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Meeting Abstracts

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Keynote Presentation

Favoring the Formation of Desirable Flavour while Mitigating Food-Borne Contaminants

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Abstract

It has been shown in recent studies that flavor and food-borne process contaminants are generated through similar reaction pathways, might it be the Maillard reaction cascade or oxidative degradation of lipids, polyphenols and other food constituents. While studies carried out in model systems based on simple precursors are valuable, they need to be validated in food under relevant process condition. The use of labelled precursors has allowed gaining a more precise insight into the formation pathways and estimating their relative importance. Since several years, such labelling experiments turned out to be a powerful tool to gain a deeper insight regarding the impact of reaction conditions on the formation of key flavor molecules and undesirable compounds in both model systems and real food to identify parameters that are essential for product quality. The approach will be illustrated by looking at the formation of certain aroma compounds (e.g. 2,5-dimethyl-4-hydroxy-3(2H)-furanone) as well as process contaminants (e.g. acrylamide, furan) in thermally processed foods with focus on extruded cereals and cooked vegetables.

Food Contamination from Food Packaging

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Abstract

Since food contact materials (FCMs) are in direct contact in consumer products, the existence of extractables and leachables (E&L) in the packaging and storage materials can raise health and safety concerns. To address these concerns and comply to the regulations, companies demand methods and techniques to analyze their products for research and development as well as quality assurance purposes. In response to this increasing demand, we developed a method to analyze extractables and leachables in FCMs using a high-resolution mass spectrometer (LCMS Q-TOF) and inductively coupled plasma mass spectrometry (ICP-MS) to investigate extractables and leachables in plastic sandwich bag, clear plastic cup, and aluminum foil. For ICP-MS, sub ppb or ppt level of LODs and LOQs were achieved for all analytes especially for the potentially toxic elements such as, Cd and Pb. For LCMS Q-TOF, 19 unknown ions from both positive and negative modes were tentatively identified in food contact materials from various sources.

Red, White and… Orange? A New Look into an Old Style of Wine

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Abstract

Orange wine can be described as white wine that is produced similarly to red wines, with skin- contact during maceration. Polyphenols are extracted from the skin of grapes during maceration and are known to contribute to the heart health benefits of wine, especially red wines. The objective of this study is to identify if grape skin contact gives orange wine similar antioxidant properties as red wine, by comparing total polyphenols and antioxidant capacity of red, white, and orange wines. Fifteen wine samples were analyzed in triplicates (4 red, 8 orange and 3 white wines). A set of orange, red and white wines from the same wineries and vintages were purchased and analyzed. Analysis consisted of total phenolic content (TPC) and total antioxidant capacity (ORAC). TPC in orange wines (1259.2 + 138.9 mg GA/L) was 44% lower than red wines (2239.4 + 156.9 mg GA/L) and 460% higher than white wines (273.9 +11.8 mg GA/L). Similarly, ORAC of orange wine (12.2 + 1.9 µmol TE/ml) was 42% lower than red wines (20.9 + 2.7 µmol TE/ml) and 249% higher than white wines (4.9 + 0.9 µmol TE/ml). Differences in TPC and ORAC values between types of wines were significantly different (ANOVA, $\alpha = 0.05$). TPC and ORAC values of orange wine were closer to red wines than to white wines due in part to the maceration step. This study contributed to the characterization of orange wines and the understanding of their beneficial effect on heart health.

Influence of Food Processing Technology on Nutritional Security

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Abstract

Sustainable nutrition and food security are a major global challenge. About 9.2% (more than 700 m million people) of the world population were exposed to food insecurity in 2018. Fruits and vegetables are rich sources of micronutrients, macronutrients and health promoting compounds. Epidemiological studies show inverse associations between a diet rich in fruits and vegetables and risk of certain cancers, cardiovascular disease, diabetes and stroke. They are also a major source of dietary fiber, which influence the gut microbiota composition, thereby regulating several metabolic pathways through symbiotic host-microbiome signaling. Due to their limited shelf life and perishable nature of fruit and vegetables, food processing plays a critical role to reduce the postharvest loss and improve food quality. Advancements in food processing have resulted in the expansion of novel techniques such as high-pressure with UV treatment, pascalization, and high hydrostatic pressure processing. Recently, the demand of the processed foods with enhanced health benefits phytonutrients has increased and it has been commercially implemented worldwide, for preserving meats, vegetable products, seafood, and other foods, and several HPP fruit juices are available in the market. These minimally processing techniques will influence the stability, bioavailability and bio accessibility of the bioactive components. Moreover, common household processing techniques such as blending, squeezing, and juicing techniques influence the levels of phytochemicals. For example, juicing and blending of grapefruits showed significantly higher levels of ascorbic acid and citric acid, respectively. Similarly, blended grapefruit juice showed higher levels of flavonoids. In another study, thermal processed kale, beet and melon juices showed higher total phenolics and antioxidant activity than the cold-pressed juices. This may be due to thermal processing might have cleaved sugar moiety in flavonoid glycosides in kale and melon juices to get more free hydroxyl groups, which will increase the total phenolics and radical scavenging activities. Conversely, storage of fruit or vegetables juices under non-ideal conditions will convert nitrate to nitrite, which could have negative impact on human health. Results of storage stability in beetroot and arugula juices demonstrated that the degradation of nitrate was initiated within 24 h at 25 ºC and after 4 days at 4 ºC. This talk will include the evidences for health promoting effects of plant products, isolated compounds which have been processed through various minimally processing techniques. This study was supported by United States Department of Agriculture-NIFA-SCRI- 2017-51181-26834 through National Center of Excellence for Melon at the Vegetable and Fruit Improvement Center of Texas A&M University.

Finding New Uses for Low Value Agricultural Products and Waste: Applications and Advances in Phytochemical Compositional Analysis

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Abstract

The search for new functional foods, environmentally friendly pest control, biofuels, and biodegradable consumer products and packaging is the ongoing challenge to 21st century agriculture research. Interest in natural functional ingredients from plants is on the increase along with the demand for faster, efficient and accurate ways of measuring these compounds. These demands are being met with innovative research using cutting edge instrumentation. We are working on developing methods for the rapid and complete chemical analysis of agricultural co-products to assess their use as biological control agents for the prevention of disease in humans, animals and in agriculture. This research will be used to develop non-destructive spectrophotometric analytical methods to rapidly assess the levels of specific phytochemicals in seeds, tissues, and processed products. We are focused on the characterization of the phytochemical and chemical components of underutilized agricultural materials, such as weedy species, or processing by-products, such as seed meals from biofuel production, that have potential uses as biological pest controls and/or as food nutraceuticals for the control of the development of chronic disease.

An Ultra-High Throughput Analytical Strategy Based on UHPLC-DAD in Combination with Syringe Filtration for the Quantification of 9 Synthetic Colorants in Beverages: Comparison with UHPLC-MS/MS

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Abstract

An ultra-high throughput analytical strategy based on UHPLC-DAD in combination with syringe filtration was developed and validated for the ultrafast quantification of 9 synthetic colorants in beverages. The satisfactory separation of the 9 synthetic colorants was achieved within 1 min of chromatographic running time. The UHPLC-DAD was much better than UHPLC-MS/MS in terms of the linearity of standard curves and detector sensitivity of the target compounds. The recovery of the colorants from beverages was dramatically affected by syringe filter types and pH of the sample solution. Excellent recovery rates of the colorants (92.7 - 105.9%) was achieved with simple filtration with PVDF syringe filter at pH 7.0 of sample solution. The UHPLC-DAD method showed excellent linearity, low limit of detection, and high precision and accuracy. The method was successfully applied in the rapid determination of 9 colorants in beverages. Total analytical time including the sample preparation and chromatographic operation was only 3 min.

