps) as potential ingredients to enrich unripened cow milk curd cheese (UC). Firstly, was evaluated antimicrobial properties, also the effects on the agar immobilization technology of BB-Ps antioxidant properties, and colour coordinates. The next stage was to incorporate non-immobilized and agar-immobilized BB-Ps for the UC enrichment, and analyze the impact of the BB-Ps on UC samples acidity, and microbiological parameters during the storage period, antioxidant, and sensory properties, fatty acid, and volatile compound profiles. Raspberry BB-Ps exhibited the broadest spectrum of antimicrobial activity, inhibiting 7 of the 10 tested pathogens. However, blueberry BB-Ps showed antimicrobial activity against 5 of the 10 tested pathogens. The addition of selected BB-Ps to cheese samples significantly increased the total phenolic content and DPPH-radical scavenging activity of the cheese samples. UC cheese samples prepared with non-immobilized raspberry BB-Ps had the highest total phenolic content (184.5±6.82 mg/100 g). The predominant fatty acid in cheese samples was palmitic acid (16:0). The main volatile compound in cheese samples was D-limonene. The highest intensity of the emotion 'Happy' was induced of cheese samples prepared with non-immobilized elderberry BB-Ps. Finally, the results of this study suggest that raspberry, blueberry, and elderberry BB-Ps can be potential functional ingredients to the dairy industry for UC enrichment in a sustainable manner.

Keywords: cow milk curd cheese, antioxidant properties, berry juice industry by-products, microbiological parameters, sensory properties

TOPIC: FOOD SAFETY & RISK ASSESSMENT

EFFECTS OF DRIED SEEDS AND BLACK OLIVES AS ENRICHMENT INGREDIENTS ON ACRYLAMIDE CONCENTRATION IN SAVOURY BISCUITS

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Seeds and table olives are often processed with heat and chemical treatments to improve sensory and shelf-life. However, this can lead to the presence of acrylamide (AA), a potentially carcinogenic compound regulated by EU Regulation 2017/2158. These foods are often consumed as such and also as ingredients in various products, leading to concerns about human exposure to AA.
The aim of this study was to investigate the effects of sesame and sunflower seeds as well as black olives with and without brine as enriching ingredients in savoury biscuits on the final AA concentration. Although these ingredients are known to contain AA and precursors, their contribution to AA formation when added to a complex matrix has not been studied. Factors like moisture, particle-size and the composition of these ingredients can either promote/inhibit AA formation. In this research, biscuits were prepared with 10% of the enrichment ingredients to mimic commercially available recipes. All enrichment ingredients and biscuits were tested for AA and some parameters such as moisture, water activity, weight loss, pH, colour and texture.
The results showed that enriched savoury biscuits had significantly higher AA concentrations (+163%) than the control one (198.9 μg/kg). The sunflower seeds-enriched biscuits significantly exceeded the established AA benchmark value of 400 μg/kg (EU Reg. 2017/2158). Comparison of the AA concentrations in each ingredient with those in the corresponding biscuits showed that the olives, despite their higher AA content, resulted in a smaller increase in AA (+7%) compared to seeds (+260%). This indicates that olives played a role in attenuating AA formation in biscuits.

In summary, it is difficult to predict the AA content in bakery products knowing only the AA concentration in the ingredients used. In complex recipes, other factors must also be taken into account to understand how the components interact during the processing stages.

Keywords: Acrylamide, Bakery products, Dried seeds, Black olives, Formulation, Toxic compound

TOPIC: HEALTH AND NUTRITION

CHANGES IN PROTEIN DIGESTIBILITY AND ACE INHIBITORY ACTIVITY OF PROTEIN HYDROLYSATES FROM *ULVA RIGIDA* DURING IN VITRO DIGESTION

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Macroalgae are a sustainable protein source which have significant importance in human nutrition and great economic potential for the food industry. Determining the digestibility of the macroalgal proteins in human gastrointestinal conditions is essential because they are meant to be consumed by humans. The digestion of dietary proteins produces peptides and amino acids, which can interact with bodily receptors and have various biological effects, such as angiotensin converting enzyme (ACE) inhibitory activity. Their biological effects that are produced through enzymatic hydrolysis during food preparation and/or gastrointestinal digestion even though they are not active in the parent protein. Encapsulating these protein-derived active ingredients can improve their stability and protect them from the gastrointestinal tract environment, limiting structural changes and maintaining biological properties. Macroalgal protein hydrolysate showed high ACE inhibition, however, still limits its use in food formulation

due to instability. Therefore, in this study, macroalgal protein hydrolysate obtained Ulva rigida was first purified by ultrafiltration and then ion exchange chromatography, and liposomal encapsulation was performed to increase the stability of the resulting peptide solution. Protein digestibility and ACE inhibition activity were determined for each sample (hydrolysates obtained from enzymatic hydrolysis (PH) and peptide fractions from ultrafiltration membrane separation (UF-P) and ion exchange chromatography processes (IE-P) and peptide encapsulants prepared with liposomal encapsulation (LE-P)) before and after in vitro intestinal digestion. After intestinal digestion, protein digestibility of PH, UF-P, IE-P and LE-P were ~100%. On the other hand, after encapsulation, protein digestibility decreases to ~56%. ACE inhibitory activity, which was initially over 50%, decreased significantly after intestinal digestion. After encapsulation of peptide solution, ACE inhibitory activity was 32.93% intestinal phase. According to the results, macroalgal protein can be digestion approximately 100% in the human gastric system. Moreover, the applied encapsulation method was sufficient to preserve the ACE inhibitory activity of the peptides.

Keywords: ACE Inhibitory Activity, Macroalgae, Peptides, Protein Digestibility

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

INCORPORATION OF AN *ACTINIDIA ARGUTA* FRUIT EXTRACT IN BUCCAL FILMS FOR THE TREATMENT/PREVENTION OF ORAL MUCOSITIS

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Actinidia arguta fruit, commonly known as kiwiberry, offers unique characteristics, being associated with different pro-healthy benefits. These small, smooth-skinned fruit is extremely rich in phenolic compounds, vitamins, and organic acids, which contribute to it nutritional value and antioxidant and anti-inflammatory properties. The growing interest in kiwiberry has inspired the product development innovation, including their application in pharmaceutical industry. For instance, the development of buccal films for the treatment/prevention of oral mucositis (OM), a common side effect of cancer treatments that causes oral inflammation and pain. These films could be painlessly applied, serving as protective barriers, and containing natural bioactive ingredients that reduce the OM symptoms and promote healing.
This study aims to formulate a buccal film with *A. arguta* extract for the treatment of OM symptoms. The buccal film was prepared by solvent casting with 50 g of a 1% HPMC K100 LV EP solution with 2.5% glycerin, using the A. arguta extract as solvent. Several parameters were assessed, including physical features (weight: 194.8 ± 12.0 mg; thickness: 0.37 ± 0.04 mm; disintegration time: 15.05 ± 3.25 min) and mechanical properties (moisture content: 10.53 ± 1.81%; swelling capacity: 55.95 ± 4.17%; resistance to extension; 10.11 ± 2.32 N; percent elongation: 36.10 ± 3.94%; Young's modulus: 3440 ± 1020 MPa). The total phenolic content (TPC; 6.46 ± 0.54 mg GAE/g film) and the antioxidant/antiradical activities (ABTS: 3.74 ± 0.09 mg AAE/g film; DPPH: 4.90 ± 0.54 mg TE/g film; FRAP: 49.45 ± 49.45 µmol FSE/g film) were also evaluated. In vitro cell assays showed the safety of the buccal film, not affecting the viability of HSC-3 and TR146 cell lines (oral cell lines). Additionally, the compounds release profile is also being studied by an in vitro 3D buccal model and ex vivo permeation assays.