Current Megatrends in Food Production Related to Microbes

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Abstract

Novel solutions for food production are required urgently for several reasons which relate to the global micro-organisms: A. Human population growth continuously increases the demand for hygienically safe and adequate supplies to prevent qualitative and quantitative malnutrition. B. Requirements for sustainable and climate-friendly methods have also increased considerably. C. Common understanding of the vital role of soil microbes in the food production has emerged globally. D. Relationships between our nutrition, health and microbiome have become more and more evident to the consumers. All these main points or trends relate to microbiological research and education in a decisive way: a. Biorefineries and biotechnological techniques could be established on the basis of microbial bioengineering and understanding on natural microbial populations: this includes the reuse of food residues as well as the conversion of industrial and agricultural side streams into food sources, b. Food ingredients can be produced from the above-mentioned additional resources which could be found within the existing processes and processes developed from them, c. Soil microbiota needs to be protected, and its role in the balances of carbon, nitrogen and other nutrients and elements need to be profoundly investigated, d. Human microbiome has emerged as the core factor and contributor to our general well-being and health - the balance of the microbiome strongly influences the nutritional effects of our food, which must be nurtured. Based on the arguments above and their implications, more cooperation and research and education related to the microbial kingdom are needed for the food sector in order to satisfy the future needs of our societies.

Effect of Flaxseed on the Choroid–Sclera Complex Thickness and LDL Oxidation in the Sclera, Choroid and Retina - A Potential Prevention for Age Related Macular Degeneration

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Abstract

The objective of this presentation is to provide our findings on the anti-inflammatory effect of flaxseed to potentially inhibit the progression of macular degenerative disease. The authors conducted a study on two groups of rabbit's choroids–sclera complex thickness and LDL oxidation in the sclera, choroid and retina: G1 received a hypercholesterolaemic diet and G2 the same diet but enriched with flaxseed flour. Serum concentrations of total, LDL and HDL cholesterol, TAG and fasting blood glucose were determined at the start of the experiment and in the 8th week. Choroid and sclera samples were stained with haematoxylin–eosin and analyzed histomorphometrically and immunohistochemically with the anti-oxidized LDL antibody. Sensory retina samples were analyzed immunohistochemically with primary monoclonal nitro tyrosine antibody. At the end of the experiment, a significant increase in G1 concentrations of TC and LDL-C, in the choroid–sclera complex thickness, and in immunoreactivity, identified by the immunohistochemical analysis of choroid and sclera samples with the anti-oxidized LDL marker, and by the immunohistochemical analysis of sensory retina samples with the anti-nitro tyrosine marker. These results reveal that flaxseed reduced the choroid–sclera complex thickness of diet-induced hypercholesterolaemic rabbits, the expression of oxidized LDL in the choroid–sclera complex, and the expression of nitro tyrosine in the sensory retina, confirming the anti-inflammatory effect of flaxseed.

Determinativo of Polyphenolic Composition of Colombian Yacon (*Smallanthus sonchifolius* Poepp. and Endl) Tuber by Hplc-Dad-Esi-Ms/Ms

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Abstract

Yacon (*Smallanthus sonchifolius* Poepp. and Endl) is a native plant of the Andes region. The tuber is rich in fructose oligosaccharides, inulin and polyphenols and it is consumed as traditional folk treatment to control hyperglycemia, kidney problems and for skin rejuvenation. This consumption has increased since recent in vivo studies show that it improves antioxidant defense mechanisms, reduces glucose levels in diabetic mice and reduces weight in patients with metabolic syndrome or diabetes. Such effects may be related to the phenolic content and composition of the tuber. Polyphenolic composition in plants can vary with factors such as region of growth and agricultural techniques, among others. Therefore, the aim of this study was to evaluate the polyphenolic composition of tubers from four different geographical locations in Colombia. High-performance liquid chromatography with photodiode array and tandem mass spectrometry detections (HPLCDAD- ESI- MS/MS) revealed a total of 21 caffeic acid derivatives. The main compound was identified as 4-O- caffeoyl-2,7-anhydro-Dglycero-β-D-galacto-oct-2-ulopyranosonic acid (isomer 1) varying from 409.3 ± 148.7 to 518.5 ± 91.1 µg chlorogenic acid equivalents (CAE)/g DW followed by 4,5-di-O-caffeoyl-2,7- anhydro-D-glycero-O-β-galacto-oct-2-ulopyranosonic acid ranging from 382.9 ± 122.8 to 493.2 ± 88.0 µg CAE/g DW, Dicaffeoyl tartaric acid (261.0 ± 68.6 to 407.8 ± 95.2 µg CAE/g DW), and 4-O-caffeoyl-2,7-anhydro-D-glycero-β-D-galacto-oct-2-ulopyranosonic acid (isomer 3) (195.5 ± 77.9 to 237.4 ± 38.7 µg CAE/g DW). The characterization of these phenolic compounds can be the basis to understand the pharmacological properties and the medicinal principle behind the ethnobotanical practices associated to these tubers.

The Use of Microbiological Methods to Reduce Aflatoxin M1 Contamination in Dairy Products

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Abstract

The current study was aimed tested two different strains of LABs (*Lactobacillus rhamnosus* and *Lactococcus lactis*) and the capacity of Saccharomyces cerevisiae (SC) to reduce the AFM1 in Minas cheese contaminated artificially (0, 25 µg/kg). Twenty-four cheeses with 250 grams each were prepared for the tests separated in eight treatments: cheese, cheese with LABs, cheese with SC, cheese with AFM1, cheese with AFM1 and SC, cheese with AFM1 and LABs and cheese with AFM1 +SC and LABs. The LABs and SC were heat-killed being inactivated by boiling at 100 °C for 1 hour previously the assays and were used together at concentration 1010CFU/ mL. The capacity of microorganisms to reduce AFM1 was assessed over time the determinations of AFM1 in the contaminated cheeses were realized in the second and in the thirtieth day after the manufacturing. AFM1 quantification in cheese achieved by injection into a HPLC system. The limit of detection for AFM1 was 0.017 µg/kg. The cheeses of the control groups (cheese and cheese with LAB or SC) did not show any level of AFM1, endorsing that the milk used to produce the cheeses did not contain AFM1. In the groups containing AFM1, (cheese with AFM1 and cheese with AFM1 and LAB), a reduction percentage of 66% and 70% was observed respectively, during the experimental period. Cheese with AFM1 and cheese with AFM1 and SC, a reduction percentage of 64% and 100% were observed respectively. The LABs and SC showed a promising capacity to reduce AFM1 in Minas cheeses.

Featured Presentations

Effects of Breast Feeding or Replacing Formula on the Bacteriological Intestinal Balance and the Gut Microbiome

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Abstract

Introduction: Human milk is a natural source of nutrients, prebiotics and probiotic organisms for a new-born and infant during first months of life. For various reasons there is often a need to replace breast milk with cow's milk or other formulas. The pattern of the microbiome of breast milk fed infants is regarded as a gold standard of the intestinal microbiome. The microbiome of children fed by formulas can be compared to that. In this study the impact of the type of feeding on the development of intestinal microbiome was examined with special emphasis on the family Enterobacteriaceae strains.

Materials and Methods: Fecal samples were collected from infants at different ages. The samples were cultivated in the PMEU (Portable Microbe Enrichment Unit; Finnoflag Oy), isolated from BBLTM CHROMAgarTM Orientation plates (Becton, Dickinson & Co.), identified by BBL Crystal Enteric/Nonfermenter test and isolated strains were phenotypically compared by PhenePlateTM – RS (Bactus AB).

Main Outcome and Results: Interesting differences could be seen between the feeding groups. Enterobacterial species appeared remarkably later in breast milk fed infants compared to others. The balanced existence of both mixed acid fermenting and 2, 3-butanediol producing enterobacterial isolates was clearer in breast fed infants. Numbers of detected enterobacterial strains were higher in formula fed individuals.

Conclusions: Feeding has an important impact on the development of the balanced human microbiome. The Bacteriological Intestinal Balance (BIB) is an important aspect when new formulas are developed. The PMEU method comprised a useful tool for personalized analysis of the intestinal microbiome.

Enzymatic Hydrolysis of Food By-Product Proteins: Mechanisms, Kinetics and Mathematical Modelling

Pedro Valencia

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Abstract

The enzymatic hydrolysis is a valuable technology to valorize the food by-product proteins through the production of bioactive peptides. Despite the protein source, the reaction progress is always characterized by a rapid initial phase followed by a very fast decrease in the reaction rate. Some hypotheses as the exhaustion of substrate, the enzyme inactivation and the product inhibition were proposed to explain the kinetic behavior. The experimental results strongly suggested that the most important factor was the product inhibition, thus causing the rapid decrease in reaction rate. Stabilization of the protease was observed thus suggesting positive modulation of the enzyme inactivation in reactive conditions by the presence of substrate and products. The mathematical modeling has been proposed using Michaelis-Menten equation adding the effect of mixed product inhibition. Furthermore, as the reaction progress modify the composition of the peptides, the inhibition constants evolve according to the reaction conversion, thereby increasing the accuracy of the proposed mathematical model. Another attempt of modeling was the logarithmic equation widely used to model the reaction progress of the protein hydrolysis. The logarithmic equation was first proposed to model the cellulose hydrolysis in the early 80s and some years later it was used to model the enzymatic hydrolysis of proteins. It was very useful to evaluate the proteolytic susceptibility of food proteins. The dilucidation of mechanism and mathematical modeling has allowed to characterize the enzymatic hydrolysis of proteins and to propose technological improvements to increase the process efficiency.

Textural and Rheological Properties of Alaska Pollock Surimi Gel Fortified with Fish Oil under Ohmic Heating

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Abstract

To understand the effects of the oil distribution in surimi gel under ohmic heating, the effects of fish oil incorporation on the gelling and physical properties of different levels of emulsified surimi gel subjected to ohmic heating were investigated. Frozen Alaska pollock surimi (RA grade) was chopped with salt (1.5%) and ice water and then mixed with refined fish oil (10%) at four different mixing conditions (hand mixing, mild mixing (300 rpm/min; 900 rpm/min), and vigorous mixing) to prepare different level of emulsified surimi paste. The prepared surimi pastes were stuffed into the casing tubes and heated in a water bath (90 ºC for 30 min) and ohmic heater (applied two different heating speeds: 3 ºC/min- slow and 80 ºC/min - fast) to 90 ºC to obtain the emulsified heat induced gels. Physical properties, water-holding capacity (WHC), color, microstructural, and rheological properties were conducted to evaluate the effects of oil particle distribution and electrical parameters on the gel properties. The well-emulsification of fish oil into surimi promoted gel properties both in water-bath heating and ohmic heating. Vigorous mixing decreased the size of oil droplets and generated uniform and stable emulsified surimi paste and contributed to the higher gel strength. Heating rate also influenced the gel properties and significantly improved gel-forming ability and WHC of emulsified surimi paste. The highest breaking strength and lowest drip loss of emulsified gels were obtained by the slow heating rate (3 ºC/min) in comparison with the other conditions ($p < 0.05$). Rheological and color measurement also showed coincident results.

Effects of pH Variation on the Properties of Protein-Based Films from Lizardfish (*Saurida wanieso)* Viscera

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Abstract

Fish viscera is commonly considered as discarded waste due to the unsuitable part for human consumption, which causes the environmental problems and has not been also well-developed to be value-added products as biological materials. In this current research, protein-based films were produced by utilizing lizardfish viscera (stomach and intestines) with varying pHs. The new approach without protein extraction at pH range from 2 to 4 and 13, was investigated for obtaining edible films directly from fish viscera. The assessment of amino acid profile, electrophoresis patterns and Fourier transform spectroscopy for all

protein-based films was conducted. The differences in pH of film-forming solution evidently influenced mechanical properties, water vapor permeability, color, and barrier extent of light transmission in the visible ranges (350 – 800 nm). The UV light transmission was completely blocked by these films. Protein-based films under alkaline condition (pH 13) were hydrophilic, more yellowish, revealed the lowest mechanical strength and highest deformability. In contrast, the mechanical properties of films prepared at pH 3 and 4 were improved. Therefore, protein-based films could be potentially used as new bioresources for food packaging for the eco-friendly and nontoxic future perspective.

Synthesis of Diketopiperazines from Free Amino Acids by using Only Water ~ Potential of Water in Chemical Reaction~

Seiichiro Yoshida* and Keiichiro Matsushima

Industrial Research Institute, Industrial Technology Research Department, Hokkaido Research Organization, Japan

Abstract

Diketopiperazines (DKPs) contained in various foods and beverages, e.g., meat, fish, wine, coffee and beer, are well known as physiological active substances. There are mainly two ways to obtain DKPs, one is extraction from foods and beverages, and the other one is synthesis from amino acids. Synthesis from amino acids are prefer in industrial fields because of supply stabilities of raw materials. However, it is difficult to obtain DKPs by using environmentally friendly reaction because protected amino acids and condensation agents are needed. Here we report that synthesis of DKPs from un-protected amino acids by using only steam, or water, which is one of the most environmentally friendly chemicals. It is well known that high-temperature and high-pressure water shows that a high reactivity for various chemical reaction such as hydrolysis and dehydration. We focused on the potential of this activity to synthesis of DKPs from free amino acids. Typical free amino acids were used as model reactant, and it is found that ratio of water and amino acids (W/A) are important to effectively obtain DKPs. The obtained results suggest that the balance between hydrolysis and dehydration reaction is important to maximize DKPs yields. In this work, we discuss about the effects of reaction conditions such as reaction time, reaction temperature and amino acid species, on DKPs yield. This work suggests that water has a potential to be used as the eco-friendliest reactant in food chemistry and food engineering.

Anti-Helicobacter pylori and Immunomodulatory Effect of Ethyl Acetate Fraction from *Persea americana* (Avocado) Seeds)

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Abstract

Helicobacter pylori is a Gram-negative bacillus that plays a role in the pathogenesis of a number of diseases, ranging from asymptomatic gastritis to gastric cancer. Persistent infection of *H. pylori* stimulates the immunomodulatory system by releasing cytokines and nitric oxide (NO). Difficulty adhering to a drug regimen, antibiotic drug resistance, and side effects of triple or quadruple therapy have prompted a search for new alternatives for treatment. Therefore, the present study aims to evaluate the effects of the ethyl acetate fraction from *Persea americana* (avocado) seeds (SEAP) against *H. pylori* and immunomodulatory factors involved in infection. Anti-*H. pylori* activity was evaluated against *H. pylori* ATCC 43504 and 43629 showed Minimal Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of 128 µg/mL for ATCC 43504 and MIC of 256 µg/mL and no MBC for ATCC 43629. Morphological analysis of *H. pylori* using a scanning electron microscope after treatment with SEAP showed filamentous forms, characteristic of Penicillin Binding Protein 2 (PBP2) inhibition that is essential for cellular division. Immunomodulatory effects evaluated on RAW 246.7 macrophages culture presented inhibition of 83.81 ± 9.40 for IL-6 and 45.84% ± 2.59 for NO, both at 100 µg/mL. SEAP chromatographic study by ESI FT-ICR MS determined the presence of flavonoids, phenylpropanoids and tannins, catechin and epicatechin (confirmed by HPLC-DAD) and quercetin and kaempferol derivatives. According to these results, it is possible to conclude that this avocado seed extract may be a suitable natural source for the prevention and treatment of gastric ulcer caused by *H. pylori*.