Keywords: *Actinidia arguta*, Oral mucositis, Buccal films, Antioxidant activity

TOPIC: FOOD SAFETY & RISK ASSESSMENT

INVESTIGATION OF PORK MEAT MICROBIOME AND ITS ASSOCIATION WITH HUMAN HAND MICROBIOME

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Present study aims to assess the composition and similarity between microbiomes on pork meat and humans handling the carcasses at the slaughterhouse. Pork meat from 12 carcasses with identification number were collected in the carcass processing area over the course of 2 runs (n=6/replicate). The hands from 8 persons were swabbed after carcass processing. The DNA was extracted from the meat and hand swab samples. The 16S rRNA gene was sequenced using Illumina NovaSeq 6000 platform, followed by bioinformatics and biostatistics using different R packages. Overall, the sequenced taxonomic community from 12 carcasses and hand swabbing showed a variation in bacterial genus profiles. The relative abundance of bacterial communities in pork meat were *Acinetobacter, Escherichia_Shigella, Streptococcus, Bacteroides, Moraxella, Clostridium_sensu_stricto_1, Pseudomonas, Fusobacterium, Campylobacter*, and UCG_005 in sequence, whereby the meat products of the first replicate (M1-M6) were more contaminated with Escherichia. In comparison to the hand microbiome of the carcass handlers, the dominant genus found on the hands varied among persons. On the hands, the taxonomic composition was dominated by skin-associated taxa but also taxa that probably originated from the carcasses,

including *Aeromonas, Pseudomonas, Acinetobacter, Escherichia_Shigella*, UCG_005, *Clostridium_sensu_stricto_1* and *Streptococcus* in sequence. The correlation analysis indicated the presence of approximately 20-27 positive correlations between genera in meat and hand samples. Many genera showed positive relationship with more than 3 genera. *Campylobacter* were positively correlated with other pathobionts (i.e., *Mycoplasma, Clostridium_sensu_stricto*_1, and *Helicobacter*). On the handlers' hand, *Christensenellaceae*_R_7_group was positively correlated with *Campylobacter, Helicobacter, Prevotella*, and *Ruminococcus*, indicating an association and potential translocation route of microbes between pig carcasses and the handling people. Therefore, it can be deduced how crucial it is to identify the origin of the meat contamination to minimize the spread of potential pathogens.

Keywords: microbiome, pig, pork, human infection, zoonotic pathogens

TOPIC: DEVELOPMENT OF SUSTAINABLE BUSINESS MODELS IN THE FOOD SECTOR

REFORMING THE FOOD SYSTEMS TOWARDS SUSTAINABILITY: IDENTIFYING THE SAND IN THE WHEELS

Marc Dreyer

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The discussion about the necessity to reform our Food System is all the rage nowadays, and many organisations or institutions, such as the EU, the OECD or the WEF, have developed their own version of a roadmap. They all want to deliver a healthier nutrition, while improving sustainability by decreasing carbon emissions, soil pollution, waste reduction and land use, or enhancing food safety, security, and circularity. Because the Food System is highly complex, and populated with stakeholders of diverging interests, a transition will have to deal with many tensions and frictions, that have to be identified, This means that this

Food Systems transition will face serious obstacles that should be identified and, to be successfully orchestrated, should be anticipated.
We propose in this session to engage a discussion on the issues that we are presently facing in this Food Systems transition, with regulation, incentives, taxation, impact assessment and how it can impart the potential to mobilize the stakeholders, implement a regenerative agriculture, greening further the manufacturing process, accelerate circularity, redesign the supply chains or develop products that meet the emerging consumer needs while mitigating the environmental impact.
The Business and Innovation community must have a clear view of these issues if they want to navigate successfully through the pitfalls of this transition, and it is time to engage in a candid discussion on the hurdles that may be expected in the journey to this Food System transition.

Keywords: food systems, sustainability, transition

SESSION 7

Oral Presentations – Continued

Moderators
Prof. Mihaela Adriana Tiţa, Sibiu, Romania
Associate prof. Ion Mironescu, Sibiu, Romania

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

INVESTIGATION OF THE EFFECT OF ATMOSPHERIC PRESSURE PLASMA DISCHARGE ON FOOD POWDER ADHESION ONTO CORN CHIP SURFACES

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Coating with seasoning or aroma powders significantly influences consumer acceptability in snack food processing. The conventional method of coating the powder material onto the snack food product surfaces is using a liquid application that uses oil or syrup in the process, which has drawbacks of uneven distribution of powder material and consumption of excessive calories. The need for an environmentally friendly, cost-effective, and practical method is in the industry's interest. This study studied the effect of atmospheric pressure plasma (APP) treatment on the enhancement of model food powders' adhesion properties. After the APP treatment, an improvement of up to 45% was achieved in the adhesion strength of powder samples. The adhesion strength increased up to 2 times after Nitrogen plasma application, while Oxygen plasma showed a lower effect. The highest increase in adhesion strength was obtained from a 100-200 μm size fraction, and the least increase was noted for a 0-60 μm size fraction. Further research needs to be undertaken to better understand the influence of the plasma treatment on powder adhesion using different parameters and setups.
Financial support by Istanbul Sabahattin Zaim University through Technology Transfer Office is gratefully acknowledged (Grant Number: IZU-BAP-2022-1000-97).

Keywords: Atmospheric plasma, Snack food, Powder adhesion, Seasoning powder, Aroma powder

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EXTRACTION RATE ASSESSMENT OF COLD-PRESSED BLACK CUMIN (*NIGELLA SATIVA L.*) SEED OIL WITH VARIED PRETREATMENT METHODS

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In recent years, there has been a surge in interest surrounding oils extracted from non-traditional seeds, driven by consumers' desire for healthier diets rich in monounsaturated and polyunsaturated fatty acids, as well as antioxidant phenolic compounds. Among these non-traditional seeds, *Nigella sativa L.*, commonly known as black cumin, stands out due to its remarkable phytochemical content, which boasts potent antioxidant properties and various health benefits. The seeds of black cumin are an abundant source of oil, containing essential fatty acids, phenolic compounds, tocopherols, and sterols that contribute to human health and nutrition.
This research focuses on the extraction of black cumin seed oil using the cold pressing method, while exploring the impact of different pretreatment techniques, including heat treatment, microwave, ultrasound pretreatment, and PEF (pulsed electric field) method.
The various pretreatment methods applied to black cumin seed oil extraction exhibited distinct impacts on the oil yield. PEF (pulsed electric field) method, for instance, resulted in a remarkable increase in extraction yield, with values reaching up to 18% higher compared to the non-pretreated seeds. Microwave pretreatment, on the other hand, showed a moderate improvement, contributing to a 10% increase in oil yield. Ultrasound pretreatment displayed similar effectiveness, enhancing the extraction yield by approximately 14%. In contrast, heat treatment of the seeds yielded a marginal increase of around 9% in oil extraction. These findings highlight the significance of pretreatment techniques in enhancing the efficiency of cold pressing for black cumin seed oil extraction.
This statistical analysis was carried out using STATISTICA 10 software, employing one-way analysis of variance (ANOVA) for data analysis.
This research sheds light on the effects of different pretreatment methods on the quality of cold-pressed black cumin seed oil, providing valuable insights into its shelf life and potential applications in the food and health industries.

Keywords: *Nigella sativa L.*, oil extraction, cold pressing, pretreatment, pulsed electric field

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

PROTEIN EXTRACTION, PURIFICATION AND CHARACTERIZATION FROM MICROALGAE *PHAEODACTYLUM TRICORNUTUM* BY-PRODUCT BIOMASS

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Due to their rapid growth rate and high-value metabolites, microalgae are a good source for extracting products of biological interest, such as polyunsaturated fatty acids, pigments, polysaccharides or proteins. Industrially, the microalgae *Phaeodactylum tricornutum* is often produced to extract dietary essential omega-3 fatty acids, such as eicosapentanoic acid (EPA) or docosahexenoic acid (DHA) by using supercritical CO2 as extraction solvent. This extraction produces a spent biomass by-product which can make up more than 90% of the initial algae biomass and contains many other interesting compounds that can be extracted. A general compositional characterisation revealed a large amount of protein that could be extracted from the residual biomass. Protein extraction and precipitation was optimised using water as a solvent, changing the pH of the medium from 12 to 2 and coupling ultrasound-assisted extraction for 2.5 minutes to improve the extraction yield. A precipitation yield of 35-40% was obtained with a 50% purity in the precipitate, which was further improved with dialysis. Finally, the foaming and emulsifying properties and the oil and water retention capacity of the precipitate were evaluated, showing good results and opening the door to its use as nutritional/technological additive in food or cosmetics.

Keywords: Microalgae, protein, valorization

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EFFECT OF HIGH-PRESSURE ASSISTED EXTRACTION OF CHITIN AND CHITOSAN FROM SHRIMP BYPRODUCT

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Shrimp by-products are mainly used as raw material for the extraction of chitin and its deacetylated derivative chitosan. Chitin is a highly versatile biopolymer and the second most abundant polymer in nature. Chitosan is obtained from chitin by the process of deacetylation. The conventional chemical approach to obtaining chitin/chitosan has drawbacks and poses many environmental problems. Recently, significant progress has been made in the development of more environmentally friendly processes for obtaining chitin/chitosan through innovative extraction methods. Chitin and chitosan have valuable biological properties (antimicrobial; antioxidant) that make them very promising for improving food safety, quality and shelf life in the food industry. The aim of this study was to investigate the effects of high-pressure processing (HPP) on the physicochemical properties of chitin and chitosan extracted from shrimp by-products. Chitin was extracted from rose and red shrimp by-products. Three pressure levels (400, 500, and 600 MPa) were applied to raw shrimp shells for 10 min, after which chitin was extracted by thermochemical processes. Chitosan was recovered by deacetylation processes after 4 and 18 h at 80°C with 50% NaOH solution and a solid to solvent ratio of 1:10 (w/v). The recovered chitin and chitosan were characterized by FT-IR spectroscopy, differential scanning calorimetry (DSC) measurements, water holding capacity, fat holding capacity, yield, color, dry matter, and ash content. The highest yield of chitosan extracted from raw shells

(22.32%) was obtained with the 500MPa treatment for the red shrimp. HPP pre-treatment was significantly effective in improving fat binding capacity, water binding capacity of chitin/chitosan samples and water solubility index of chitosan samples. HPP can be an excellent alternative method to improve the yield extraction rate and physicochemical properties of chitin and chitosan. This research was funded by Era-Net BlueBio project "IMPRESSIVE-Improved Processing to Enhance Seafood Sidestream Valorization and Exploration", RCN-grant number 341732.

Keywords: Seafood processing, Chitosan, High hydrostatic pressure, Physicochemical properties

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EFFECT OF COLD PLASMA ON SARDINE FILLETS SHELF LIFE

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Cold atmospheric plasma (CAP) is a mixture of reactive species, including reactive oxygen species (ROS) and reactive nitrogen species (RNS) (such as ozone, superoxide, hydroxyl radicals and nitric oxide, together with UV radiation and charged particles. It has been shown as a promising technology for microbial decontamination of foods. However, its effect on seafood products has not been fully investigated. Therefore, the aim of this work was to evaluate the microbial decontamination and evolution during 13 days of storage at 4 °C in sardine fillets

processed with CAP using the device "Plasma Assisted Sanification System" (PASS), developed by AlmaPlasma srl (Bologna, Italy) in NOx-mode=332,9 W for 30 min. During storage, the presence of biogenic amines, the extent of lipid oxidation and the sensorial profiles of the fillets were also assessed.
The initial microbial loads were only slightly affected by the CAP treatment, however, during storage, a microbial inhibition was observed for CAP treated samples compared to untreated ones. Similarly, starting from day 8 a significant increase of biogenic amines such as putrescine, cadaverine and tyramine were observed in non-treated fillets. Sensorial profile confirmed these results, as the CAP treated fillets scored higher values compare to the control ones until the end of the storage. Therefore, CAP treatment confirmed its ability to increase the shelf-life of sardine fillets, ensuring product safety.
The present work is part of the project "PRIN 2017 -PLASMAFOOD - Study and optimization of cold atmospheric plasma treatment for food safety and quality improvement" founded by MIUR - Ministero dell'Istruzione dell'Università e della Ricerca.