Evaluation of Non-Conventional Extraction Methods and GRAS Solvents on Anthocyanin Extraction from Colombian Bilberry (*Vaccinium meridionale* S.) Pomace

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Abstract

The pomace of Colombian bilberry (*Vaccinium meridionale* S.) is a by-product that represents about 20% of the fruit weight and exhibits high concentration of anthocyanins. There is a current trend to find new sources of anthocyanins that can replace synthetic colorants in foods as they might have harmful health effects. Methanol, and acetone are widely used for the extraction of ACNs; however, these solvents are toxic, which limits the application of the extracted pigments as food colorants. The effect of solvent concentration and extraction method for the clean anthocyanin extraction from *V. meridionale* pomace was studied. Aqueous ethanol at three concentrations (30%, 50% and 70%) was used as Generally Recognized as Safe (GRAS) solvent and 80% aqueous ethanol was used as a control. Ultrasound assisted extraction (UAE) and Microwave assisted extraction (MAE) were used as non-conventional extraction methods. Anthocyanin recovery increased with ethanol concentration and the recovery was significantly higher when using MAE. Monomeric pigment ranged from 14.5 ± 0.4 (30% ethanol) to 24.9 ± 1.0 (70 % ethanol) mg cyn-3-glu/g DW and from 29.1 ± 1.3 (30% ethanol) to 46.9 } 17.3 (70% ethanol) mg cyn-3-glu/g DW when using UAE and MAE, respectively. The anthocyanin concentration in the extract obtained using 80% methanol and UAE (30.9 ± 0.1 mg cyn-3-glu/g DW) was comparable to the concentration in the extract obtained by MAE (32.6 ± 2.2 mg cyn-3-glu/g DW). These results contribute to the knowledge of environmentally clean extraction techniques to obtain anthocyanins from *V. meridionale* pomace.

Evaluation of The Technical Feasibility of Developing a Drink Based on Quinoa (*Chenopodium quinoa*: Blanca Junin Variety) and Avocado (*Persea americana* Mill: Hass Variety) for Endurance Athletes

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Abstract

Athletes seek excellence in every competition by improving their performance. The great variety of sports includes those that have a long duration, which are called endurance sports, including triathlons, marathons and road cycling, among others. Their nutritional requirements vary, which need to be prioritized by taking into account the demands of training and the type and location of the competition, among others. Protein supplements are the most commonly used by athletes for increasing muscle mass and improving exercise recovery and performance. However, fat, in the form of plasma free fatty acids, intramuscular triglycerides and adipose tissue, provides a fuel substrate that is relatively abundant and more available to muscle in endurance training ("Nutrition and Athletic Performance", 2016) Therefore, the consumption of fats in adequate amounts is important to optimal health, maintaining energy balance, optimal intakes of essential fatty acids and fat-soluble vitamins, and replenishing reserves of intramuscular triacylglycerol. The consumption of fat should not drop below 20% of the total energy intake since the ingestion of fat-soluble vitamins and essential fatty acids is important. The optimization of the type of fatty acids in diets is important. The focus should be on increasing the dietary sources of essential or unsaturated fatty acids (Potgieter, 2013). In many sports, fat is stigmatized and sometimes completely suppressed, generating vitamin deficiencies in athletes. Therefore, this study evaluated the technical feasibility of developing a drink based on quinoa and avocado for endurance athletes, offering a new alternative for the supplement market.

Characterization and Comparison the Protein from Lupin and Soybean Milk Using Two-Dimensional Gel Electrophoresis and Mass Spectrometry

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Abstract

Plant milk is known for its high nutritious value and different investigations. Over the past few decades it has proved, that plant milk proteins offer the rich amino acids source to the consumer. This comprises of various bioactive proteins together with known biological function that benefits human health. This study characterized lupin and soybean milk proteins from whole seed using 2-dimensional polyacrylamide gel electrophoresis (2D–PAGE) coupled with mass-spectrometric identification. The examination was stratified to demonstrate a proteomic orientation plan for soybean milk as well as lupin milk. Protein of lupin and soybean milk were extracted under the same method by using centrifuge filtration and thiourea/urea solubilization, followed by separation of proteins at 2D gels. The examination was attained by choosing twenty-six protein spots which were assimilated with trypsin and analyzed using liquid chromatography-mass spectrometry (LC-MS). During the study, main storage proteins in the soybean milk were identified to be α-Subunit of β-Conglycinin (Glycine max), β-Subunit of β-Conglycinin (Glycine max), Glyso Glycinin (Glycine soja) while most of the spots for lupin milk proteins were identified as β-Conglutin (*Lupinus angustifolius*) and hypothetical protein Tanjilg (*Lupinus angustifolius*). These results suggest that the separation technique by centrifuge filtration and the thiourea/urea method are effective methods for 2-dimensional polyacrylamide gel electrophoretic separation of lupin milk as well as soybean milk proteins and subsequent identification by mass spectrometry.

Hydration Shells of Carbohydrate Polymers Studied by Calorimetry and Terahertz Spectroscopy

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Abstract

It is hypothesized that water molecules are grouped with other water molecules, in the vicinity, through a fluctuating local tetrahedral network of hydrogen bonds. However, when macromolecules like carbohydrates or proteins are dissolved in water the structural tetrahedral network is perturbed in the vicinity of the solute macromolecule, this H-bond water network perturbation is denoted as hydration dynamic. The protective effect against freezing and dehydration of carbohydrates, related to the way the macromolecule disturbs the water network, on biomolecules has been a subject of great interest in the area of cryopreservation and biomedical research. Due to the previous, this study focused on the hydration dynamic of aqueous solutions for some carbohydrates of commercial and biological importance, namely, agave fructans, inulin, and maltodextrin, employing terahertz time-domain spectroscopy and differential scanning calorimetry. We observe that the hydration numbers calculated using terahertz spectroscopy are marginally higher than those from calorimetric measurements. We attribute this discrepancy to the definition of hydration number, which in a way correlates with the physical process used to quantify it. The aqueous solutions show a non-proportional increase in the absorption coefficient and the hydration number, with a decrease in the carbohydrate concentration, this behavior is consistent with the "chaotropic" or "structure breaking" model of the hydration shell around the carbohydrates. Furthermore, this study reveals that agave fructans and inulin have good hydration properties. Given the high glass transition temperature and good hydration ability, these carbohydrates may behave as good bio-protectants and hydrating additives for food and beverages.

Herbicide and Pesticide Residues in Beverages

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Abstract

Background: With population growth and the development of agriculture and food industries, food safety is becoming a greater concern in recent years. The increasingly stricter regulations of residual food contaminants require faster and more accurate analytic techniques. For this purpose, targeted screening by simultaneous MRM measurements using a triple quadrupole mass spectrometer is the most common strategy.

Objective: The purpose of this study is to screen and identify herbicide and pesticide chemicals in seven kinds of beverages using QuEChERS extraction method and analysis with MS/MS measurement using LCMS/MS and LC/Q-TOF-MS.