Keywords: Decontamination, biogenic amines, lipid oxidation, sensorial quality

SESSION 7

Oral Presentations – Continued

Moderators
Prof. Teodor Trască, Timisoara, Romania
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TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

NANOPARTICLES FORMED FROM ETHANOL-TREATED WHEY PROTEINS: EFFECT ON THE PHYSICOCHEMICAL AND SENSORIAL PROPERTIES OF YOGURT-TYPE PRODUCTS

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Under different environmental conditions, whey proteins treated with ethanol can self-assemble into nanoparticles with modulate size, morphology, and physicochemical properties. These nanoparticles can be used to improve the physicochemical properties and structural characteristics of dairy products, such as yogurt. This study investigated the effect of nanoparticles, derived from ethanol-treated whey proteins, on the physicochemical and sensory attributes of yogurt-type products and the potential use of these nanoparticles as fat replacers.
Nanoparticles were prepared at varying ethanol concentrations (30–70% w/w) and low protein concentrations (1.0–2.0% w/w) by controlling pH and ionic strength. The ethanol was then removed by freeze drying. The resulting nanoparticles were incorporated into skimmed milk powder, which was used to produce yogurt-type products. Laser diffraction analysis, confocal laser scanning microscopy and rheology were employed to characterize the nanoparticles and assess their impact on the physicochemical properties of the resulting yoghurts. Furthermore, the acidification kinetics and the sensory characteristics of the yogurt type products were evaluated.
It was found that the inclusion of whey protein nanoparticles modified the physicochemical properties of the yogurt products. Consequently, nanoparticles obtained from ethanol-treated whey proteins could be used as a promising substitute of fat in food products.

Keywords: Nanoparticles, Ethanol denaturation, Yogurt-type products

TOPIC: DEVELOPMENT OF SUSTAINABLE BUSINESS MODELS IN THE FOOD SECTOR

THE ROLE OF FOOD SOCIAL ENTERPRISES IN DESIGNING SUSTAINABLE AND CIRCULAR CITIES OF TOMORROW

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The growing problem of environmental pollution, including waste generation and climate change, is forcing public administrations to take action to meet residents' basic needs. In the era of negative environmental phenomena, it could become increasingly difficult. One of the concepts aimed at limiting the adverse effects of pollution is sustainable and circular cities. The foundation for cities designed in this way is the development of initiatives supporting climate change adaptation and efficient use of resources. To make this possible, public administration should create a cooperation network with various stakeholders to implement the assumed goals jointly. Social entrepreneurship entities are an example of such a group, which, thanks to their knowledge, experience and relationships with the local community, can play an essential role in transforming cities towards sustainability and circularity. The presentation will present the idea of social cooperation of exemplary social enterprises operating in the food field in Sheffield, UK. The presence of social enterprises in local communities allows the implementation of sustainable development goals in a way that engages and supports residents to adapt to changing environmental conditions. The presentation illustrates how community supported agriculture can be applied in practice.

Keywords: food social enterprise, sustainable city, circular city, sustainable food production, community supported agriculture

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

BIOREFINING OF MICROALGAE TO PREPARE NOVEL HIGH ADDED VALUE INGREDIENTS

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The microalga *Tetraselmis chuii* is a promising source of various potentially valuable biomolecules. However, the extraction and the recovery of these compounds with improved quality remains a technological challenge due to the inherent problems linked to their availability and stability. In this study, water-soluble compounds, notably *T. chuii* proteins, were extracted by maceration, and recovered by membrane filtration. Firstly, the optimization of the maceration process was done by means of a design of experiments (DoE) with response surface methodology using Box-Behnken design. The effects of three operating parameters including solid/liquid ratio (0.5-7.5 g/L), pH (6-12), and temperature (25-45°C) were investigated. Secondly, ultrafiltration was applied on supernatant obtained after centrifugation, testing membranes with different cut-off (3,

15, 50, 150 et 300 kDa). All membranes were compared based on their hydraulic performance, recovery and retention rates and selectivity. A high protein extraction yield (78.38%) was achieved under the following optimal aqueous extraction conditions: biomass concentration 7.5 g/L, 20°C and pH 12. Furthermore, soluble protein recovery was significantly affected by the three variables tested. Regardless of the membrane used, yellow permeates, poor in chlorophyll, were successfully produced. All filtrations using five membranes with different cut-off showed similar protein concentration levels with a purity index between 13 and 16%. In addition, filtration on a 300 kDa membrane showed a 67% increase of protein recovery in the retentate compared with other membranes. The study also concludes that increasing the cut-off of the membrane does not necessarily increase the permeate flux and the yield of proteins recovered in the permeate phase. Considering this conclusion and the highest protein yield of recovery obtained after maceration, a combination of this treatment and fractionation by ultrafiltration using a 300 kDa membrane cut-off would be the best route to achieve an enriched protein fraction for this species.

Keywords: *Tetraselmis chuii*, Protein, Maceration, Membrane filtration, Biorefinery

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

NATURAL PRESERVATION: EVALUATING THE IMPACT OF POMEGRANATE JUICE ON PORK MEAT SHELF LIFE

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Meat is of essential importance for human's diet because of its high protein content, including essential amino acids, fatty acids, vitamin B12 and minerals

such as iron and zinc. Shelf life is the key characteristic of fresh meat that determines consumer acceptance and ensures its safe consumption. Marination, a time-honored practice, has been widely employed to enhance the flavor, tenderness and texture of meat. Moreover, this practice aligns with the consumers' growing preferences for convenient, longer-lasting, and ready-to-cook meat products, making marination an increasingly popular technique in the meat industry. Among the various marination options, fresh juices rich in antioxidants such as pomegranate juice can offer interesting alternatives as natural preservatives. Thus, the aim of the present study was to evaluate the effect of marination with pomegranate juice on the physicochemical, technological, and microbiological properties throughout storage (12 days at 4 °C) of fresh pork meat under control (wrap) and vacuum packaging. A significant reduction on the total viable count (TVC), *Pseudomonads* spp, Lactic Acid Bacteria (LAB) and *Enterobacteriaceae* highlighted the ability of the pomegranate juice to increase the microbiological stability of the pork meat. The pH was decreased after marination and remained lower compared to the control samples throughout storage. The marinated samples exhibited a substantial increase in antioxidant activity and total phenolic content, demonstrating significant differences compared to the control samples. Color measurements indicated satisfactory results in terms of improved preservation; however, the obtained color may not be as visually appealing to consumers. Moreover, cooking loss has increased among marinated samples compared to the control ones. In summary, the utilization of pomegranate juice as a marinade for pork meat demonstrated several beneficial effects. These findings hold significant implications for the meat industry, as the combined effects of marination and packaging substantially extended the shelf life of pork meat.

Keywords: marination, pomegranate, pork, packaging, shelf life, natural preservation

TOPIC: DEVELOPMENT OF SUSTAINABLE BUSINESS MODELS IN THE FOOD SECTOR

FOOD SYSTEMS IN UNIVERSITIES: A SUSTAINABLE APPROACH IN THE CONTEXT OF SAFETY AND QUALITY ASSURANCE

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This paper raises awareness of the importance of involving universities in the process of sustainable development in relation to food systems and with the implementation of food quality principles on consumer safety. This paper aim is to explore the concept of implementing a sustainable approach to food systems in universities by presenting good practices in order to create a food system that supports environmental, social, and economic well-being, both on campus and beyond, this includes attention to consumer health by ensuring the availability of quality, safe products. With the increasing global concern for sustainability and the growing recognition of the impact of food systems on the planet, universities have a unique opportunity to lead by example and promote sustainable practices within their campus food systems. The circular economy perspective is of great importance in universities as it promotes sustainability and responsible resource management. A sustainable approach to food systems in universities refers to the creation and implementation of practices and policies that promote the production, distribution, consumption, and disposal of food in a manner that is environmentally, socially, and economically sustainable in a context of good hygiene practices. This paper presents key components of sustainable food system development in universities with references from the specific literature and professional organisations.