Methods: Compounds were extracted with QuEChERS extraction after grinding with cryogenic milling. UHPLC-MS/MS analysis was performed on an LCMS-8050 with a heated ESI ion source, equipped with a Nexera™ X2 system (Shimadzu Corporation). LC separation was performed using a Raptor Biphenyl (2.1 mm × 100 mm) with binary gradient of 2 mmol/L ammonium formate + 0.002% formic acid in water and 2 mmol/L ammonium formate + 0.002% formic acid in methanol.

Results: The chromatograms of each compound at a concentration of 5 µg/L and the calibration curves were obtained. The accuracy and area repeatability (%RSD) values of each calibration point was determined. The accuracy of the calibration points is within 95.3 to 106.9 % for each compound. Recovery rates of various herbicides and pesticides were determined.

Conclusion: Herbicides and pesticides could be determined in seven kinds of beverages by direct analysis. The results confirm a sensitive and robust method using LCMS techniques.

The Higher Utilization of Cereals and Pseudo-Cereals to Obtain Fortification Food

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Abstract

Functional foods are products containing different biologically active compounds which, consumed in a current diet, contribute to maintaining the optimal state of the physical, psychical and mental state of the population. A functional food product may be a natural product containing biologically useful components. Cereal grains represent one of the major sources of human food and nowadays, their production has increased to fulfil the needs of the world's increasing population. The aim of this study was to make healthy crackers. Cereals and pseudo-cereals chosen for their nutritional properties are rye, oats, rice, buckwheat and quinoa. To which is added lentils, seeds such as sunflower, sesame, pumpkin, and flaxseed, mushrooms and nettle seeds. The innovative feature of this products consists in its being enriched with essential fatty, amino acids, polyphenols and antioxidants. We performed several the physicochemical analyses, as follows: moisture, ash, alkalinity, protein content, fat, carbohydrates, energy value, total polyphenolics content and antioxidant activity. For consumer preferences, sensory analysis was performed by the 9-point hedonic test. New trends suggest strategies and processing technologies to improve the content and bioavailability of nutrients and bioactive compounds in cereal foods. Our suggestions come with suggestions for using functional foods using whole grains, pseudo-cereals and plant products rich in macronutrients and high-quality micronutrients. This research study was supported by a project of the Romanian National Authority for Scientific Research, CNCS–UEFISCDI-CI 141 PN-III-P2-2.1-CI-2018-1428 "Innovative pastry products" and CNCS–UEFISCDI-CI 232 PN-III-P2-2.1-CI-2018-1352 "Innovative menus for pre-schoolers".

Exposure Estimates for FD&C Color Additives for School Children

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Abstract

Artificial Food Colours (AFC) are widely used to colour food juices and drinks. Exposure studies in children are emphasized due to higher consumption vulnerability. Exposure assessment of AFC intake was carried out among 6-15-year-old 5000 school children, male/female using 24 hours food intake recall. 800 food products of 9 categories (Biscuits, Cake, Chocolates, Potato chips, Ice cream, Juices & drinks, Sweets, Jelly and Chewing gums) consumed by school children are analysed by HPLC-DAD for the 9 permitted and one non-permitted artificial food colours according to GCC food colour standard number 214/1999. We found 54.1% brilliant blue (E-133), 42.3% tartrazine (E-102), 39.1% sunset yellow (E-110) and 58.3% red 2G in the above-mentioned food categories. Juices and drinks are the highly consumed 350 (g capita-1 day-1) followed by ice cream 275. Substantially high daily intake of tartrazine, sunset yellow, carmoisine, and allura red was noticed compared to Acceptable daily intake (ADI) of WHO/FAO-JECFA.

Sustainably Sourced Light Blocking Technologies for Shelf Life Extension of Light Sensitive Food

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Abstract

Recent studies demonstrated increased optical performance of extruded films with post- consumer recycled (PCR) polymers. This research determined the light blocking mechanism of the films, demonstrating that virgin/PCR blends of HDPE follow a mixed mechanism of scattering and absorption, with scattering in the ultraviolet and blue-visible. This inspired the application of the material as a light blocking filter for retail environments. Light emitting diode light sources have replaced traditional fluorescent lighting for product illumination in display cases due to their reduced energy consumption. These lights yield intense and directional lighting, reducing the shelf life of light sensitive foods. This may include discoloration and/or the development of off flavours. The light filters are applied to roast beef, which is known to quickly discolour. The filter protection efficiency of the beef was determined using colorimetric analysis and evaluated as a function of time quantitatively (CIE L*a*b* color space) and qualitatively (digital imaging). The maximum color change value of the filtered roast beef samples compared to the dark control was realized for the specimens under LED lighting conditions approximately 100 hours earlier, demonstrating extended shelf life. The reduction in color loss and improved sample appearance under the filtered light can be attributed to the intense scattering of light across the blue wavelength range. This wavelength range neighbour's the main absorption band of myoglobin (and roast beef itself), inhibiting metmyoglobin production and reducing discoloration. Data presented in this study suggest that the optimization of PCR content provides an opportunity to divert food and plastic waste.

Biorefinery Upgrade, Reuse and Hygienization of Food-Derived Side Streams

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Abstract

Various biomass-derived materials can be refined into useful chemicals by micro-organisms and their enzymes. In the food and feed sector we can circulate carbon and modify biomolecules by bio-catalysis. Microbiological processes can be established as non-aseptic fermentations. Their products include organic acids, alcohols and sugar alcohols. Bulk or platform chemicals, such as ethanol and lactic, acetic, propionic and butyric acids are rapidly formed into the broth. For example, lactate and propionate can condense into valerate both from carboxylates and proteins. Like 2,3- butanediol from potato industry waste, for example, valerate is a raw material for aromatic compounds. The maximal productivity of butanediol was 8 g/l/h. Propionate from meat industry wastes is a well-known preservative. Mannitol sweetener is obtained from fructose in accumulated high concentrations by mixed flora from fructose. One important side stream was the so called zero fibre deposit removed from the lake bottom, where it had accumulated for example in Tampere, Finland, as a result of a century long polluting emission. Such manmade raw material deposits are important starting points for bioprocess industries, besides the reuse options, the cleanliness of food materials can be achieved by various treatments, such as acidity, steam osmotic pressure, UVC radiation and microbial interactions. For example, antimicrobial peptides of the amphibian skin can be used for the prevention acetification of sour milk. Probiotic microbes and prebiotic substances increase nutritional values, maintain microbiome balance and improve hygienic

qualities. Food taste, structure, preservatives, outlook and healthiness can be modified by biorefinery processes. This opens up novel options for feeding the growing populations.

The Role of Esters and Thiols on Tropical Fruit Aromas in White Wines

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Abstract

White wine aroma is mainly characterized by fruity aromas and their presence is important to wine quality. Volatile thiols are impact aroma compounds that are well-known for imparting tropical fruit aromas in wine, such as pineapple, mango, and passion fruit. Although volatile thiols are potent aroma compounds and there is scientific evidence that they impart tropical fruit aromas in wine, there is the thought that thiols themselves do not impart tropical fruit aroma. They rather must be in combination with other compounds to impart this aroma in wine. This study investigated the interaction effects of esters and volatile thiols to the fruitiness profile of white wine. A dearomatized Pinot gris wine was created at the OSU research winery and combinations of compounds were added to the wine, forming the aroma base. Treatment wines were composed of additions of different concentrations of volatile thiols and esters. Samples were subjected to sensory analysis where fifty-two white wine consumers participated in check-all-that-apply (CATA). Results were analysed using Correspondence Analysis (CA). Thiols contributed to earthy and green aromas. Overall, tropical aroma perception was only seen when a combination esters and thiols were present. This study emphasizes the importance of studying the interactions that occur between aroma compounds in the wine matrix.

Lipidomic Profiling of Pinot Noir Wines from Different Regions

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Abstract

Lipidomic profiling of different grape varieties has been studied for their impacts on fermentation processes and production of wine aroma compounds. Even though lipids are one type of the macromolecules found in wine, knowledge of lipidomic profiling in final wine products has not been investigated. This study aims to conduct a comparative lipidome analysis of commercial Pinot noir wines produced from Oregon, California, and Burgundy. There are a wide range of lipids identified in Pinot noir wines such as fatty acids (FA), monoglycerides (MG), diglycerides (DG), triglycerides (TG), phosphatidylcholines (PC), phosphatidylethanolamines (PE), lysophosphatidylcholines (LPC), lysophosphatidylethanolamines (LPE) and cholesteryl esters (CE). Lipid-liquid extraction was done to obtain the total lipid content. Liquid chromatographic-mass spectrometry (LC-MS) was used for the quantitative analyses of the wine lipid composition. The principal component analysis shows separated clusters of wine samples from different regions. Thus, lipidomic could be potentially used in wine research as a tool to obtain insight into wine geographical origin. Biography Quynh Phan is a doctoral student in the Department of Food Science and Technology at Oregon State University. Her passion for chemistry and wine led her to join Dr. Elizabeth Tomasino's research group in 2017 where she started researching the lipid content of wine and their link to mouthfeel perception. Her work is dedicated to the understanding of wine chemistry and developing of wine making methods that could be used to make wines which have desirable mouthfeel characteristics.

Effect of Ultrasounds on the Extraction Yield, Physicochemical and Functional Properties of Proteins Obtained from Quinoa, Black Beans, and Lentils

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Abstract

Sonication was used to evaluate the protein extraction capability from *Chenopodium quinoa*, *Phaseolus vulgaris*, and *Lens culinaris*. We optimized the extraction process of each source using a Box-Behnken experimental design. Buffer pH (6-10),

a material to- buffer ratio (1:5 to 1:15) and sonication time (0 to 20 min) were taken as independent variables, whereas we used a frequency of 37 KHz and power of 320 as constant operational conditions. The optimal extraction conditions for each source were compared to the same conditions with proteins extracted by leaching. Properties such as water and oil absorption capabilities (WHC and FAC); gelation temperature (Tgel); extraction yield (EY); emulsifier activity and stability (AEI and ESI); SH group content (SH); molecular weight (WM); and isoelectric point (PI) were studied using a Principal Component Analysis (PCA), cluster analysis and correlation matrix (Euclidean square). The optimal conditions for the ultrasound-assisted extraction from the three sources were 20 minutes of sonication, buffer pH of 9 and a material-to-buffer ratio of 1:5 for quinoa and black beans, and 1:10 for lentils. The sonication increased EY, Tgel, AEI, WHC, and FAC; and furthermore, induced a partial denaturation but did not affect WM, IP, SH, PS, and ESI. The effects of the independent variables could be classified into three principal groups. One group was composed of SH, Tgel, and source. The extraction method, EY, WHC, and IP formed the second group. The third group was constituted by WM, AEI, and FAC, which were associated with the emulsification process.

Design of a Mixed Alcoholic Beverage from Acai (*Euterpe precatoria* Mart.) and Cupuacu (Theobroma grandiflorum)

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Abstract

Cupuacu (*Theobroma grandiflorum*) is a fruit of Amazonian origin of the same family of cocoa, and acai (*Euterpe precatoria* Mart.) is a fruit of palm from Amazon, these fruits could promote the local economic growth through fruit processing to increase added value. The main aim of this work was to produce fruit alcoholic beverages from pulp or seed of cupuacu and acai and identify kinetics of production of these liqueurs, being a fermentation kinetics in the case of the drink of cupuacu and a diffusion kinetics in the case of the acai, also the feasibility of generating a milky mixture with the liquor obtained from the cupuacu process was evaluated. The yeast Prestige Turbo Yeast 15%R was efficient in the fermentation of the cupuacu fruit pulp in concentration of 60 g/L and the soluble solids was adjusted at 25 °Brix, achieving alcohol contents up to 16 %w/v after 30 days of processing. Fermentation was separated in two stages, the first was a controlled fermentation during the first 5 days and the second a maturation process that lasted 25 days. In the case of acai, using the anthocyanin content as a marker, it was found that both the micronutrients and flavours of the fruit, pulp or seed were transferred to the liquor without initiating the degradation process. The optimum point was at day 60 after starting the extraction using pulp in an ethanol solution at 15% w/v, where the maximum anthocyanins concentration is 85.22 ± 15.30 mg cianidin-3-glucoside/kg.

Potential of Microwave Irradiation on the Postharvest Control of Cowpea Bruchid

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Abstract

Cowpea Weevils are serious threats to Cowpea production and storage in Nigeria. The use of synthetic chemicals in their control poses to health and environmental safety. Hence, there is need to explore environmentally safe and sustainable control measures. Consequently, experiments were conducted at the Crop Protection Research Centre, St Xavier's College (Autonomous), Palayamkottai India under laboratory conditions (28 ± 2 OC, 70 – 75% RH and 11:13 h photoperiod) to determine the effect of microwave irradiations on the postharvest control of Cowpea bruchid, *Callosobruchus maculatus*. Five pairs of 2-day old *C. maculatus* collected from stock culture were kept in a Petri-dish containing 50 healthy seeds (Ife brown variety) and exposed to microwave irradiation at 300 power level for 0,4,6,8, and 10 minutes. The experiment was conducted using Completely Randomized Design (CRD) replicated five times. Results showed that microwave irradiation significantly (P≤0.05) increased the mortality of *C. maculatus* when compared with control without adversely affecting the viability and proximate composition of the seeds. Hence, microwave irradiation could be in cooperated into the Integrated Pest Management Strategy of *C. maculatus*.

Poster Presentations

Determining Authenticity of Eco-Friendly Cultivated Rice (*Oryza sativa* L.) Using Stable Isotope Ratio: Four Years Case Study in Korea

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Abstract

As nowadays rapidly growing the global organic food market, the necessity of reliable manners to avoid fraud or improper labelling against genuine organic products is becoming crucial to the ensure food safety as well as fair trade to protect the economic interests of authentic organic producers. Despite lack of international and universal standards for identifying as "organic", this study has been annually tested for four years (2016-2019) about the applicability of δ13C and δ15N analyses as potential alternative tools for organic authentication of eco-friendly cultivated rice in Korea.δ15N value displayed a significant difference among organic (OR), pesticide free (PFR), and conventional rice (CR) sold across several Korean retail markets and also showed some annual variations, but no trend ($p<0.05$). In contrast δ13C values displayed a weak rice type effect as well as annual variation. In addition, 2D plot by δ13 C and δ15N for organic authentication was clearly discriminated the authentication between OR and CR; however, others (e.g. OR vs PFR, or PFR vs CR) need further improvement for reliable authentication. Meanwhile, no multi-residue pesticides were detected in the examined rice samples including CR samples in this study. This study demonstrates successful application of δ13C and δ15N analyses for the authentication of organic rice distributed in Korea; however future study needs to be ensured the authenticity of the other eco-friendly cultivated rice (PFR) against to conventional ones.