Keywords: food system, safety and quality assurance, sustainable development, circular economy, universities

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

MANAGEMENT OF APPLE INDUSTRIAL BY-PRODUCTS – A CASY STUDY ON CIRCULAR ECONOMY APPROACH

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Current research aims to obtain sourdough naturally from the fermentation of the by-products resulting from the industrial processing of apples of the Idared and JonaGold varieties and to identify sustainable solutions regarding their use in various quality bakery products under a circular economy perspective.
The management of industrial apples by-products is important to decrease the volume of food waste addressed to landfills but also to develop strategies through reusing by-products, with the purpose of both their valorisation and economic value increase. The elimination of some waste sources thanks to the fruit processing industry would solve some global problems with beneficial effects for the environment and economy.
The residues resulting from apple processing represent a rich source of valuable compounds (polyphenols) with high antioxidant activity that can be used after drying as additives in bakery products, showing industrial scale feasibility. The results of the present research also include the analysis of the influence of using these residues on the textural properties, using Perten texturometer, as well as on the porosity and volume of the bread using 3D scanning technique.

In this context, the management of apple by-products represents a challenge regarding the transition to the circular economy.

Keywords: apple by-products, porosity, textural parameters, bakery products

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

QUALITY OF ASPARAGUS SPEARS AS AFFECTED BY CULTIVAR AND PRODUCT TYPE

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The present research was aimed to verify the possibility to practise an eco-compatible production of asparagus shoots (spears), both as 'fresh' and processed product, taking into account that most of the spears are addressed to the "fresh" market but the industrial product has been increasingly produced for the last two decades. The experiment was carried out in the province of Naples (Italy) on asparagus, with the aim to evaluate the qualitative properties of spears, depending on the crop system and the product type. Organic crops produced better spear quality in terms of higher level of residues and sugars and lower content of nitrate and fibre, compared to the conventional ones. The "appertized" spears obtained from freshly harvested asparagus had a greater drip yield than those frozen at -5°C for a month. Between the three processing types compared (patè, in oil, in water), the patè spears showed the greatest overall richness in organic and mineral components, those "in oil" had the highest levels

of vitamin C, and water treatment caused the less appreciable intrinsic qualitative characteristics. From this research it arose that organic farming had a positive impact on some important quality parameters of asparagus spears and the spears processed as 'patè' showed an overall better quality than those 'in oil' or 'in water'.

Keywords: *Asparagus officinali L.*; fresh spears; patè; spears in oil; spears in water; fiber

SESSION 8

POSTER SESSION

Introduction to the poster session
Lecturer Otto Ketney, Sibiu, Romania

THE VIRTUAL POSTER ROOM WAS HELD IN ZOOM.
ALL POSTER PRESENTERS WERE PRESENT IN THEIR DEDICATED ZOOM BREAKOUT ROOMS.

TOPIC: HEALTH AND NUTRITION

INVESTIGATING THE PHYSIOLOGICAL ROLE OF A PROBIOTIC YOGHURT CONTAINING MICROCRYSTALLINE CELLULOSE ON GUT MICROBIOME AND SHORT-CHAIN FATTY ACIDS PROFIL

Charikleia Kyrkou[1]; Asterios Stamkopoulos[1]; Panagiota Tsafrakidou[1]; Kallirroi Babi[1]; Argyrios Doumas[2]; Georgios Menexes[3]; Costas G. Biliaderis[1]; Alexandra-Maria Michaelidou[1]

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In recent years, probiotics have gained significant interest among researchers due to their potential health benefits attributed to their ability to modulate the gut microbiome and short-chain fatty acids (SCFAs) production (Huang et al., 2022). Simultaneously, preliminary studies have revealed that reducing cellulose particle size to micro-sized fiber powder can effectively promote SCFAs yields, probably due to the changes in its physicochemical properties (Lu et al., 2015). Toward this direction, this study investigated the potential impact of probiotic yoghurt containing microcrystalline cellulose (MCC) on the diversity of the gut microbiome and the fecal SCFAs. Forty healthy adults aged 19-49 old with a mean body mass index of about 25 kg/m^2 were randomized into four groups for receiving the following dietary interventions (1:1:1:1): 1. ProYo, yoghurt containing probiotic components (*Bifidobacterium animalis* ssp. lactis BB-12), 2. PreYo, yoghurt containing MCC, 3. ProPreYo, yoghurt containing both *Bifidobacterium animalis ssp. lactis* BB-12 and MCC, 4. control, conventional yoghurt. The total duration of the study was four weeks. At the baseline and the end of the trial, participants provided information regarding sociodemographic, health and lifestyle characteristics, and dietary data were collected via an interview-administered food frequency questionnaire. Furthermore, fecal samples were collected. No undesired health effects were reported. The findings obtained from this study provide insights into the potential role of MCC in counteracting dysbiosis and improving host health. However, given that randomized controlled trials (RCTs) are the highest level of evidence, further studies in larger population groups are recommended to explore the exact effects of MCC on gut microbiome.

Acknowledgement
This work has been co-financed by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship, and Innovation, under the call RESEARCH – CREATE – INNOVATE (T2EDK-02242).

Keywords: microcrystalline cellulose, probiotic, yogurt, gut microbiome

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EFFECTS OF FOOD ADDITIVES ON COLOR CHARACTERISTICS AND PH OF CANNED BEANS

Eleni Gatsouli; Anna Marinopoulou; Dimitrios Petridis; Stylianos Raphaelides

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Poster presentation author: Anna Marinopoulou

Beans belong to the *Fabaceae* family. They are rich in plant protein and are excellent sources of fibers, vitamins, and minerals. Canned beans are a convenient and popular food product that has a variety of uses in cooking. In this study, the effects of food additives (citric acid, sodium metabisulfite, and rosmarinic acid) on the color parameters i.e. Lightness (L*), a*, b*, Hue angle (H°), Chroma [C*] as well as pH of canned beans were investigated. The beans were canned in either water or tomato sauce with food additive concentrations ranging from 0.1 to 1%. Significant differences in colour values were observed between the canned beans in water or tomato sauce, both with and without the addition of citric acid, sodium metabisulfite, and rosmarinic acid. Statistical analysis indicated that the canned beans in tomato sauce containing food additives displayed reduced L* and H° values when compared to their counterparts in water. On the contrary, the canned beans in water with food additives exhibited significantly higher a*, b*, and C* values than the canned beans in tomato sauce. The pH of canned beans in water without the presence of food additive (control) was 6.17, whereas in tomato sauce, it was 5.51. The lowest recorded pH value was observed in canned beans with tomato sauce containing 1% citric acid, and it measured 3.88. In general, canned beans in water had higher pH values than those in tomato sauce. Overall, it is suggested that the incorporation of food additives had a positive impact on improving the appearance of canned beans.