New Method for Analysis of Free Xanthophylls and Xanthophyll Esters Using UPLC-ESI-MS/MS

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Abstract

Lutein and zeaxanthin are among the most common xanthophyll carotenoids found in yellow fruits and vegetables. In humans, lutein and zeaxanthin are known to accumulate in the macula of the eye, forming the macular pigment that provides our eyes photoprotection against damaging High Energy Visible (HEV) light. As humans cannot synthesize carotenoids and must rely solely on dietary sources, understanding the many factors controlling carotenoid bioavailability is important for disease prevention. Lutein and zeaxanthin are often found esterified with fatty acids in nature, a state that greatly increases their lipid solubility. Capsicum species fruits provide an excellent model for understanding xanthophyll chemistry, due to their high accumulation of free and esterified xanthophylls. A new analytical method, modified from a waters or lipid separation method, has been optimized to profile free and esterified xanthophylls in addition to multiple lipid species from plant tissue by UPLC-PDA-ESI+-MS2. Separation of free xanthophylls, monoesters and diesters was facilitated by UPLC-PDA. Parent xanthophylls were identified by their unique absorption spectra while elucidation of fatty acyls in xanthophyll esters was resolved by neutral loss in tandem mass spectrometry (MS2). In yellow fruits of *Capsicum annuum*, the new method revealed at least ten xanthophyll monoesters, ten xanthophyll diesters and ten free xanthophylls. A minimum of eight lipid species in the triacyl glyceride (TAG) class were also identified, illustrating another profiling dimension in concert with carotenoid analysis. The new method offers an effective approach for simultaneously profiling free xanthophylls, xanthophyll esters and lipid classes in the complex matrices of Capsicum fruits.

Discrimination of Geographical Origin for *Lentinula edodes* Using Stable Isotope Ratios of Abundant Bio elements Between Korean and China

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Abstract

Lentinus edodes species, commonly known as shiitake, has been widely used in many cuisines in several East Asian countries owing to its unique and pleasant flavour and texture. Recently, as a consequence of the continuing increase in the import of cheaper Chinese shiitake, the identifying genuine Korean shiitake against cheaper imported Chinese shiitake is considered to be the most critical issue for consumers purchasing shiitake products in Korea. Therefore, this study aimed to examine variations of stable isotope ratios (δ13C, δ15N, δ18O, δ34S) in shiitake mushrooms obtained from Korea and China and also possibly develop a discrimination model of geographical origin combined with chemometric approaches. δ13C, δ15N, δ18O, δ34S in shiitake were significantly influenced by its geographic origins ($p < 0.05$). In particular, δ13C, δ15N, and δ34S values were higher in shiitake produced by a bag cultivation manner from China compared to those by a wood-log cultivation manner from Korea. Regardless different regional cultivation methods (a log vs a bag), 2-D plots by combinations of δ13C, δ15N, or δ18O potentially displayed a relatively suitable geographical discrimination of shiitake between Korea and China. Hence, these preliminary results can extend reliable information of geographical differences between China and Korea evidenced by the shiitake isotope signatures, thereby contributing to potential geographical authentication with broader applications for global shiitake markets.

Encapsulation of Annatto Seed Extracts by Internal and External Ionic Gelation Mechanisms, Optimized by A Response Surface Methodology

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Abstract

The annatto seeds extract is an important source of polyphenol and carotenoid (bixin) compounds, which are bioactive compounds (BC) due to their antimicrobial and antioxidant properties. However, these compounds are susceptible to different environmental factors decreasing their effectivity. An alternative way to increase the shelf-life of these compounds is by encapsulation of the extract by ionic external (EG) or internal (IG) gelation. The aim of this study was to optimize the operational conditions for the encapsulation process of annatto seeds extract and evaluate its encapsulation efficiency (EE). In order to optimize this process, two experimental response surface designs were proposed. Calcium chloride concentration ($CaCl_2$) (0.3-3.5% (w/v)) and sodium alginate: $CaCl_2$ ratio (A:Ca) of 1:2-1:6 were evaluated as factors for the GE design. On the contrary, acetic acid (0.2-5.0% (v/v)) and sodium alginate: oil (A:O) (1:2-1:6 ratio) were used as factors for the GI design. The dependent variable for both designs was process yield (PY (% w/w)). A multifactorial ANOVA was used to compared EEs of the BCs with different extract concentrations (5, 10 and 20%(v/v)). The factors levels that maximize the PY (88.06 ± 0.55%) were: 0.3% $CaCl_2$ and 1:17 of A:Ca for EG; whereas IG rendered a PY (56.51 ± 3.18%) at 0.29% [CH_3COOH] and 1:5 ratio of A:O. Statistical analysis indicates that the mechanism of gelation and the concentration of the extract affect significantly the EE of the CB. We could optimize both EG and IG processes, but EG with 20% extract achieved higher PY and EE.

Optimization of pH and Temperature Conditions of *Kluyveromyces* lactis B-Galactosidase Functionality for Lactose Hydrolysis by Response Surface

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Abstract

β-galactosidase (EC 3.2.1.23), is one of the most widely used enzymes in the food industry, it catalyses the hydrolysis of nonreducing terminals of β-D-galactosidase residues in β-D-galactose. An example is hydrolysis of lactose in galactose and glucose to produce lactose-free milk derivatives (Pereira-Rodriguez et al., 2012). The enzymatic characterization of this protein depends on substrate, medium, temperature, pH, presence of ions and even source obtention (Saqib et al., 2017). In order to optimize the functionality of β-galactosidase from Kluyveromyces lactis, the aim of this work was to obtain the best conditions of pH and temperature for characterization the hydrolysis of lactose. We were search for the enzyme kinetic parameters to determining its optimum use conditions. The initial reaction speed of lactose hydrolysis (50 mM) in phosphate buffer (50 mM) at variable pH (7 to 7.8) was determined at different temperatures (25 to 45 °C). The glucose production was quantified with GOD/PAP reagent and read at 546 nm (Nguyen et al., 2006), the assays were performed in triplicate. The kinetic parameters

were determined with lactose at 5 to 150 mM in the presence of Mg^{+2}. The response surface and its contour graphics were obtained, which determined the optimal conditions of operation of the enzyme and the corresponding kinetic parameters: without Mg^{+2} a KM of 36.98 ± 4.09 mM, Vmax = 6.97 ± 0.24 mM/min·mg; with Mg^{+2}, KM of 30.95 ± 2.91 mM, Vmax = 7.32 ± 0.20 mM/min·mg. These results will allow the potential use of the enzyme in industrial processes.

Impact of Heat Type, Temperature and Heating Time on the Conversion of Gingerols to Shogaols in Ginger

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Abstract

The effects of heat type, sample type, temperature and time on the conversion of gingerols to shogaols in ginger during were studied by an UHPLC–ESI–MS/MS. The efficient conversion of gingerols to shogaols in ginger was observed during the heating of ginger. As the temperature increased, the faster conversion of gingerols into shogaols was observed. The efficiency of the heat-induced conversion was greatly different with the heat types, temperature, and time. Moist heat treatment induced a significantly higher quantity of shogaols than dry heat treatment. Generally, the higher the temperature, the faster and higher the conversion. The moist heat treatment was much more efficient than dry heat treatment at the same temperature. The formation of 6-shogaol during moist heat treatment at 120 °C for 360 min was highest, reaching to about 3000 mg 6-shogaol per kg ginger. The dry-heat treatment on dried powder induced a significantly higher quantity of shogaols than that on sliced fresh ginger. The heat-induced conversion of gingerols to shogaols was found to be also affected by the sample type (sliced fresh ginger or freeze-fried ginger powder). Moist heat treatment at a higher temperature (120 or 130 °C) for the present time is advantageous to obtain the ginger products with the high quantity of bioactive components of shogaols.

Physical Properties of Sweet Potato Starches Obtained from 12 Different Cultivars Grown in Rice Filed in Korea

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Abstract

The starch, sugar content, shapes and particle sizes and gelatinization temperature of starches obtained from 12 different sweet potato cultivars grown in the rice field of Korea. The crude starch contents in sweet potatoes were greatly different with cultivars. The water contents in the sweet potatoes were in the range of 60 – 71%. The starch content was greatly dependent on the cultivars of sweet potatoes. Jinhongmi and Shinyulmi had the highest starch content, showing 19.5 and 19.3% (based on fresh weight) starch contents, respectively. Pungwonmi had the least starch content (11.6%). Purified starches were obtained to study the shapes and particle size of the starches. The scanning electron microscopy study showed that starch shape was independent of the cultivar. The particle size of the starches was in the range of 12.6 – 20.9 micron. The gelatinization peak temperature obtained by a differential scanning spectroscopy (DSC) was in the range of 55 – 80 °C depending on the cultivars.

Squalene Contents in the Hexane Extracts of the Green Tea (*Camellia sinensis*) Leave Collected at Different Seasons

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Abstract

Squalene is a skin protective and cancer chemo-preventive agent having high commercial demand. Tender leaves and turf leaves of *Camellia sinensis* were hand-picked at 4 different collecting seasons (April-August). Hexane was used to extract the

lipophilic compounds from the collected leaves. The squalene contents in the hexane extracts were determined by the in-house validated GC method. The identity of squalene was verified by a GC-MS. It was found that squalene contents in the extract varied greatly with the types of leaves and seasons. The hexane extract of turf leaves had greatly higher contents of squalene than the extract of tender leaves. The hexane extract of the turf leaves collected in August contained the highest content of squalene, reaching 29.2 g/kg extract.

Colorimetric Determination of Food Colorants using Transparent Polymer Optode

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Abstract

This paper describes a simple colorimetric method for determination of Brilliant Blue, Sunset Yellow, Ponceau 4R and Tartrazine using transparent polymer optode. The method provided acceptable linear ranges 0.01-3.0 mgL^{-1} with correlation coefficients higher than 0.995 under the optimal conditions. Commercial beverages and juices containing different amounts of food dyes were analysed and the results were compared to those obtained by HPLC. Different analytical procedures have been developed for quantification of various synthetic food colourants, such as spectrophotometry, capillary electrophoresis and electrochemical methods. However, all of them present major drawbacks as they require time-consuming extensive pre-treatment of the samples or/and cannot be applied to complex colourant mixtures. To overcome these limitations, the use of mass spectrometry and digital image analysis techniques has been proposed as an alternative. However, the small volume of the samples used and background noise result in sensitivity problems limiting robustness of these methods. HPLC and ion-pair LC are currently the preferred analytical techniques as they provide robustness combined with sensitivity and selectivity. Nevertheless, these approaches require laboratory equipment and skilled personnel, although they are perfectly suitable for determination of different colourants. In spectrophotometry due to spectral overlap of the analytes, separation steps are required in most cases. The amount of food dyes was determined after absorption by polyurethane foam and aluminium oxide. The problem with quantification of synthetic food dyes lies in their extraction from a complex matrix. The widely used methods, such as adsorption into C-18 cartridge, are not quantitative and can result in degradation of the dye. PMM has been successfully used in various extraction procedures, as a transparent matrix can retain both organic and inorganic substances. In this work extraction of the selected food colourants into PMM was used for extraction of the colourants from the food matrix and their visual and spectrophotometric determination. Development of colorimetric sensors has been a key trend in designing novel chemical optode systems.

Quantitative Analysis of Aloin 'A' and 'B' in Finished Products by High-Performance Liquid Chromatography UV Photometric Detector

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Abstract

In this study, simultaneous quantitative test method was developed for Aloin (Aloin A, Aloin B) in processed foods in Korea market by High-Performance Liquid Chromatography - Diode Array Detector. Sample preparation for solid type materials and liquid type materials from Korean processed foods was prepared to extract Aloin effectively using methanol solvents and ultrasonic treatment. The method validation was performed to establish simultaneous analysis of aloin A and B in the food by HPLC and pre-treatment conditions for the sample. Linearity, detection limits, and minimum quantitation, accuracy, precision, and crosschecking were performed as validation methods. Separation was achieved on a Reversed-phase C18 column (5 um, 4.6 x 250 mm) in 40 min under gradient elution conditions. The calibration curves for aloin A and Aloin B exhibits coefficients of determination R2 of 0.9999 over the linear range of 0.5-50 µg/mL. The LOD values for both aloin A and B was 0.03 µg/mL and the quantitation limit were 0.08 µg/mL. The results of checking the recovery rate at 3 concentrations using the standard substance addition method showed a good recovery rate within 80 to 120% and a relative standard deviation of 0.4 to 4.4%.

Statistical Comparison of Some Guidelines for Sampling Method to Inspect Mycotoxins in Foods

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Abstract

Statistical comparison of some guidelines for sampling method to inspect mycotoxins in foods was reviewed in this study to improve Korea Food Standard. Although many nations follow WHO/FAO or CODEX guidelines which is based on the statistical approach from ISO sampling related standard, there are quite a many difference for sampling standard. In this study, the difference of Korea Standard from such guideline was reviewed and the risk differences from some guidelines were statistically approached. Differences among basic statistical principles of each nation's standard were reviewed and compared. Also, differences definitions and use of technical or statistical approach were reviewed in related with many important terms and notions such as Lot, sample size, item or increment of individualizable goods, Sampling plans to be associated with the type of characteristic, defects (nonconformities) and critical nonconformities, operating characteristic curve, inspection by attributes, inspection by variables, etc. Thus, consideration for reasonable improvement of Korea Standard with global harmonization may be possible for sampling standard for inspection followed by quantitative test for mycotoxins. Acknowledgement: This research was supported by a grant (19162MFDS025) from Ministry of Food and Drug Safety in 2019.

Effect of Protease Hydrolysis on Antioxidant Properties of Brewers' Spent Grain Protein

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Abstract

Brewers spent grain (BSG), removed after mashing is the most abundant brewing by-product. Approximately, it contains 29% protein (w/w) on dry basis. This protein rich by-product has been used as low value animal feed or deposited in landfill until today. BSG protein is a probable source of antioxidants as it is derived from barley, known for antioxidant peptides. Main objective of this study was to analyse antioxidant properties of BSG protein and its protease hydrolysates. BSG protein was prepared using alkali extraction followed by hydrolysis with different proteases and protease combinations. Antioxidant activity was determined by DPPH free radical scavenging activity, ferric reducing antioxidant power, ferrous ion chelating activity, and superoxide radical scavenging ability. Hydrolysates reported the highest DPPH scavenging activity were produced with Alcalase or Alcalase combined treatments. It could be due to ability of Alcalase to produce a particular amino acid sequence due to its specificity. The highest metal chelation activity was reported by unhydrolyzed BSG protein (85.42%). Mostly, an inverse relationship was observed between degree of hydrolysis and ferrous ion chelating ability. This could be due to ability of long peptides to trap metal ions in cage structures. Similarly, unhydrolyzed BSG protein reported the highest ferric reducing antioxidant power (0.49), and superoxide radical scavenging ability (60.99%). In conclusion, there is an effect of protease hydrolysis on antioxidant activity of BSG protein. Key words: antioxidant, brewers' spent grain, protein, hydrolysed.

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