Keywords: Canned beans, citric acid, rosmarinic acid, sodium metabisulfite

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

THE EFFECT OF STORAGE TIME ON THE PHYSICOCHEMICAL AND MECHANICAL CHARACTERISTICS OF KIWI VARIETIES

Maria Kikidou ; Vasiliki Nina Filiousi; Fotini Lapantoni; Anna Marinopoulou; Dimitrios Petridis; Stylianos Raphaelides

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Kiwifruit is a member of the *Actinidiaceae* family and is a fruit rich in vitamin C and fiber, providing numerous health benefits. The Actinidia fruits are characterized by juicy pericarps containing numerous black seeds. This study was conducted in order to investigate the impact of storage time after harvesting the kiwi fruits for preservation time on the physicochemical (pH, acidity, brix) and mechanical properties (hardness) of two types of kiwifruits: the green-fleshed *Actinidia deliciosa* and the yellow-fleshed *Actinidia chinensis*. A comparative analysis of the physicochemical and sensory attributes between yellow-fleshed and green-fleshed kiwifruit was also performed. Results revealed that the green variety has a post-harvest preservation time of six months under suitable storage conditions, while the yellow variety has a post-harvest preservation time of three months. Textural analysis showed that the cutting shear and penetration force was higher for green kiwis than for yellow ones. During storage, the maximum cutting shear and penetration force of green kiwis decreased, while for yellow kiwifruit, the highest force cutting shear value recorded one month after harvesting followed by a subsequent decrease. These results were also verified by sensory evaluation. A statistical difference was observed in dry matter, acidity, and Brix values between yellow-fleshed and green kiwifruits, with yellow kiwifruits exhibiting higher values. However, the panellists found the green kiwifruit to be more likable than the yellow kiwifruit.

Keywords: *Actinidia* fruits, green-fleshed *Actinidia deliciosa*, yellow-fleshed *Actinidia chinensis*

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EVALUATING THE FUNCTIONAL PROPERTIES OF SPRAY-DRIED AQUAFABA: A COMPARISON BETWEEN DRYING CHAMBER AND COLLECTION FLASKS

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This research investigated the functional properties of spray-dried aquafaba, a byproduct of chickpea cooking, to enhance the efficiency and utility of this often-discarded material. The study compared the characteristics of aquafaba powders obtained from the drying chamber and collection flasks under two different spray drying settings: intermediate intensity (170°C inlet air temperature, 6 mL/min feed flow rate, 80 m^3/h) and high intensity (170°C inlet air temperature, 4 mL/min, 92 m^3/h). The product yield, which was calculated based on the amount of powder from the collection flasks, was found to be less than 50% in both settings, pointing to a low level of productivity. No significant differences ($p>0.05$) were determined between the powders from different sources in terms of bulk density, solubility, flowability, water and oil holding capacities, creaming index, and foam stability under both drying conditions. Despite noticeable color variations, the comparable functional properties of the aquafaba powders from different sources suggest their interchangeable use in food applications, potentially making the spray drying process more efficient and productive. This study serves as a foundation for the further exploration and enhancement of aquafaba utilization in food industry applications, contributing to waste reduction and sustainable food production.

Keywords: aquafaba, spray drying, product yield

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

APPLICATION OF MICROWAVE TREATMENT TO REDUCE ANTINUTRIENTS IN LUPINE SEEDS

Imants Jansons; Vita Šterna; Zaiga Jansone; Maryna Zhylina

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Obtaining plant protein of local origin is becoming more important, especially in countries where soy is not grown enough, such as in Latvia. Unfortunately, in addition to a rich range of nutrients, lupine seeds also contain various anti-nutrients - alkaloids, phytates, tannins, etc., so they can only be used after thermal or enzymatic treatment. One of the less studied methods of processing legumes is short-term microwaving, which raises the temperature of the product/raw material and provides the possibility of reducing its anti-nutrient content. However, research data is contradictory and there is no information about the effect of microwaves on amino acid composition and other nutrients. The aim of the study is to obtain data on the possibilities of microwave radiation to reduce the amount of anti-nutrients in lupine seeds.
Processing in a microwave oven was carried out for lupine of the variety "Derliat": ground seeds processed for 2 min, unground seeds processed for 2 min, ground seeds processed for 6 min.
Testing of chemical composition of lupine seeds was performed by standard methods - protein (LVS EN ISO 5983-2:2009), fat (ISO 6492:1999), fiber (ISO 5498:1981), starch (LVS EN ISO 10520:2001). Urea ISO 5506:1988
The results of the study show that microwave treatment reduces the alkaloid content of lupine seeds and significantly reduces urease activity. Alkaloid content is affected by the duration of treatment, but whether the sample was processed ground or unground are not affected. Urease activity decreased from 0.17 mgN/g/min to 0.14 mgN/g/min after 2min and to 0.03 mgN/g/min after 6

min. The content of protein, total fat, fiber and starch does not change significantly during processing.

Keywords: lupins, antinutritives, microwave, food

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

EXTRUSION AS AN INNOVATION PROCESSING METHOD FOR PROTEIN EXTRACTION FROM GREEN MICROALGA (*TETRASELMIS CHUII*) BIOMASS

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Recognized in diverse sectors, microalgae research expands in developing adapted technologies. In the field of energy and food processing, interest in microalgae has risen due to its high protein content and multiple valuable compounds. The extrusion process applied to microalgae is not well developed. It is mainly used to texturize, structure or mix plant based proteins in order to produce protein enriched products like meat analogues. Regarding protein extraction or co-extraction with the extrusion process, few studies have been done with plants. However, there is currently no studies on protein extraction from

microalgae using this continuous thermomechanical process. This study aimed to evaluate the effectiveness of extrusion on cell disruption of a green microalga *T. chuii* with a twin-screw extruder for the protein extraction, compared to a conventional maceration method. The optimization of the extrusion process was done by means of a design of experiments (DoE). The experimental design was conducted with response surface methodology using Box-Behnken design. The effects of three operating parameters including flow rate (1-5 kg/h), temperature (25-45 °C), and screw rotation speed (100-400 rpm) were investigated. Optimization of the extrusion process allowed to uncover selected factors' influence on protein extraction as well as optimum conditions for extraction. Soluble protein recovery is significantly affected by temperature, flow rate and screw rotation speed according to model analysis. Also, low temperature, low flow rate and high screw rotation speed gave higher protein yield. Under the optimized extrusion conditions, maximum protein yield reached 25.02%. Moreover, it was found that the maceration process did not allow to recover more than 16.42% of protein. Therefore, the extrusion process was demonstrated more efficient than maceration regarding protein yield and time consumption. This study confirmed that extrusion is a promising large scale method for the extraction of microalgal protein.

Keywords: *Tetraselmis chuii*, Protein extraction, Twin-screw extrusion, Process optimization, Maceration

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

POTENTIAL OF PORTABLE NEAR-INFRARED SPECTROMETER FOR EVALUATION OF GRAPE SKIN COMPOSTING PROCESS

Korina Krog; Davor Valinger; Jasenka Gajdoš Kljusurić; Tamara Jurina; Maja Benković; Ivana Radojčić Redovniković; Ana Jurinjak Tušek; Tea Sokač Cvetnić

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Introduction: Composting is considered an environmentally acceptable and cost-effective process for processing organic waste and has significant potential to contribute to the circular bioeconomy. During the composting process, polymer waste materials are broken down, caused by the growth of various microorganisms, such as fungi and bacteria. During the composting process, a large number of time-consuming physical and chemical analyses, microbiological analyses, and enzyme activity analyses are carried out. So there is a great need and interest in developing new and fast methods for analyzing and controlling the composting process. Spectroscopic methods are considered a fast measuring system for online measurements needed for quality control of the composting process.
Aims: The potential of a portable near-infrared (NIR) spectrometer (range 900-1700 nm) for the evaluation of the grape skin composting process was analyzed.
Materials and methods: Five composting experiments were carried out with different pretreatments of grape skins (grape skin without pretreatment, crushed grape skin without pretreatment, grape skin extracted at 40 °C for 90 min, crushed grape skin extracted at 40 °C for 90 min, and a mixture of skins without pretreatment and treated skins) in laboratory composters (V = 5 L) with continuous aeration for 30 days. Physical and chemical analyses, microbiological analyses, and NIR spectra of compost samples were collected dynamically every 48 hours of the process.
Results: Developed ANN models for predicting compost physical and chemical properties based on raw NIR spectra that describe moisture content, organic matter content, ash content, carbon content, total compost colour change, pH, total dissolved solids (TDS), and total color change of the compost extract showed high precision (R2 validation >0.75).
Conclusion: The results showed a significant potential of NIR spectroscopy in composting process analysis

Keywords: composting, grape skin, NIR spectra, ANN models

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

RECOVERY IN AN INNOVATIVE WAY OF THE WASTE RESULTING FROM THE OBTAINING OF FRUIT JUICE

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Most people buy more food than they need because it is offered, either in larger quantities or cheaper. Reducing food waste creates savings for both consumers and producers. Recovery and reuse of surplus food that would otherwise be lost, contributing to food security, biodiversity, bioeconomy, waste management and renewable energy. After processing the fruit to obtain the juice, we have waste that can be used to make a good profit. Food waste due to crops left in the field in the years when the product is harvested and processed, the price is higher than the selling price, this due to the lack of proper machinery. Losses during transportation, storage, processing, food waste due to too high conditions, misuse of stocks, too much unsold food is approaching expiration dates (a production controlled according to market demand) we reduce losses and how to profit. to the maximum of waste produced during the extraction of fruit juice. We will discuss safe packaging without additional waste generation and reusing the resulting processing waste in an innovative way.

Keywords: apple juice, waste, reuse

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

PEF PRE-TREATMENT ON GOAT MILK PASTEURIZATION

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Goat milk is an interesting product from a nutritional and health standpoint, although its physical-chemical composition presents some technological challenges, mainly for being less stable than cow's milk at high temperatures. The effect of high temperatures treatments on physical and organoleptic properties, like nutritional losses, color modifications, and flavor changes have led to an exploration of emerging technologies to produce milk products with better retention of nutrients and fresh-like characteristics of milk components. Pulsed electric fields (PEF) technology is one of those emerging technologies that has been considered alternative to pasteurization technology. In this study, we demonstrate that the combined use of pulsed electric fields with a short thermal processing and moderate temperature can be effective and energy-efficient in the processing of goat milk. For nonthermal processing of raw goat milk, a low-intensity PEF equipment was used (EPULSUS®-LPM1A-10) for laboratory scale followed by a thermal treatment using temperatures in the range of 63-75ºC, and a holding tube of 2 s. Enumeration of the surviving cells was performed after decimal dilution in a series in maximum recovery diluent of the samples taken, and incorporation into MRSA for counting L. salivarius. The pH, TA and TSS of untreated and PEF-processing samples were carried out at room temperature (20±2 ºC) according to the AOAC (2016) standard methods. In goat's milk the combined use of PEF and mild temperature allowed to obtain a 5.002 ± 0.029 log CFU ml-1 reduction after the PEF treatment combined with a heat treatment for 2

s at 75°C. In the absence of the PEF pre-treatment, the reduction obtained was just of 2.858 ± 0.117 log CFU ml-1. The average values of pH (6.76±0.03) and total soluble solids (10.70±0.26) in raw milk did not change after the treatment.

Keywords: pulsed electric fields, goat milk, pasteurization

TOPIC: NEW METHODS OF PROCESSING RAW MATERIALS, WASTE AND BY-PRODUCTS IN FOOD PRODUCTION

VALORIZATION OF THE GRAPE POMACE BY USING THE ACTIVE PRINCIPLES IN ANIMAL FEED

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The wine-viticulture industry has experienced a remarkable development in the last development, given that technology and biotechnologies have also gained unprecedented momentum. But an increasingly interesting and current segment is the study and exploitation of wine by-products.
Following the processing of raw materials to obtain products intended for animal and human consumption or the obtaining of biogas, significant quantities of secondary products known as industrial residues, by-products or waste result. These industrial residues were to a small extent processed and exploited as new sources of raw materials for human or animal food.
For many of them, further studies are needed to understand their mechanisms of action and to optimize the rate of inclusion in feed formulas for farm animals. The pomace (pulp, bunches and skins of grapes), although known from a scientific point of view, is of particular interest for zootechnical practice.

Grape pomace has a high content of unsaturated fatty acids (79.92%), and among them polyunsaturated fatty acids have an important weight (61.98%). Linoleic acid, n-6 (58.99%) dominates the other polyunsaturated fatty acids in the highest concentrations. Considering the high level of polyunsaturated fatty acids found in dry cranberries (61.98%) along with the low concentrations of saturated fatty acids (19.71%), we consider that this by-product can be a promising source of polyunsaturated fatty acids for animal feed.
The use of dry pomace leads to the improvement of the quality indices of the carcass and to the obtaining of carcasses with a percentage of meat in the carcass of over 55%. Dry pomace, due to its residual oil content of approximately 5%, in which polyunsaturated fatty acids predominate, but also due to natural antioxidants such as polyphenols, is a by-product with high nutritional value, which can be incorporated into the feed recipe intended for animals in the growing phase fattening-finishing.

Keywords: animal food, grape pomace, fatty acid

TOPIC: SUSTAINABLE ECODESIGN FOR FOOD

OPTIMIZATION OF ULTRASOUND-ASSISTED EXTRACTION OF PROTEINS FROM *SPIRULINA PLATENSIS*

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Introduction: Microalga *Spirulina platensis* is becoming a viable source for producing highly nutritive food ingredients to meet the needs of the world's population. It is used in human nutrition due to its high protein content (up to 70 % w/w), as well as the number of important amino acids it contains and its good digestibility. Numerous extraction techniques can be used to recover proteins

from microalgae, but the primary goal is still to rupture the microalgae's cell membrane and release intracellular material, which would allow the protein to be extracted from the microalgae. Process variables such as the solid-to-solvent ratio, solvent concentration and composition, extraction temperature, and extraction time all have an impact on extraction efficiency.
Aims: Optimization of the extraction process of proteins in order to maximize protein extraction and determine the independent and interactive impacts of different process parameters on extraction yields.
Materials and methods: In this work, the effect of solid-to-solvent ratio, extraction time, pH and temperature on the extraction efficiency of ultrasound-assisted extraction (ultrasonic bath with an ultrasound frequency of 35 kHz) of proteins from *Spirulina platensis* was analyzed. According to the Box-Behnken design of the experiment, 30 independent experiments were performed, and total phenolic content, antioxidant activity (DPPH and FRAP), and total protein concentration (Bradford method) were measured for each individual extract.
Results: Based on the response surface model (second-order polynomial equations with linear interaction coefficients) analysis, the optimum extraction conditions were: solid-to-liquid ratio of 35 g/L, extraction time of 20 min, pH of 10, and extraction temperature of 45 ºC. Under specified conditions, TPC was 17.31 mg/gd.m., DPPH was 0.024 mmol/gd.m., FRAP was 0.023 mmol/gd.m., and the total protein concentration was 1.99 mg/mL.
Conclusion: The optimal conditions for protein extraction were successfully determined.

Keywords: *Spirulina platensis*, ultrasound-assisted extraction, proteins, optimization

TOPIC: HEALTH AND NUTRITION

RESEARCH ON THE ADVANTAGES OF APPLE JUICE CONSUMPTION FOR THE HUMAN BODY AND POSSIBILITIES TO IMPROVE ITS QUALITY WITHOUT CHANGING ITS TASTE

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Natural apple juice is appreciated due to its special taste and rich content of vitamins and antioxidants, providing the human body with the necessary elements for proper functioning. The production of apple juice has increased a lot lately because apples are easy to buy compared to other fruits, they are not very perishable, they are kept for a long time without losing their properties and because of the beneficial effects on health. Apple juice is low in sodium, has a diuretic effect, low cholesterol and fat, a high concentration of vitamin C, polyphenols and antioxidants that play a significant role in preventing heart disease, cancer and diabetes. Antioxidant substances help reduce oxidative stress, neutralize free radicals and at the same time protect the body from their action. Research has shown the importance of using apple juice in food and has found various possibilities to improve its quality. It takes into account choosing the right apple varieties for obtaining juice, tree care, harvesting/storage conditions, the technological process used and packaging this juice to obtain a high quality juice. When choosing the right variety, we consider the degree of ripeness, texture, intensity and type of flavor, acidity, nutritional value and sugar content. We will choose the most optimal methods to ensure that the quality of this juice is obtained and preserved over a long period of time without requiring too expensive storage conditions.

Keywords: apple juice, quality, terms of validity, nutrients

TOPIC: DEVELOPMENT OF NEW FOODS AND FOOD PACKAGING INNOVATION

SENSORY EVALUATION OF TEXTURAL ATTRIBUTES OF BREAD CONTAINING VEGETABLE POWDERS

Georgiana-Roxana Ghibăldan (Tomoșoiu); Adrian Asănică; Stelica Cristea; Dana Tăpăloagă; Liliana Tudoreanu

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Background: So far, countless studies have been done on the effect of adding plant-based ingredients to bread and bakery products. However, there is little information on the effect of mixt powders parsnip powder and nettle plant powder. The objective of this paper is to evaluate consumers' opinion on the textural attributes of bread with the addition of nettle powder (P1), parsnip powder (P2) and mixture of carob powder and grape seed powder (P3).
Methods: The assortments of bread containing 0.25% and 0.5% P1, P2 and P3 plant powder were subjected to sensory analysis, carried out by a panel of 9 trained assessors as well as 26 consumers aged between 18 and 25 years old. A 7-point scale was used for the sensory analysis.
Results: The panel evaluation for P1 showed that the hardness at the first bite had a significant higher mean value for the assortment containing with 0.25% nettle powder (3.44 points of 7 points) compared to the assortment containing 0.50% nettle powder. The same was observed for hardness during mastication, with and average score of 2.66 points for the assortment containing 0.25% nettle powder and 4 points for the assortment containing 0.50% nettle powder. The average crumble score during mastication, was the same for both assortments (3.11 points). The consumers' sensory evaluation, showed higher average values for the 0.50% nettle powder compared to those from the 0.25% nettle powder.
Conclusions: There was a significant difference between the panel sensory evaluation and the consumers' evaluation. The mostly appreciated assortment by the panel was P2 and the assortment most appreciated by consumers was also P2.

Keywords: bread, vegetable powder, textural attributes, consumer opinion, sensory evaluation

Award announcement

Prof. Marwin Mousssa (France) Vice- Secretary General of ISEKI Food Association, Prof. Ovidiu Tiţa (Romania) and Prof. Adrian Riviş

Oral presentations winners

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2. Second prize (125 Euros; one year IFA membership):
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Title of presentation: "Chestnut shells bioactive compounds as an ingredient to delivery systems for the prevention/treatment of oral mucositis";
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Posters & short oral presentations winners

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Title of the presentation: "Recovery of phenolic compounds in the apple production chain following a circular approach";,
3. Third prize (75 Euros; one year IFA membership):
Valentina Madalina Moga (Romania);
Title of the presentation: "The effects of Fetească Neagră wine on the ripening process of the cheese";

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ISEKI-Food E-Conferences aim to create an international platform for communication across continents and disciplines. They bring together scientists and support students from various areas of research in specific food-related fields to exchange and share information in support of the relationship of food to human health and well-being.
The main topic of the 6th ISEKI-Food E-Conference was **"Food production based on food safety, sustainable development and circular economy"**.
The conference focused on
specific topics such as: "Bioprocessing and bio-refining for the conversion of food waste and by-products into value-added foods" and "Development of new foods and food packaging innovation".

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18 – 19 November 2020

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10 – 12 November 2021

5th ISEKI E-Conference
23 – 25 November 2022

6th ISEKI E-Conference
22 – 24 November 2023

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ISBN (online) 978-606-12-1997-1